IBM

Analysis of Alternatives with Regard to the USAID New Management System (NMS)

Report to the United States Agency for International Development (USAID)

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A

Table of Contents

Acronyms vii

List of Figures ix

List of Tables x

List of Appendices xii

I. Executive Summary 1

II. Introduction 8

A. FEDSIM Statement of Work 8
1. Analysis of Alternatives Task 8
2. Analysis of Alternatives Subtasks 9
3. Previous Evaluations of NMS 9

B. IBM Approach Methodology 10

III. Application Development Effectiveness/Capability Maturity Model Assessment 12

A. Background 12
B. Methodology 13
C. Conclusions 14
D. Recommendations 15
E. Next Steps 16

IV. NMS Business Application Review 17

A. Methodology 17
1. Conduct Data Gathering Activities 18
2. Validate System Capabilities 19
3. Identify and Grade Desired Functions 19
4. Define Gaps Between Necessary Functions and System Capabilities 20
5. Compile Results 20

B. USAID Worldwide Accounting and Control System (AWACS) 20
1. Application Overview 21
2. Legal and Regulatory Requirements 22
3. Evaluation of Demands and Capabilities 24
4. Analysis of Gaps 26
a. Funds Management 26
b. General Ledger and Reporting 29
c. Accounts Payable 31
d. Accounts Receivable 34
e. AWACS-wide Gaps 36

C. Acquisition and Assistance (A&A) 38
1. Application Overview 38
2. Legal and Regulatory Requirements 40
3. Evaluation of Demands and Capabilities 41
4. Analysis of Gaps 41
a. System Cannot be Satisfactorily Queried for Information 42
b. Cannot Record and Use Vendor Past Performance Information 42
c. Does Not Systematically Account for Receipt of Goods 42
d. Invoices Can Be Paid After Money is De-obligated 42
D. Budget (BUD) 43
1. Application Overview 43
2. Legal and Regulatory Requirements 44
3. Evaluation of Demands and Capabilities 44
4. Analysis of Gaps 45
a. Establishing, Reporting, and Tracking Operating Expenses Budget by Object Class and Resource Category 46
b. Identifying Congressional Earmarks and Directives 46
c. Generating Accurate Query Results 46
E. Operations (OPS) 46
1. Application Overview 47
2. Legal and Regulatory Requirements 49
3. Evaluation of Demands and Capabilities 49
4. Gap Analysis 50

V. NMS Technical Review 52

A. Overview 52
B. Methodology 53
C. Technical Discussion 54
1. System Architecture 54
a. Overview 54
b. Findings 54
c. Recommendation 56
2. Networking 57
a. Overview 57
b. Findings 57
c. Recommendations 59
3. Existing Hardware Assessment 59
a. Overview 59
b. Findings 60
c. Recommendations 60
4. Security Assessment 60
a. Overview 61
b. Methodology 61
c. Findings 62
d. Recommendations 63
5. Database Review 67
a. Overview 67
b. Methodology 70
c. Findings 71
d. Recommendations 77

6. Visual Basic Code Review 78
a. Overview 78
b. Methodology 78
c. Findings 79
d. Recommendations 80
7. Year 2000 81
a. Overview 81
b. Methodology 83
c. Findings 85
d. Recommendations 88

VI. Process and Organization Issues 91

A. Organization Issues and Implications 91
B. Process Issues and Implications 92
C. Reengineering and Change Management Cost Considerations 93
1. Reengineering Costs 94
2. Organizational Change Management Costs 95

VII. Legacy Systems 99

A. Overview 99
B. Analysis of Legacy Systems 100
1. Federal Manager's Financial Integrity Act (FMFIA) 100
2. Joint Financial Management Improvement Program (JFMIP) Compliance 101
3. Year 2000 102
4. Data Integrity 103
a. Current MACS Data Integrity Issues 103
b. Migration of Data from NMS to Legacy Systems 104
5. Other Issues 104

VIII. Commercial Off the Shelf Software Solutions 106

A. Financial Management COTS 106
1. GSA FMSS Schedule 107
2. GSA FMSS Schedule Vendors 107
3. Non-GSA FMSS Vendors 109
4. COTS Core Accounting System Characteristics 110
5. Agency COTS Implementation Experience 112
a. Department of Education 112
b. Department of Labor 112
c. Export Import Bank 113
d. Department of Housing and Urban Development (HUD) 114
e. Defense Agency #2 114
f. US Coast Guard 114
g. US Department of Agriculture (USDA) 115
6. Implementation Costs 115
a. Vendor Costs 115
b. Government Agency Implementation Costs 118
7. Additional Considerations 119
a. GSA Vendor vs. Non-GSA Vendor 119
b. Client/Server Technology vs. Mainframe Platform Usage 120
c. Security 121

B. Procurement COTS 122
1. Procurement COTS Overview 122
a. AMS – Procurement Desktop 122
b. CACI – Standard Automated Contracting System (SACONS) 124
c. DynCorp – Acquisition Management Automated System (AMAS) 125
2. Procurement COTS Cost-Model Matrix 126
C. Budget Formulation COTS 126
1. Budget Formulation COTS Overview 126
a. KPMG – FAMIS Advanced Budget Preparation System (BPREP) 126
b. KPMG – Performance Budgeting 127
c. PeopleSoft Budgets for Public Sector 128
2. Budget Formulation COTS Cost-Model Matrix 129

IX. Cross-Servicing 130
A. Overview 130
B. Methodology 131
C. Cross-Servicing Providers 131
D. Additional Considerations 139
1. Benefits 139
2. Risks 139

X. Identification of Alternatives 141
A. Common Activities 142
B. Alternatives Identification 143
1. The "Full NMS Fix" Alternative 143
2. The "Partial NMS Fix" Alternative 144
3. The "Full COTS" Alternative 145
4. The "COTS/NMS" Alternative 145
5. The "Legacy/NMS" Alternative 146
6. The "Cross-Servicing" Alternative 146
7. The "Outsourcing" Alternative 146

XI. Business Analysis 147
A. Methodology 147
B. Evaluation of Alternatives 148
1. Full NMS Fix 148
2. Partial NMS 149
3. Legacy/NMS 149
4. Full COTS 149
5. COTS/NMS 150
6. Cross-Servicing 150
7. Outsourcing 150

C. Cost Analysis 152
1. Description and Assumptions Associated with Key Cost Elements 152
a. USAID Program Office 153
b. Prime Contractor Cost 153
c. Service 153
d. Security Licensing Costs 153
e. Design and Development 154
f. Year 2000 Fix 154
g. Hardware Costs 154
h. Licensing Costs 154
i. Telecommunications Costs 155
2. Description of Cost Estimates by Alternative 155
a. Full NMS Fix 156
b. Partial NMS Fix 157
c. Legacy/NMS 158
d. Full COTS 159
e. COTS/NMS 160
f. Cross Servicing 161
D. Risk Assessment and Analysis 162
1. Risk Assessment 162
a. Schedule Longevity 162
b. Life Cycle Cost 162
c. Technical Feasibility 162
d. Risk of Technical Obsolescence 163
e. Architecture Dependencies 163
f. Skills 163
g. Program/Acquisition Management 163
h. Creating a Monopoly for Future Procurements 163
i. Availability of Funds 164
2. Risk Analysis 164
a. Full NMS Alternative 165
b. Partial NMS Alternative 166
c. Legacy/NMS Alternative 167
d. COTS Alternative 168
e. COTS/NMS Alternative 169
f. Cross Servicing Alternative 170
E. Net Assessment 171
F. Recommended Solution 171
1. Implementation Plan 172

XII. Business Case 180

A. Introduction 180
B. Background 181
C. USAID Business Needs 181
1. Technical Needs 181
2. Business Functionality Needs 182
a. AWACS 182
b. A&A 183
c. Budget 183
d. Operations 184
3. Management and Operational Gaps 184
4. Organizational and Process Gaps 185
D. Identification of Alternatives 186

E. Benefits-Cost Assessment 187
1. Benefits Evaluation 188
2. Cost Assessment 189
3. Risk Assessment 190
4. Summary Assessment 191
F. Recommendation 191
G. Compliance with Raines' Rules 192

Acronyms

A&A ..... Acquisition and Assistance (NMS application)
ADE ..... Application Development Effectiveness
ADP ..... Automated Data Processing
AID ..... Agency for International Development (short for USAID)
AP ..... Accounts Payable (accounting function)
AR ..... Accounts Receivable (accounting function)
AWACS ..... AID Worldwide Accounting and Control System (NMS application)
BAA ..... Business Area Analysis
BUD ..... Budget (NMS application)
CBD ..... Commerce Business Daily
CMM ..... Capability Maturity Model
COBOL ..... Common Business Oriented Language
COTR ..... Contracting Officers Technical Representative
COTS ..... Commercial Off The Shelf
DASD ..... Direct Access Storage Device
DBA ..... Database Administrator
DOC ..... Department of Commerce
FACS ..... Financial Accounting and Control System (legacy accounting system)
FAM ..... Foreign Affairs Manual
FAR ..... Federal Acquisition Regulations
FASAB ..... Federal Accounting Standards Advisory Board
FM ..... Funds Management (accounting function)
FMSS ..... Financial Management Systems Software
FTE ..... Full Time Equivalent
FY ..... Fiscal Year
FYB ..... Fiscal Year Budget
GAO ..... General Accounting Office
GFY ..... Government Fiscal Year
GL ..... General Ledger (accounting function)
GPRA ..... Government Performance and Results Act
GSA ..... General Services Administration
GUI ..... Graphical User Interface
IP ..... Internet Protocol

IRM ..... Information Resource Management
ISSO ..... Information Systems Security Officer
IT ..... Information Technology
IV&V ..... Independent Verification and Validation
JFMIP ..... Joint Financial Management Improvement Program
LAN..... Local Area Network
MACS ..... Mission Accounting and Control System (legacy accounting system)
NMS..... New Management System
OE ..... Operating Expenses
OIG..... Office of the Inspector General
OMB ..... Office of Management and Budget
OPS..... Operations (NMS application)
OSI ..... Open Systems Interconnection (model)
OYB..... Operating Year Budget
PC ..... Personal Computer
RBAC..... Role-Based Access Control
RDBMS..... Relational Database Management System
SO ..... Strategic Objective
SOW..... Statement of Work
SQA..... Software Quality Assurance
SQL ..... Structured Query Language
TCP/IP..... Transmission Control Protocol/Internet Protocol
USAID..... United States Agency for International Development (AID)
VB..... Visual Basic
VINES..... Virtual Inter-Networking Enterprise System
VSAT ..... Very Small Aperture Terminal
WAN..... Wide Area Network
Y2K..... Year 2000

List of Figures

Figure 3-1: Four Phases in the ADE/CMM Methodology 12
Figure 5-1: OSI Model 58
Figure 5-2: Typical Two-Tier Client/Server Scenario 68
Figure 5-3: NMS Network Architecture 69
Figure 5-4: Year 2000 Target Dates 82
Figure 6-1: Transformation Process 93
Figure 11-1: Benefits/Cost Assessment 147
Figure 11-2: Outsourcing Tasks/Schedule 151
Figure 11-3: Overview of Risk Analysis Scores 164
Figure 11-4: Proposed Transition Plan 172
Figure 11-5: Transition Plan Activities 173
Figure 12-1: Overview of Risk Analysis Scores 190

List of Tables

Table 3-1: ADE/CMM Assessment Conclusions 14
Table 3-2: Recommendations for Process Improvement in the NMS Development Organization 15
Table 4-1: Impact Level of NMS Application Functions 19
Table 4-2: Applicable Regulations, Directives, and Guidance 23
Table 4-3: Impact Level of AWACS Application Functions 24
Table 4-4: AWACS Capabilities Assessment Results By Module 25
Table 4-5: Gap Summary for AWACS Application 26
Table 4-6: Legal and Regulatory Compliance 40
Table 4-7: Impact Level of A&A Application Functions 41
Table 4-8: Impact Level of Budget Application Functions 45
Table 4-9: Impact Level of Operations Application Functions 49
Table 5-1: Technical Review Summary Findings 53
Table 5-2: OMB Requirements Compliance Analysis 62
Table 5-3: Suggested IT Security Infrastructure 64
Table 5-4: SSM Responsibilities 66
Table 5-5: Significant Database Review Findings 71
Table 5-6: NMS Summary 79
Table 5-7: Federal Government and USAID Year 2000 Considerations – 1996-1997 85
Table 6-1: Organization Issues and Implications 92
Table 6-2: Process Issues and Implications 92
Table 6-3: Examples of NMS Success Factors 95
Table 7-1: Core Financial Management Legacy System 100
Table 7-2: Legacy Systems Non-Compliance With JFMIP Core Financial Management 101
Table 7-3: USAID Legacy Systems Y2K Compliance Costs 102
Table 8-1: COTS Characteristics Matrix 111
Table 8-2: Vendor Costs Matrix 116
Table 8-3: Procurement COTS Cost-Model Matrix 126
Table 8-4: Budget Formulation COTS Cost-Model Matrix 129
Table 9-1: Cross-Servicing Providers Specifications 133
Table 10-1: NMS Alternatives 141
Table 11-1: Alternatives Assessment Summary Table 148
Table 11-2: Alternative Cost Summary ($'s in 1,000's) 152
Table 11-3: FTE's Required by Alternative 153
Table 11-4: Full NMS Fix Costs ($'s in 1,000's) 156

Table 11-5: Partial NMS Fix Costs ($'s in 1,000's) 157
Table 11-6: Legacy/Partial NMS Costs ($'s in 1,000's) 158
Table 11-7: Full COTS Costs ($'s in 1,000's) 159
Table 11-8: COTS/NMS Costs ($'s in 1,000's) 160
Table 11-9: Cross-Servicing Costs ($'s in 1,000's) 161
Table 11-10: Full NMS Risk Analysis 165
Table 11-11: Full NMS Risk Analysis 166
Table 11-12: Legacy/NMS Risk Analysis 167
Table 11-13: COTS Risk Analysis 168
Table 11-14: COTS/NMS Risk Analysis 169
Table 11-15: Cross Servicing Risk Analysis 170
Table 11-16: Total Benefit/Cost Ratio 171
Table 11-17: Weighted Benefit/Cost Ratios 172
Table 12-1: NMS Organization and Process Issues 185
Table 12-2: Actions for Implementing NMS Solutions 187
Table 12-3: Alternatives Assessment Summary Table 188
Table 12-4: Alternative Cost Summary ($'s in 1,000's) 189
Table 12-5: Total Benefit/Cost Ratio 191
Table 12-6: Weighted Benefit/Cost Ratios 192

List of Appendices

Appendix A: NMS Evaluation Studies and Outside Reviews
Appendix B: Interview List
Appendix C: CMM Assessment Report
Appendix D: NMS Program Documentation
Appendix E: NMS Application Gap Analysis Matrices
Appendix F: Enterprise Security Management Mechanisms
Appendix G: NMS Applications and Supporting Module Code Review Results
Appendix H: Year 2000 Compliance

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Executive Summary

The United States Agency for International Development (USAID) has implemented a portfolio of systems under an initiative entitled New Management Systems (NMS). The purpose of NMS is to provide the agency with an integrated suite of systems to perform the required business functions associated with the USAID mission and to support the reporting and tracking requirements of the agency and to satisfy United States (US) Government reporting requirements.

It has been determined that there are major issues and concerns with the applications and subsystems comprising NMS and their ability to satisfy USAID's business needs. This document presents the systems assessment and alternatives analysis performed to determine the preferred methods of addressing USAID's business needs. The alternatives analyses were conducted in accordance with the Office of Management and Budget (OMB) guidance on funding IS investments, also known as Raines Rules.

IBM Approach

USAID, using Federal Systems Integration and Management Center (FEDSIM) services, contracted with IBM to perform an assessment of the USAID's NMS and an alternatives analysis with regards to NMS. To perform the NMS alternatives analysis and subtasks, IBM provided subject matter and discipline staff in the following areas:

- CMM assessment for Software Engineering practices
- Business Application analysis / Business Case development
- Technical – Architect, Visual Basic, Oracle design, Y2K, Security, Network
- Commercial Off The Shelf software capabilities

Data for the NMS alternatives analyses were gathered by conducting NMS user, management, and developer interviews, reviewing USAID supplied documentation (e.g., audit reports, Business Area needs documentation, regulatory requirements) and by conducting technical evaluations of NMS using automated analysis tools and manual methods. COTS capabilities and cost parameter data were solicited and received from vendors.

The gathered data were used to gain an understanding of the current "gaps" between NMS and USAID capabilities and business needs along the dimensions of Process, Organization, and Technology. The available alternatives were then assessed against the gaps according to benefits, risks, and costs to determine the preferred alternative and recommendations.

ADE/CMM Assessment Team Findings

The assessment followed the IBM Application Development Effectiveness (ADE) methodology. Interviews were conducted with 47 USAID executives, staff members, and contractors and project and process documentation was reviewed. The primary conclusion of the assessment is that USAID, specifically the NMS development organization, is a CMM Level 1 organization. Other conclusions and recommendations were developed in six major categories:

- Culture – characterized by informal communications, committee and consensus management
- Methodology – lack of project management, life cycle methods
- Technology – need for overall technical architecture
- Organization – fragmented, complex, little accountability
- Skills – significant skills needs for migration to process-driven environment
- Measurements – lack of measurements inhibits fact-based decision making

Business Requirements

USAID business requirements were identified using a methodology that consisted of the following steps:

- Data gathering activities – Interviews, NMS documentation review, Federal regulation review
- Validation of NMS system capabilities – Follow-up interviews, subsystem demonstrations
- Identification and grading of functions – Characterization of existing and "to be developed" NMS capabilities as necessary, desired, or not necessary
- Identification of "Gaps" between system capabilities and necessary functions

The gaps identified translate into the business requirements that the selected NMS alternative should address. The following are the high-level business requirements findings that the proposed NMS alternative needs to satisfy.

A total of 257 business functions across the four NMS applications were identified. Of this total, 189 of these functions are considered necessary and are required to support essential business

processes and/or regulatory requirements. This number is further detailed by current NMS application with 98 necessary functions identified for AWACS, 46 functions identified as necessary for A&A, 29 functions considered necessary in the Budget area and 16 in the Operations area. Of the 189 necessary functions, only 107 provide total functionality. By application this total consists of 43 for AWACS, 39 for A&A, 15 for Budget and 10 for Operations.

In addition, a total of 46 functions within NMS are considered desired. These are functions that will not improve USAID's ability to perform its business processes but are not essential and are not required to meet regulatory requirements. A total of 22 functions are not necessary. These are functions that are nice to have but are not needed as part of an integrated system.

Of primary concern to USAID management is financial management operations and compliance. Specifically, the current NMS system does not satisfy some Joint Financial Management Improvement Program (JFMIP) requirements for core financial systems. The JFMIP identifies system requirements that must be satisfied by federal core accounting systems. The JFMIP encompasses financial management regulatory requirements established by the OMB, the General Accounting Office (GAO), and the US Treasury. The key gaps in JFMIP requirements include:

- AWACS does not fully meet the JFMIP core financial requirements designed to support the Prompt Payment Act
- AWACS does not provide for JFMIP requirements supporting the need for three-way matching of invoices with purchase orders and receiving reports
- AWACS does not support USAID's external reporting needs as dictated by the Department of Treasury, OMB FASAB
- AWACS does not support JFMIP requirements established to ensure that costs are accumulated and reported with proper matching of periods, segments and outputs
- The AWACS General Ledger does not report comparisons between the amounts in other modules of AWACS and the related control accounts in the General Ledger. Accounts in the General Ledger do not agree with detailed transaction data, a basic control.

In addition to the JFMIP requirements, USAID has unique needs that should have been provided for the functionality of NMS. The key gaps include the following:

- NMS does not provide for the unique requirements concerning bilateral agreements that USAID enters into with host countries
- NMS does not provide for foreign currency accounting and reporting functions
- NMS does not provide full functionality in the area of loan management

Key Technical Findings

The key technical findings of our assessment of NMS include the following:

- NMS was designed without regard to proper design requirements definition to support worldwide implementation
- The current network provides adequate networking facilities for USAID
- An Information Systems Security Management Program does not exist at USAID
- Haphazard database design practices have resulted in an undocumented and poorly integrated NMS system
- Lack of proper testing has failed to identify and isolate code problems that adversely affect system performance and reliability
- Both NMS and legacy systems are exposed to significant Year 2000 compliance issues

Alternatives Identification

Seven alternatives to NMS were identified for assessment. The identified alternatives and their primary approach are:

- Full NMS Fix – Continue NMS development to provide all desired functionality
- Partial NMS Fix – Continue NMS development to provide minimum mission-critical subset of functionality
- Legacy/NMS – Replace AWACS with Legacy systems and provide the Partial NMS Fix solutions for A&A, Budget and Operations
- Full COTS – Replace NMS with one or more COTS packages, customizing them where needed to provide missing mission critical functionality
- COTS/NMS – Replace AWACS with a COTS solution and provide the Partial NMS Fix solutions for A&A, Budget and Operations (Note: A&A could be replaced with a COTS package under this alternative)
- Cross Servicing – Use a cross-servicing agency to replace AWACS and provide the Partial NMS Fix solutions for A&A, Budget, and Operations (Note: A&A could also be cross-serviced)
- Outsourcing – Similar to the cross-servicing option above, but outsource to the private sector instead of another government agency

The IBM Team identified criteria that are common to each of these alternatives as well as alternative specific items that will require significant effort by USAID in the following areas regardless of which alternative is implemented. The common activities include:

- validation of system functional requirements
- conduct process redesign and organizational change activities
- implementation of an IT security infrastructure
- ensure sufficient training and testing prior to well coordinated worldwide rollouts

Business Analysis

In order to evaluate and recommend a solution, the IBM Team performed a three step benefit/cost assessment of the relative benefits, costs, and risks associated with each alternative. These results were integrated into a multi-attribute scoring model as defined in the OMB Capital Programming Guide and GAO's Guide to Best Practices for IT Investment. The Outsourcing alternative was determined to not be a viable alternative because of the time it takes to implement an outsourcing arrangement as regulated under OMB Circular A-76. For this reason, outsourcing was not included in the business analysis.

The benefit analysis rates each alternative by assigning benefit scores that indicate how well each alternative meets the business requirements and necessary functionalities. The cost analysis presents the estimated cost of each alternative in terms of a five year lifecycle estimate. The risk assessment identifies the risk of each alternative against a standard set of criteria.

The results of the benefit analysis indicate that the Full COTS and COTS/NMS alternatives provide the highest level of confidence that they can be in place by Year 2000 with all necessary functionality. The other alternatives were evaluated in descending order as follows: Cross-Servicing, Partial NMS Fix, Full NMS Fix and last, Legacy/NMS.

The IBM Team conducted cost estimates for the alternatives based on nine key cost elements. The cost estimates also reflect the required full time equivalent USAID program and security personnel necessary to manage and implement each alternative. The results of the cost analysis indicate that the COTS alternative provides the least expensive five-year lifecycle estimate of $50.6 million. The most expensive alternative is the Full NMS Fix alternative estimated at $74.4 million. The cost estimates are likely to change as USAID gains greater understanding of the requirements and architecture required to implement the selected alternative.

The IBM Team identified nine key risk drivers which we measured against each of the alternatives. The risk analysis evaluated the program impacts against the alternatives. Each risk was characterized regarding the likelihood of its occurrence and the severity of potential consequences. Based on these factors, the Full COTS alternative was determined to be the least risky alternative and the Legacy/NMS alternative was considered to be the riskiest.

Throughout the separate parts of the benefit/cost analysis, the Full COTS and COTS/NMS alternatives were the two solutions that scored most favorably. The net assessment of our analysis indicates that the Full COTS alternative will provide the most functionality at the least cost and mitigates risk significantly. To these results, we factored into the analysis the USAID management established priorities which include:

- ability to obtain reliable financial data
- ensure the integration between Budget and Operations functions
- enhance the security in the Budget business area
- assign emphasis area coding in the Operations business area
- fulfill all functionality in the Operations business area

Inclusion of these factors results in a summary recommendation that the COTS/NMS alternative will best meet USAID's business needs.

Finally, as part of our effort, IBM has provided USAID with a proposed transition plan to implement the recommended alternative and a prototype business case for funding justification.

Document Overview

This report is subdivided according to each area of our analysis and assessment. The document is organized according to the following areas of discussion:

- Section I – Executive Summary
- Section II – Background and IBM Approach and Methodology – wherein we present the requirements of the statement of work and our approach to perform this effort
- Section III – Application Development Effectiveness/Capability Maturity Model (ADE/CMM) Assessment– wherein we provide an explanation on the background, methodology, conclusions, recommendations and next steps identified by the ADE/CMM assessment
- Section IV – NMS Business Application Review – wherein we present an overview of each NMS application, identify the necessary requirements to be performed and identify the gaps between necessary functionality and system capability
- Section V – NMS Technical Review – wherein we provide a discussion of the technical review of the NMS performed by the IBM Team in the areas of System Architecture, Networking, Existing Hardware Assessment, Security, Database Review, Visual Basic Code Review, and Year 2000 compliance
- Section VI – Process and Organization Issues – wherein we summarize the process and organizational issues that have in the past impeded USAID system development activities and NMS performance
- Section VII – Legacy Systems – wherein we present our assessment of the USAID legacy systems
- Section VIII – Commercial Off The Shelf Software Solutions – wherein we provide an overview of the Commercial Off The Shelf software options to NMS
- Section IX – Cross-Servicing – wherein we present a summary of the financial support services provided by other government agencies
- Section X – Identification of Alternatives – wherein we present a discussion of the seven alternatives for addressing the business and systems needs of USAID
- Section XI – Business Analysis – wherein we provide a discussion of our alternatives evaluation and our determination of a recommended approach, based on relative benefits, costs, and risks associated with each alternative
- Section XII – Business Case – wherein we provide a prototype for USAID to create a business case for funding justification after selecting an alternative to NMS

II

Introduction

The United States Agency for International Development (USAID) has implemented a portfolio of systems under an initiative entitled New Management Systems (NMS). The purpose of NMS is threefold. First, NMS is to provide the agency with an integrated suite of systems to perform the required business functions associated with the USAID mission. Second, NMS is to support the reporting and tracking requirements of the agency. Finally, NMS is supposed to satisfy United States (US) Government reporting requirements.

NMS is comprised of four applications:

- AID Worldwide Accounting and Control System (AWACS)
- Acquisition and Assistance (A&A)
- Budget System (BUD)
- Operations System (OPS)

These four applications were originally developed at different times and independently from each other. USAID has determined that a number of vulnerabilities, deficiencies, and concerns exist with the NMS applications as implemented. These issues have resulted in NMS not fulfilling the purposes for which it was envisioned. This determination has required USAID to examine what alternatives are available to management to resolve these issues.

A. FEDSIM Statement of Work

USAID, using Federal Systems Integration and Management Center (FEDSIM) services, contracted with IBM to perform an alternatives analysis with regards to NMS. In addition IBM was asked to perform a series of subtasks in support of the to the primary analysis of alternatives task effort.

1. Analysis of Alternatives Task

The goal of the analysis of alternatives task effort was to identify and evaluate alternatives and strategies for USAID to use in meeting its information management requirements for financial,

acquisition, budget, and development programs. USAID requested that four specific alternatives were to be reviewed. These alternatives are:

- Reverting to legacy systems
- Continuing NMS development
- Replacing portions of NMS with Commercial Off The Shelf Software (COTS) solutions
- Replacing all of NMS with COTS solutions

IBM identified and examined the following additional alternatives and included them in our analysis:

- Agency cross-servicing
- Outsourcing

The analysis of alternatives task included assessment of the development, implementation and operations of NMS.

2. Analysis of Alternatives Subtasks

A list of subtasks associated with the alternatives analyses was identified by USAID. The flexibility to adjust detailed activities associated with these subtasks was provided in the Statement of Work to insure the timely submission of the NMS alternatives analysis report. The listed subtasks include:

- Evaluate the current operational effectiveness of NMS
- Apply Capability Maturity Model (CMM) measurements
- Evaluate NMS Year 2000 Compliance
- Analyze segregation of NMS database tables
- Determine feasibility and risks to enhance NMS
- Evaluate AWACS capability to meet core financial management requirements
- Evaluate and document commercial of the shelf (COTS) options
- Provide recommendations to USAID

IBM began its analysis of alternatives effort on November 21, 1997.

3. Previous Evaluations of NMS

It should be noted that organizational, management and technical issues related to the New Management System have been documented and known to USAID management through the findings identified and conclusions developed in numerous studies of the New Management System previously conducted. These efforts include internal OIG studies, as well as outside reviews conducted by Mitretek Systems, the Software Engineering Institute of Carnegie Mellon Institute, and

KPMG Peat Marwick, among others. IBM acknowledges that in most cases, each of these studies tended to focus on singular issues or was sponsored by an organization within USAID that was looking at the issues from a particular point of view. The IBM approach reflects an enterprise-wide effort. Yet the fact remains that the Agency has had prior notification of the existence and the severity of many of the problems related to NMS. Response in the form of comprehensive, corrective action has been limited. Reasons for this could include one or more of the following:

- the information in the form of findings and conclusions was not shared by the study sponsor with other organizational entities or managers within USAID
- additional findings or duplicative confirmation of findings was sought beyond the individual study
- correlation of findings was not evident to the study sponsor
- unwillingness to present or acknowledge adverse findings in an environment and culture that would be unable or unwilling to address important issues and decisions

Appendix A identifies the important NMS evaluation efforts conducted prior to the IBM alternatives assessment engagement. These efforts were reviewed at the beginning of our effort and provided a baseline for this study.

B. IBM Approach Methodology

To perform the NMS alternatives analysis and related subtasks, IBM provided subject matter and discipline staff in the following areas:

- CMM assessment for Software Engineering practices
- Business Application analysis / Business Case development
- Technical - Architect, Visual Basic, Oracle design, Y2K, Security, Network
- Commercial off the shelf (COTS) software

Data for the NMS alternatives analyses was gathered by conducting NMS user, management, and developer interviews; by reviewing USAID supplied documentation (Audit reports, Business Area Analysis and requirements documentation, regulatory requirements, etc.); and by conducting technical evaluations of NMS using automated analysis tools and manual methods. The gathered data were used to gain an understanding of the current "gaps" between NMS and USAID capabilities and business needs along the dimensions of Process, Organization, and Technology. Alternative solutions to address USAID's business needs were identified and these alternatives were then assessed against the gaps to determine the preferred alternatives and recommendations.

The identified alternatives were then evaluated according to benefit, cost and risk criteria, as well as USAID management priorities. A recommended alternative was selected and a suggested implementation plan was produced as part of this report.

The assumptions the IBM Team made in performing our analysis are presented throughout this report. In contrast, the following are a few general constraints we encountered in conducting our work that should be noted in reviewing our findings and recommendations. Overriding our effort was the compressed timeframe of our period of performance and the intensity of our effort considering the scope and expectations of USAID management. In addition we experienced varying degrees of difficulty because of the following:

- lack of Strategic Plan detailing management and information systems business objectives
- limited access to users, especially mission users, given short project time frame
- limited user knowledge of the functionality and operations of NMS, both at the system level and for individual applications
- lack of internal agency expertise to help assess functionality and requirements
- NMS system too unreliable or speed too slow for full demonstration of all functionality
- objectivity of respondents
- access to most current version of code
- timely access to system documentation

III

Application Development Effectiveness/ Capability Maturity Model Assessment

This section of the report provides an explanation of the background, methodology, conclusions, recommendations, and next steps identified by the Application Development Effectiveness (ADE)/ Capability Maturity Model (CMM) Assessment.

A. Background

USAID engaged IBM Consulting to perform an ADE/CMM Assessment as part of the overall NMS alternatives assessment effort. ADE is an IBM methodology that defines four steps toward improving the effectiveness of application development and maintenance activities. These four steps are 1) Assessment 2) Target Definition 3) Transition Planning and 4) Change Integration. Figure 4-1 presents an overview of these four phases in the ADE/CMM methodology. The Assessment phase, the first of these four steps, is based on the Software Engineering Institute (SEI) Capability Maturity Model (CMM) for Software.

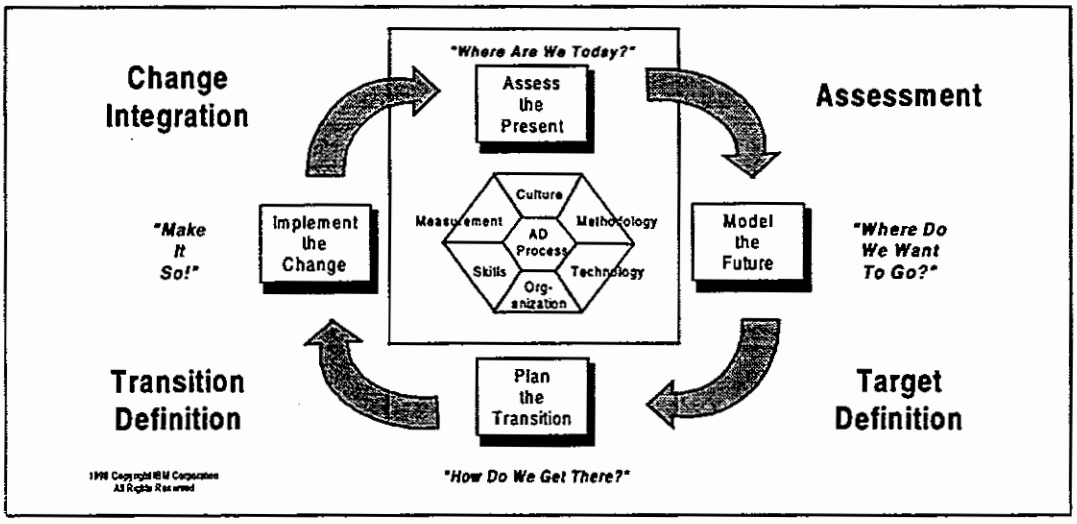

Figure 3-1: Four Phases in the ADE/CMM Methodology

B. Methodology

The ADE/CMM Assessment involves planning, data gathering, analysis, and report preparation steps. As part of the planning effort, the team developed a set of hypotheses to guide data gathering. The ADE process establishes six categories for data gathering. These categories are culture, methodology, technology, organization, skills, and measurement. Interview guides were developed using the hypotheses and data categories, and sources of existing documentation were identified. Interviews were planned and scheduled.

A total of forty-seven people were interviewed as part of the data gathering process, including representatives of the Inspector General's Office, IRM managers and developers, other NMS managers and staff, as well as contractor managers and developers. Those interviewed during the ADE/CMM assessment are listed in Appendix B. NMS Project and Process Documentation was also reviewed.

During the analysis process, the data gathered through interviews and document reviews were used to generate a set of interim findings. These findings were applied to the original hypotheses about the process environment, allowing the team to confirm, reject, or add additional hypotheses. The final hypotheses then served as the basis for a set of conclusions and recommendations, as well as the determination of the CMM rating for the NMS development organization[1].

The NMS development organization was evaluated in each of the eighteen Key Process Areas (KPAs) in the CMM. The overall assessment rating of the NMS development organization is Level 1 (Initial), as a result of noncompliance with the six Level 2 KPAs. The team observed some evidence of activity in all of the Level 2 KPAs and many of the Levels 3 through 5 KPAs, although none were performed or institutionalized to the extent considered satisfactory in the CMM model. The detailed evaluations for each KPA, as well as observed strengths and weaknesses, are contained in the full ADE/CMM Assessment report provided in Appendix C.

An additional tool used during the ADE study was the IBM Information Technology Process Model (ITPM). This is a hierarchical model composed of process groups, processes, and sub-processes that defines the process infrastructure for I/T organizations. NMS was evaluated using the ITPM processes relevant to application development and maintenance as an additional confirmation of the results of the CMM analysis.

[1] The NMS development organization is considered the aggregate of contractor, task force, and IRM individuals responsible for NMS delivery.

C. Conclusions

The IBM ADE/CMM Assessment Team developed twelve conclusions relative to the effectiveness of the application development and maintenance environment. These conclusions are summarized in Table 3-1:

Key Conclusions
1. There are positive factors within the USAID NMS development organization that can be leveraged to enhance application development effectiveness. These include leadership, people assets, teamwork, and the beginnings of future discipline.
2. The NMS leadership fails to provide consistent direction, leading to uncertainty, which impacts both morale and productivity.
3. The current NMS organization is fragmented and complex, discouraging accountability and inhibiting productivity.
4. Two aspects of the USAID culture, informality of communications and management by committee and consensus, inhibit timely, effective decision making and productivity for software engineering.
5. The lack of a well-defined project management process inhibits consistent delivery of applications on time and within budget.
6. The lack of a life cycle methodology prevents consistent development and maintenance of quality applications in a timely and efficient manner.
7. The lack of an effective requirements management process inhibits the timely identification of business needs.
8. Lack of a comprehensive and rigorous Software Configuration Management process in a high-volume change environment introduces production and control problems and places software assets at risk.
9. Testing lacks appropriate rigor, consistency, and focus, resulting in errors, rework, and reduced customer satisfaction.
10. The current contracting approach inhibits achievement of consistent quality and productivity.
11. The lack of a measurements program in the NMS application development environment is inhibiting fact-based decision making, direction setting, and communication.
12. Achieving significant process improvement will require enhancement of both IRM and user skills.

Table 3-1: ADE/CMM Assessment Conclusions

D. Recommendations

The team developed twelve recommendations to address the need for process improvement within the NMS development organization and to guide achievement of higher CMM levels of process maturity. These recommendations are summarized in Table 3-2 below:

Key Recommendations
1. Establish an effective and sustaining leadership environment to provide the foundation for continuing application development process improvement.
2. Simplify and streamline the NMS development organization structure to focus management attention, clarify reporting chains, eliminate divided loyalties, and strengthen accountability.
3. Implement a project management process that will increase development predictability and lower project risk, contributing to improved customer satisfaction.
4. Retain contractors as the vehicle for continued NMS development and maintenance, and implement an effective subcontract management process.
5. Establish a life cycle methodology as the foundation for implementing repeatable processes and for the development, acquisition, and maintenance of quality applications.
6. Develop and implement a consistent NMS requirements process which yields timely, complete requirements for needed functionality and which can serve as a testable base for performance-based contracts.
7. Establish a process for full life cycle testing including plans, activities, and organizational standards.
8. Strengthen Configuration Management as a tool to improve production system stability and quality.
9. Leverage Software Quality Assurance (SQA) concepts to achieve effective process implementation and deliver high quality products.
10. Define a set of application development and acquisition measurements to facilitate fact-based understanding, decision making, and action.
11. Establish a clear charter for key infrastructure support functions within the NMS development organization.
12. Develop and implement a skills management strategy that will prepare NMS development personnel for the future technology-driven and process-driven environment.

Table 3-2: Recommendations for Process Improvement in the NMS Development Organization

E. Next Steps

Organizations that have invested in process improvements over an extended period have realized dramatic results. According to data gathered by the Software Engineering Institute[2], organizations that have invested in process improvement for three or more years have achieved results such as an ROI of 7:1, an average gain in productivity of 37% per year, an 18% gain each year in the proportion of defects found in pretest, a 19% average reduction in time to market, and a 45% average reduction in field error reports per year. In addition to these gains, intangible results have also been reported. These include improved employee morale, fewer overtime hours, a more stable work environment, lower turnover of staff, improved communication, and improved quality as reported by customers. It was noted that productivity improvements such as these can make resources available to be applied to USAID core programs.

Following through with the next phase of the IBM ADE process, Target Definition, would provide the USAID NMS development organization with a clearly identified target environment answering the question, "Where do we want to go?" as shown in Figure 3-1 above. The objective of the Target Definition phase is to define a future application development and maintenance environment for the organization that is aligned with the organizational vision, mission, goals, and objectives. Target Definition begins with a facilitated planning session to define the vision, mission, goals, and objectives, followed by a series of focused team efforts to address specific areas chosen for the Target Definition effort. Following the Target Definition phase, the ADE Transition Planning phase defines a detailed plan and set of projects to achieve the target environment. The fourth phase, Change Integration, involves the actual implementation of the changes through execution of the transition plan. SEI experience indicates that the average time required to move from CMM Level 1 to Level 2 is 27 months, with an additional 18 months to move from Level 2 to Level 3[3].

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[2] Paulk, M. C., Weber, C., Curtis, B., Chrissis, M. B. (1994). The capability maturity model: Guidelines for improving the software process. Reading, MA: Addison Wesley Longman.

[3] Software Engineering Institute. (1997). Process maturity profile of the software community 1997 update. Pittsburgh, PA: Carnegie Mellon University

IV

NMS Business Application Review

This section of the report describes the IBM Team's review and analysis of user demands for the New Management System (NMS) functionality and the current NMS capability. The section begins with a description of the methodology used to perform the demands and capability review for each of the four NMS applications: the AID Worldwide Accounting and Control System (AWACS); the Acquisition and Assistance application (A&A); the Budget and Fund Allocation application (BUD); and the Operations application (OPS).

Next, the section presents the analysis and findings for each application, as follows:

- Overview of the application, including a discussion of the original system design
- Identification and description of the legal and regulatory requirements to be performed by the application
- Determination of necessary user functionality
- Identification of gaps between necessary functionality and the current system environment

The discussion presented in this section is the basis for analyzing strategies to meet USAID's needs in the areas of finance and accounting, acquisition and assistance, budget formulation and execution, and results tracking and planning/implementation support.

A. Methodology

The IBM Team used the following methodology to identify and define the gaps between NMS user needs and NMS system capabilities. This methodology meets the requirements of Raines Rules numbers one and four[4]. These rules specify that USAID implement an NMS solution that supports priority Agency missions and demonstrates the best possible projected return on investment. First, the IBM methodology fulfills these requirements by identifying and documenting the system functionalities that support USAID's missions. Second, the methodology ensures that we are identifying a solution with the best possible return on investment because it eliminates unnecessary costs, improves mission performance in accordance with Government Performance and Results Act

[4] OMB Memo M-97-02. Funding Information Technology Investments, dated October 25, 1996.

(GPRA) measures, increases the quality of service, and ultimately increases customer satisfaction. The methodology consists of five areas of activity:

- conduct data gathering activities
- validate system capabilities
- identify and grade desired functions
- define gaps between necessary functions and system capabilities
- compile results

These areas of activity are discussed in the following sections.

1. Conduct Data Gathering Activities

To begin the process of determining user need and system capability, the IBM Team reviewed relevant NMS program documentation, including:

- Business Area Analyses (BAA) for each application wherein the Agency identified basic system requirements and reengineering goals
- General Services Administration waiver of requirement to use the Financial Management Systems Software (FMSS) schedule
- Background reports from such organizations as the General Accounting Office, the Office of Inspector General, and USAID contractors describing system problems
- Applicable Federal regulations and "best practices" guidance

Appendix D provides a list of NMS program related documentation the IBM Team compiled and reviewed to perform this task.

In addition to reviewing relevant NMS documentation, the IBM Team conducted interviews with application users and developers. These interviews focused on such issues as:

- Understanding of requirements as outlined in the BAA
- Utility of existing system functions and overall ability of the functions to meet their needs
- Additional functionalities that are needed in the performance of their responsibilities
- Potential process, organization, and technical problems
- Unique requirements of USAID

The interviews were conducted with personnel representing USAID headquarters, the various Agency bureaus, and missions. In addition, we interviewed the Executive Sponsors and development team leads for each application. As appropriate, we included contractor staff to help explain specific system functions. Appendix B provides a list of individuals interviewed.

2. Validate System Capabilities

In order to validate system capabilities, the IBM Team conducted follow-up interviews and participated in detailed demonstrations of each application. These interviews and demonstrations were conducted with a variety of users, functional area experts, and system development specialists.

3. Identify and Grade Desired Functions

As a result of the data gathering and system capabilities validation activities, the IBM Team defined a comprehensive list of 1) system capabilities, 2) user requirements that have not yet been incorporated into the system, and 3) regulatory requirements that may not have been incorporated into the BAA analysis and system design. The IBM Team assigned each identified function to one of the following three categories called impact levels:

- ***Necessary*** – these are functions that are required to support essential business processes and/or regulatory requirements
- ***Desired*** – these are functions that will improve USAID's ability to perform its business processes but are not essential and are not required to meet regulatory requirements
- ***Not Necessary*** – these are functions that are nice to have but are not needed as part of an integrated system or are not viewed as necessary by users

The IBM Team assigned a value to each function according to the above criteria such that a ***Necessary*** function received a value of "2," a ***Desired Function*** received a value of "1," and a ***Not Necessary*** function received a value of "0." Table 4-1 summarizes the results of our analysis by application.

Application	Impact Level			Total
	Not Necessary (0)	Desired (1)	Necessary (2)	
AWACS	1	17	98	116
A&A	9	25	46	80
Budget	3	3	29	35
Operations	9	1	16	26
Total	22	46	189	257

*General Ledger includes reporting and cost accounting requirements

Table 4-1: Impact Level of NMS Application Functions

4. Define Gaps Between Necessary Functions and System Capabilities

The IBM Team conducted an analysis of the gap between current NMS capabilities and the functions identified as being necessary. As a critical part of this analysis, the Team evaluated whether the gap results from one or more of the following three factors:

- ***Technical*** – these are gaps of a technical nature such as software/hardware problems or poor application functionality
- ***Process*** – these are gaps caused by a breakdown in processes, including lack of understanding in roles and responsibilities and lack of system user training
- ***Organizational*** – these are gaps caused by an organizational culture that does not facilitate or prohibits the performance of certain functions

In order to identify, categorize, and evaluate these gaps, the IBM Team used a standardized scoring logic. A whole integer value between 0 and 4 was assigned to each function based on the following criteria. A value of 0 indicates that the function does not exist. A value of 1 indicates that the function exists but has gaps resulting from all three factors: technical, process, and organization. A value of 2 indicates that the function exists and has gaps caused by two of the three areas. A value of 3 indicates that the function exists and has a gap in only one of the areas. Finally, a value of 4 indicates that the function exists and is fully functional according to all three factors.

5. Compile Results

We chose a matrix format to display the results of our analysis. This format provides the basis for evaluating alternatives for improving the current NMS environment.

The detailed results of the analysis are presented in Appendix E. This Appendix contains a matrix for each application that summarizes the universe of identified functions, the impact rating level or importance for each function, and the identification of the technical, organizational, and process gaps between demand and system capability.

Discussions of each of the NMS applications are presented in the sections that follow.

B. USAID Worldwide Accounting and Control System (AWACS)

The following sections provide an overview of the USAID Worldwide Accounting and Control System (AWACS) application, a general description of the legal and regulatory requirements relevant to this application, an evaluation of the business demands identified, a review of application capabilities and an analysis of the gaps found between requirements and capabilities.

1. Application Overview

In order to improve its accounting and financial management operations, USAID developed the A.I.D. Worldwide Accounting and Control System (AWACS) to serve as the Agency's core financial accounting system. Under the sponsorship of the Office of Financial Management, AWACS was intended to comply with generally accepted Federal accounting principles and standards, meet applicable legislative requirements, provide accurate and timely accounting data, and address both Joint Financial Management Improvement Program (JFMIP) and USAID specific requirements.

Eight business areas were originally identified by the AWACS project: 1) Funds Distribution, 2) Funds Usage, 3) General Ledger, 4) Accounts Payable, 5) Accounts Receivable, 6) Budgeting, 7) Cost Accumulation and 8) Payroll. The first five of these areas were analyzed to define the business rules, goals, critical success factors, data, processes, and information systems needed to fully support its functional requirements. Reports on these analyses, known as Business Area Analyses (BAA), were developed and described the intended functionality for each of the five modules as discussed below.

- **Funds Distribution** – The Funds Management module was intended to provide for the recording of incoming funding or other authority such as new appropriations, transfer appropriations, prior-year to current-year appropriation transfers or allocations. The module was to record incoming warrants, request apportionments, record approved apportionments, record appropriation transfers or allocations to other government agencies, and distribute available funds through the allotment and budget allowance levels.
- **Funds Usage** – This module was to commit and obligate direct, borrowing and reimbursable authority. In addition, Funds Usage was intended to modify obligations, record the re-estimates of guaranty and lending authority subsidies, and record subobligations.
- **General Ledger** – This module of AWACS was intended to provide for the summarization, control and classification of information for all of USAID's accounting transactions. The General Ledger was to maintain the chart of accounts and transaction codes, post transactions and adjustments, and process month and year-end closings. In addition, this module was to ensure compliance with the U.S. Standard General Ledger and required internal and external reporting.
- **Accounts Payable** – This module was intended to serve the disbursement process beginning with voucher registration, obligation matching, administrative approvals for payment of goods and services, schedule payments, certify payments, transmit payments to the disbursing office, and record accomplishment of payments. In addition, USAID developed this module in order to comply with the Prompt Payment Act, cash management guidelines, and improve the quality and efficiency of payment processes.
- **Accounts Receivable** – This module of the AWACS application was to account for the right to receive funds, collections of funds received and reimbursable orders. Accounts

receivable was also to provide for monitoring accounts with aging schedules and the ability to handle write-offs. In addition, this module was intended to account for the Agency's direct and guaranteed loan portfolios.

Of the eight business areas that were originally identified by the AWACS project, separate NMS modules were developed for ***General Ledger***, ***Accounts Payable*** and ***Accounts Receivable***. A fourth module entitled ***Funds Management*** was developed and replaced the functionality originally intended for the two BAAs on Funds Distribution and Funds Usage. Business Area Analyses for Cost Accumulation and Payroll have not yet been performed. Finally, the intention to develop budgeting as a part of AWACS was abandoned and a totally separate application for budgeting was developed under NMS.

2. Legal and Regulatory Requirements

Table 4-2 provides a general description of the legal and regulatory requirements applicable to the review of AWACS.

Name of Regulation	Key Requirements
Joint Financial Management Improvement Program (JFMIP) Federal Financial Management Systems Requirements	The JFMIP requires program and financial managers to work in partnership using modern management techniques and integrated financial management systems to ensure the integrity of information, make decisions and measure performance to achieve desirable outcomes and real cost-effectiveness.
Federal Financial Management Improvement Act of 1996 (FFMIA-96)	FFMIA establishes in statute (1) certain financial management system requirements that are already established by Executive Branch policies and (2) new requirements for auditors to report on agency compliance with these basic requirements, and for agency heads and management to correct deficiencies within a certain time period.
OMB Circular No. A-127, "Financial Management Systems."	The circular prescribes policies and standards for executive departments and agencies to follow in developing, operating, evaluating, and reporting on financial management systems.
GAO's Standards for Internal Controls in the Federal Government	These standards require Federal Agencies to follow three key practices: (1) identify internal control objectives, (2) ensure that control techniques are effective and efficient in supporting the implementation of control objectives, and (3) document internal control systems.
Federal Managers' Financial Integrity Act of 1982 (FMFIA)	This act requires an annual assurance statement with respect to management controls and compliance with financial management system requirements.

Name of Regulation	Key Requirements
OMB Circular No. A-123, "Management Accountability and Control."	The circular implements the Federal Managers' Financial Integrity Act of 1982 (FMFIA) whereby emphasizing that management control accountability is the expectation that managers are responsible for the quality and timeliness of program performance, increasing productivity, controlling costs and mitigating adverse aspects of agency operations, and assuring that programs are managed with integrity and in compliance with applicable law.
Anti-deficiency Act	The Anti-Deficiency Act prohibits Executive Branch agencies and departments from over committing, obligating, or expending budget authority.
Credit Reform Act	This act prescribes policies and requirements to measure more accurately the costs of federal credit programs; place the cost of credit programs on a budgetary basis equivalent to other federal spending; and improve the allocation of resources among credit programs and between credit and other spending programs.
Debt Collection Act	This act established the requirement for Executive Branch agencies and departments to manage their accounts receivable effectively.
Federal Accounting Standards Advisory Board (FASAB) Accounting Standards	FASAB issues concepts and statements which include standards to be followed in order to have relevant data to help make decisions affecting the budget, control of costs, and measurement of performance.
Prompt Payment Act	The Prompt Payment Act requires agencies to pay approved invoices timely, determine the economic benefit of discounts offered and if the discount should be taken, include interest on payments not made timely, and track and report prompt payment statistics on a regular basis.
OMB Circular A-125	OMB Circular A-125 prescribes procedures for executive departments and agencies to follow when paying for supplies and services. This Circular includes the requirements to satisfy the Prompt Payment Act.
United States Standard General Ledger (SGL)	The SGL establishes account guidelines that agencies of the executive branch must follow to enable the Treasury Department to prepare government-wide consolidated financial statements and internal reports.

Table 4-2: Applicable Regulations, Directives, and Guidance

3. Evaluation of Demands and Capabilities

After consolidating the detailed functional requirements identified, we determined that there are 116 upper-level functional requirements. The IBM Team identified 98 of the 116 functional requirements as being necessary to USAID's business operations. Table 4-3 provides the summary results of our analysis by AWACS module.

AWACS Module	Impact Level			Total
	Not Necessary (0)	Desired (1)	Necessary (2)	
Funds Management	1	6	22	29
General Ledger*	0	2	36	38
Accounts Payable	0	5	25	30
Accounts Receivable	0	4	15	19
Total	1	17	98	116
*General Ledger includes reporting and cost accounting requirements				

Table 4-3: Impact Level of AWACS Application Functions

Table 4-4 presents the results of our capabilities assessment by AWACS module.

AWACS Module / Score	Impact Level			
	Not Necessary (0)	Desired (1)	Necessary (2)	Total
Funds Management				
0	1	4	6	11
1			2	2
2			1	1
3		1	1	2
4		1	12	13
Module Subtotal	***1***	***6***	***22***	***29***
General Ledger*				
0		2	20	22
1			1	1
2			4	4
3				0
4			11	11
Module Subtotal		***2***	***36***	***38***
Accounts Payable				
0		1	11	12
1		1	1	2
2			3	3
3			1	1
4		3	9	12
Module Subtotal		***5***	***25***	***30***
Accounts Receivable				
0		1	4	5
1		1	1	3
2		1	3	4
3		1		0
4			7	7
Module Subtotal		***4***	***15***	***19***
Grand Total	***1***	***17***	***98***	***116***

*General Ledger includes reporting and cost accounting requirements

Table 4-4: AWACS Capabilities Assessment Results By Module

4. Analysis of Gaps

We reviewed the capabilities assessment and identified the key findings that must be addressed for AWACS to provide the minimum critical functionality. Table 4-5 presents a summary of the gaps identified. Detailed information can be found in Appendix E-1.

Funds Management	General Ledger & Reporting	Accounts Payable	Accounts Receivable	AWACS Wide
Potential Anti-Deficiency Act Violation	General Ledger Balances Do Not Agree with Subsidiary Ledger Detail	Does Not Fully Meet Prompt Payment Act Requirements	Non Compliance with Debt Collection Act	Lack of Foreign Currency Accounting
Non-Integrated Funds Control Tables	Archiving Has Not Been Implemented	Lack of Form 1099 Functionality	System Not Used by All USAID Billing Offices	Inadequate Accounting Classification Structure
Incremental Funding for Bilateral Agreements Not Supported	Need Month- and Year-End Accrual Functionality	Disbursements Not Distinguished Between Expenses and Capital Assets	Account Statements Not Available	Loan Accounting, Servicing and Reporting Not Implemented
Ability to Enter and Obligate Against an Erroneous Apropriation	Year-End Closing Process Not Fully Functional	Separate Unsynchronized Vendor Tables in AWACS and A&A	OPAC Functionality Not Fully Developed	Lack of Cost Management Functionality
	Reporting Functionality Extremely Limited	Lack of Document Matching	Pass Through Collections Not Supported	Reimburseable Agreements Not Fully Supported
		OPAC Functionality Not Fully Developed	Establishment of Payroll Deductions Not Supported	
		Vendor Notification Not Functional		
		Frequent Rejects of Payment Certifications		

Table 4-5: Gap Summary for AWACS Application

These key gaps are discussed by AWACS module in the following sections. Also included is discussion of a fifth category of AWACS gaps, presented under the section titled AWACS-wide gaps.

a. Funds Management

Ten of the 22 necessary requirements for Funds Management rated at less than full functionality. These functions are discussed in the sections that follow. Detailed information can be found in Appendix E-2.

i. Potential Anti-Deficiency Act Violation

In performing its annual closing for fiscal year 1997, USAID found that it has potentially over obligated the following two appropriation accounts:

- **Development Assistance (DV96/97; FAST No. 72671021)** – This program provides economic resources to developing countries to promote broad-based, self-sustaining economic growth and support initiatives intended to stabilize population growth, protect the environment and foster increased democratic participation in developing countries. An amount of $378,493 was reported as potentially over obligated for FY 1997.
- **Special Assistance Initiatives (AI96/97; FAST No. 72671010)** – This program provides funds to support a variety of special assistance activities. An amount of $4,734 was reported as potentially over obligated for FY 1997.

The Anti-Deficiency Act makes clear that it is unlawful to authorize an expenditure or obligation of an appropriation or fund in excess of amounts available or before an appropriation is made. Violations of limitations are to be immediately reported to the President and Congress and subject knowing and willful violators to fines and/or imprisonment. The main purpose of the Funds Management module in AWACS is to ensure compliance with the Anti-Deficiency Act.

In our detailed demonstration of the Funds Management module we reviewed scenarios to determine whether funds available were updated to prevent occurrence of commitments, obligations and expenditures in excess of available fund balances. We did not see any violations of basic funds control. USAID believes that the reported potential over obligations are probably due to the limited implementation of AWACS as a Washington-only system. Specifically, USAID believes that in certain cases USAID/Washington Bureaus may have obligated funds in AWACS and instructed USAID Missions to record the same obligations in MACS without available funding.

To resolve this situation, USAID is in the process of reconciling information at the budget allowance level in both MACS and AWACS. One potential error for the Development Assistance appropriation has been found and relates to the time period when AWACS was operational in the missions. Specifically, it appears that an amount of $300,000 was recorded in an obligation table twice – once when it was recorded at an obligation level and a second time when it was recorded as a sub-obligation. Such an error would be a technology problem and may not necessarily support the belief that the potential source of over-obligation is due to double recordings of one obligation amount by both USAID/Washington and Missions.

If USAID is unable to resolve the potential over-obligation by reconciling amounts recorded in Funds Management at the budget allowance level, then it will move to a methodology of trying to reconcile amounts reported in the General Ledger. Such a reconciliation would be rather complex due to the number of tables in AWACS and the lack of documented mapping and control totals between general ledger accounts and source tables.

This problem has widespread implications and could be caused by technology, process and organizational gaps. It will require a major reconciliation of data from disparate systems to identify the necessary corrective actions in AWACS as well as work processes and organizational roles and responsibilities.

ii. Non-Integrated Funds Control Tables

USAID records obligations in NMS through both the Acquisition and Assistance (A&A) and AWACS applications. A&A is designed to manage the majority of the USAID obligations such as grants and contracts while the Funds Management module of AWACS is used to manage miscellaneous obligation documents, including travel authorizations. We learned through interviews that separate funds control tables are maintained by both A&A and Funds Management. These tables are not integrated or synchronized to ensure the integrity of funds control data. This system deficiency compromises the funds availability control increasing the risk that USAID may excessively commit, obligate, or expend funds resulting in an Anti-Deficiency Act violation. Also, lack of integration or synchronization could result in reporting discrepancies between the amount of funds available, committed, obligated, or expended. In fact, we were told that three different amounts were reported as being obligated as of the same date for one appropriation. The lack of integration or synchronization is one reason why AWACS does not comply with the JFMIP requirements for automated systems and is considered to be one of the FMFIA Top 100 "High Risk" systems.

iii. Incremental Funding for Bilateral Agreements Not Supported

The majority of activities of several USAID Missions are funded under agreements with the host countries. These bilateral agreements refer to life-of-project funding but are normally funded through incremental appropriations over a period of several years. USAID receives Congressional approval for these projects and is required to report the cumulative results on a project basis and not simply for each incremental appropriation. The initial obligation of funds is recorded at the time that the agreement is signed in the amount that is funded to date. As contracts, grants and cooperative agreements for activities are entered into, sub-obligations are recorded and controlled. Therefore, USAID has a unique requirement to provide for an accounting and reporting structure with the flexibility to permit incremental funding and obligations of funds at the obligation and subobligation levels over the multi-year period during which bilateral agreements are carried out. AWACS does not allow for incremental funding of bilateral agreements. In addition, it does not allow for sub-obligations of amounts initially obligated at the bilateral agreement level in prior years.

Certain USAID officials believe that Bilateral Agreements were originally intended to be handled by the Awards and Assistance (A&A) Module of NMS but that this approach was later abandoned by the procurement process owners. This view may be supported by the fact that the ability to incrementally fund a master obligation does exist in the A&A module and that Bilateral Agreements – one of the largest forms of USAID "Assistance" – are accounted for under the "Miscellaneous Obligations" module of AWACS which lacks the necessary functionality.

This gap has both organizational and technological implications for USAID. The organizational issues regarding the responsibility for initial recording of bilateral agreements must be resolved and any resulting requirements for AWACS must be designed, developed, tested and implemented.

iv. Ability to Enter and Obligate Against an Erroneous Appropriation

USAID reported that an erroneous appropriation, DAB86, was entered into AWACS and obligated against. USAID does not know what caused this situation. During our detailed system demonstrations, we learned that an authorized user with the properly assigned system role, can enter appropriations. As a result, we conclude that this gap is associated with inadequate control processes.

The General Accounting Office (GAO) issued *Standards for Internal Controls in the Federal Government.* Among these standards are the requirements that internal control objectives be identified or developed for each activity, control techniques be effective and efficient in accomplishing control objectives, and qualified and continuous supervision be provided to ensure that control objectives are achieved. USAID will need to develop and document NMS-wide control objectives and techniques to meet those control objectives to reasonably assure that appropriations entered are proper.

b. General Ledger and Reporting

Twenty-five of the 36 necessary requirements for General Ledger rated at less than full functionality. These functions are captured in the discussions presented below. Detailed information can be found in Appendix E-3.

i. General Ledger Balances Do Not Agree With Subsidiary Ledger Detail

JFMIP requirements for Core Financial Systems state that the General Ledger should report comparisons between the amounts in other components of the Core financial system and the related control accounts in the General Ledger noting any accounts which are out of balance. Control accounts in the AWACS General Ledger do not agree with detailed transaction data. For example, the balance for accounts receivable in the General Ledger does not agree with the data tables maintained by the Accounts Receivable module of AWACS.

This situation exists because historical data has not been migrated and data integrity has been further compromised by programming bugs. These process and technological gaps must be addressed through data reconciliations and the definition, development and implementation of functional requirements for AWACS.

ii. Archiving Has Not Been Implemented

To support the archiving and purging process, JFMIP Core Financial System requirements provide for the capability to archive or purge closed documents and data as needed to limit the data maintained to that appropriately needed for analysis, control and presentation of historical information. AWACS has not implemented an archival method risking the potential to overload the database and increase system response times. USAID will need to address this technology gap by defining requirements to be developed, tested and implemented.

iii. Need Month- and Year-end Accrual Functionality

Federal Accounting Standards require that amounts owed by a federal entity for goods and services received, progress under certain contracts and interest incurred from borrowing be recognized as accrued liabilities. Similarly, the standards require that interest receivable should be accrued for the amount of interest income earned but not received for an accounting period. In support of this accounting standard, the JFMIP requirements for core accounting systems state that the system should provide the capability for automatic generation of recurring accrual entries and reversals in the next fiscal year period. AWACS does not provide this capability.

During our review, system developers reported that this gap in technology was being addressed for accrued liabilities for contracts through the establishment of requirements and system development activities. The new functionality was to be tested prior to implementation. In addition, USAID will need to address the automatic generation of accruals for other transactions such as payroll.

iv. Year-end Closing Process Not Fully Functional

USAID has developed and implemented certain automated closing procedures, such as closing procedures for the removal of the budget authority and conversion of 511/517 authority to new account codes. However, automated processing of general ledger closing transactions has not yet been developed. The concept of closing the general ledger accounts is a very basic accounting practice and one that should be automated in any accounting system. The JFMIP Core Financial System requirements provide for month-end and year-end closing and rollover of general ledger account balances including the automatic generation of required transactions. This functionality is a technology gap which USAID will need to develop, test and implement.

v. Reporting Functionality Extremely Limited

USAID's external reporting needs are dictated by the Department of Treasury, OMB and FASAB. System requirements in support of these needs are well defined in the JFMIP Core Financial Accounting System Requirements. AWACS does not have the needed functionality to support these requirements. In addition, internal reporting requirements for such functions as consolidated trial balances, aging of accounts receivable, payable, commitments, and obligations, funds control at the activity level and out-of-balance conditions between the general and subsidiary ledgers are not

supported by AWACS. Finally, available data queries are rather inflexible and very limited. This technological gap in the functionality of AWACS is far reaching and limits its overall usefulness given the need to manage the organization based on information contained in the system. USAID must begin by defining all relevant requirements and developing the functionality to be tested and implemented.

c. Accounts Payable

Fourteen of the 25 necessary requirements for Accounts Payable rated at less than full functionality. These functions are captured in the discussions presented below. Detailed information can be found in Appendix E-4.

i. Does Not Fully Meet Prompt Payment Act Requirements

The Prompt Payment Act requires that payment dates be based on a due date as provided for in the contract or 30 days after a proper invoice for the amount due is received. When payments are not made on time, the Agency is required to pay an interest penalty computed at the rate of interest established by the Secretary of Treasury and submit a notice stating the amount of the interest penalty included in the payment. If the Agency does not include the interest penalty due in payments made, the vendor is entitled to an additional penalty equal to a percentage of the interest due as established by OMB.

The Prompt Payment Act also provides for the taking of discounts only when payments are made within the discount period offered. In addition, the Prompt Payment Act requires that USAID submit fiscal year-end reports on its payment practices including the number, dollar value, and percentage of invoices for which interest or other late payment penalties were paid, the amount of such late payment interest and other penalties, and the reasons the interest penalties were not avoided by prompt payment. The JFMIP Core Financial System Requirements related to Payment Management include several functions to ensure USAID adheres to the Prompt Payment Act.

AWACS does not fully meet these Prompt Payment requirements. Specifically, AWACS records an accounts payable when the invoice is administratively approved and not the date of acceptance of the goods or services. Related to this is the fact that receipt, inspection, and acceptance data is not captured in NMS. As a result, the tracking for payment due date may not be based on the later of the date of receipt of goods or invoice. AWACS also does not capture discounts offered and perform an economic analysis of the benefit. Payment amounts and due dates for favorable discounts are not adjusted by AWACS. Finally, AWACS does not report prompt payment statistics such as discounts lost/taken, interest and penalties paid.

The consequences of these process and technical gaps in functionality are significant given the level of compliance that USAID is expected to achieve with this legislation. A complete set of requirements for the technical gaps must be identified in order to proceed with the development, testing and implementation of full functionality related to the Prompt Payment Act.

ii. Lack of 1099 Functionality

AWACS does not maintain information needed to support IRS Form 1099 reporting, including Taxpayer Identification Numbers (TIN) and payee types such as sole proprietorship, partnership, and corporation. As a result, it does not meet the JFMIP requirements to maintain such information in order to comply with IRS regulations and produce Form 1099. USAID will need to address this technology gap.

iii. Disbursements Not Distinguished Between Expenses and Capital Assets

USAID records all non-advance disbursements as expenses without regard to whether the expenditure should be expensed or capitalized. Later at year-end, expenses for capital assets are manually reversed and capitalized as fixed assets. AWACS was supposed to capture, classify, summarize, and report current year and cumulative data on capital acquisitions, disposals, and assets on hand. In addition, the JFMIP Core Financial System requirements state that liabilities accrued upon receipt and acceptance of goods and services should be properly identified as capital assets, expenses, prepaid expenses or construction-in-process. To close this gap in technology, USAID will need to develop, test and implement this functionality.

iv. Separate Unsynchronized Vendor Tables in AWACS and A&A

A table containing vendor information for awarded contracts and grants is maintained by the Accounts Payable module of AWACS. In addition, a totally separate table is maintained by the A&A module which includes not only vendors with awarded contracts, but also those vendors who have submitted proposals for USAID solicitations. Modifications to vendor information contained in the A&A module are written to the AWACS vendor table, but updates made to the AWACS table are not written to the A&A vendor table. As a result, vendor information is not efficiently stored and data entry efforts are duplicated due to the separate tables, coupled with the lack of synchronization between the two tables. USAID will need to develop one table to be used by both A&A and AWACS to solve this technology gap.

v. Lack of Document Matching

Disbursements should be supported by basic payment documents, which include purchase orders, acceptance reports and invoices. The matching of these documents assures that: (1) goods or services were ordered by an authorized official, evidenced by a purchase order, contract, or other authorization; (2) goods or services ordered have been delivered and accepted, evidenced by receiving and inspection reports; and (3) an invoice or bill has been received. JFMIP Core Financial System requirements supporting the payment execution process state that the system should define tolerances for quantity variances between receiving reports and the obligating document as well as track and report quantity variances between the obligating document, receiving report and invoice. AWACS does not provide this functionality. As noted below in our discussion of reject rates (section

viii) of payment certification, an obligation matching routine was developed but did not function as intended and was eventually removed from system functionality to limit data errors.

This technology gap will need to be addressed through the proper definition of requirements and their development, testing, and implementation.

vi. OPAC Functionality Not Fully Developed

The AWACS Accounts Payable module does not support the JFMIP requirement to record disbursements made through the On-line Payment and Collection (OPAC) system operated by Treasury Financial Management Service by other federal agencies against USAID's fund accounts. Currently OPAC disbursements are entered manually as no-pay vouchers. According to AWACS system developers, this functionality is under development. USAID will need to complete the development and testing of this function prior to implementation.

vii. Vendor Notification Not Functional

To support its payment confirmation and follow-up needs, USAID had developed an on-line Payment Information Management System. This system was a bulletin board which USAID vendors could dial in to receive payment processing information. AWACS was not integrated with this system nor did it replace its functionality through issuance of remittance advices. As a result, USAID does not currently have a system for notifying its vendors of payment status and must support the payment follow-up process by answering requests for information by telephone. In addition, due to the limited and inflexible query functionality of AWACS, USAID's document control center does not efficiently handle requests for information. USAID will need to develop requirements for this technological functionality gap in order to meet JFMIP requirements associated with payment confirmation and follow-up.

viii. Frequent Rejects of Payment Certifications

There have been frequent rejects of payment schedules during certification. For example, during November 1997, 2500 payments were made of which 300 rejected certifications were reported. This number probably overstates actual certification problems, since one error on one payment schedule with 10 items to certify causes the entire schedule to be rejected. In any case, the AWACS system developers have found that this problem is due to two system bugs. One of the bugs involved an obligation matching program, which has since been turned off and all affected data has been corrected. The other bug involved improper posting of transactions, which has since been corrected although the affected data is handled on a case by case basis.

USAID will need to identify and correct all affected data and implement system monitoring procedures to avoid such inaccuracies in the future.

ix. Vendor Pay Information Can Not Be Disabled

The Accounts Payable module includes the functionality to record and maintain third party (i.e., bank) payee information for individual vendors. The user can add additional third parties to an existing vendor record, but can not disable or inactivate any exiting third parties. AWACS AP is designed to prevent the deletion of any third party pay information so it can be maintained as an audit trail. The lack of functionality to disable a third party requires the user to select the active third party when scheduling a payment.

x. Approval of Invoices Is Not Restricted to Authorized Person

AWACS A/P includes the functionality to notify Contracting Officers' Technical Representatives (COTR) of registered invoices awaiting administrative approval. The A/P module notifies the COTR after signing on to NMS. This notification procedure is based upon the COTR "role" assigned to the user by the system administrator instead of the individual user identification. Therefore, NMS notifies all users assigned a COTR "role" of all invoices awaiting administrative approval and permits any user assigned a COTR "role" to administratively approve any awaiting invoice regardless of authority or responsibility. This breakdown in the system's internal controls allows invoices to be approved by an unauthorized person which could result in an inappropriate disbursement.

xi. Credits for Stop Payments and Cancellation Can Not Be Posted

The Accounts Payable module does not have the functionality to process credits forwarded by Treasury for stale-dated checks that have been canceled, stop payments requested by USAID, or undeliverable payments. This technology gap would need to be addressed through added system functionality.

d. Accounts Receivable

Eight of the 15 necessary requirements for Accounts Receivable rated at less than full functionality. These functions are captured in the discussions presented below. Detailed information can be found in Appendix E-5.

i. Non-compliance With Debt Collection Act

The Debt Collection Act requires that interest, administrative charges, and penalties on overdue receivables be calculated as necessary. The AWACS Accounts Receivable module does not provide this functionality. This gap in the technological capacity of AWACS will need to be addressed through added system functionality.

ii. System Not Used By All USAID Billing Offices

Billing offices generating non-loan receivables include overseas Missions, the Office of Procurement (OP) and various offices within the Office of Financial Management (FM). The only receivables included in AWACS are certain receivables managed by FM. Excluded are receivables managed by Payroll, Central Accounting and Reporting (CAR), Missions, and OP. This situation occurred due to a lack of planning, training and implementation and is the same situation that existed under the legacy accounting environment. There are three potential sources of bills for collection that are generated in OP: commodity procurement; transportation/freight; and individual contracting officers. At present, these bills are not captured in the general ledger.

This gap is related to USAID's work processes associated with handling accounts receivable and will need to be addressed through the establishment of policy and procedures and proper training of personnel.

iii. Account Statements Not Available

During the system demonstrations we learned that the Accounts Receivable module does not generate account statements. The JFMIP Core Financial Accounting System Requirements state that the functionality should include the ability to print statements as well as bills. USAID will need to develop this requirement and test it prior to implementation.

iv. OPAC Functionality Not Fully Developed

As with the Accounts Payable module, the Accounts Receivable module in AWACS does not support the JFMIP requirement to prepare and transmit billing data to the On-line Payment and Collection (OPAC) system operated by Treasury Financial Management Service in order to obtain funds from other federal agencies in accordance with interagency agreements. In addition, AWACS does not automatically produce supporting data for OPAC transactions to agencies billed which can be used by them to verify the OPAC charges. AWACS developers informed us that this functionality was under development. USAID will need to complete the development and testing of this function prior to implementation.

v. Pass-through Collections Not Supported

Through Treasury's OPAC system, USAID occasionally receives collections that belong to another agency. These receipts are not processed through AWACS because the ultimate disbursement to the proper Agency can not be made from AWACS since the payment function requires an obligation prior to disbursement of any funds. While these transactions are not frequent, USAID is currently dependent on legacy systems to handle such receipts and forwarding disbursements. This technology gap will need to be addressed through added system functionality.

vi. Establishment of Payroll Deductions Not Supported

AWACS does not support the JFMIP requirements to provide information to allow for offset of funds due to delinquent indebtedness through reductions to federal employee salary payments. USAID will need to establish this functionality gap by either an automated link to the payroll system or the ability to generate timely notifications to the paying office.

e. AWACS-wide Gaps

In addition to the gaps identified for each of the AWACS modules, other gaps were identified that point out general inadequacies of the AWACS modules. These gaps are discussed in the sections below.

i. Lack of Foreign Currency Accounting

USAID holds approximately $280 million in foreign currency funds of which $50 million is owned by the U.S. Government (USG) and $230 million is owned by foreign governments. The Foreign Currency Trust Fund was established to maintain these foreign currencies. Generated most often from the sale of USG provided commodities, these funds are usually jointly programmed by USAID and the foreign government to pay for program and/or operating expenses of USAID-related activities. Funds may be withdrawn only by mutual agreement between the foreign government and the USG. For those funds not owned by USAID, any funds remaining upon termination of the bilateral agreement revert to the foreign government. The USG holds a total of $300 million of foreign currency in trust, making USAID the largest holder of this type of funds.

USAID does not have accounting policies and procedures for the proper accounting for these foreign currencies. In the past, spreadsheet schedules of the amounts held have been kept and reported but exchange gains and losses have not been appropriately recorded. The need for foreign currency accounting was identified as a unique requirement in the original BAA. Although other Federal agencies may make disbursements in foreign currencies, their needs generally only require the translation of the foreign currency on the transaction date. USAID's needs involve much more than simple translation of disbursements including the ability to budget, control funds, receive and disburse amounts in foreign currencies. AWACS does not provide for the foreign currency accounting needs of USAID.

This unique requirement is a technology gap that USAID will need to address in order to adequately account for the Foreign Currency Trust Fund.

ii. Inadequate Accounting Classification Structure

The accounting classification structure in AWACS does not provide a consistent basis for integrating planning, budgeting and accounting. For example, AWACS does not provide for a project structure which is independent of the other classification structures to allow multiple organizations, programs

and funding sources to be associated with a project. One example of this deficiency is in the inability of AWACS to account for incrementally funded bilateral agreements.

In addition, the accounting classification structure in AWACS has been inconsistently used among USAID missions. Although Missions do not use AWACS, they are supposed to be using the Operations Module of NMS which establishes the activity structure for program funds. USAID did not provide detailed guidance to the missions in assigning an activity structure leaving the task to the discretion of individual missions. As a result, activity structures were not consistently applied and results would not be directly comparable had the missions been able to enter actual data at the activity level in AWACS.

These issues are caused by both technology and process issues and will need to be addressed prior to the implementation of AWACS on a worldwide basis.

iii. Loan Accounting, Servicing and Reporting Not Implemented

USAID has both direct and guarantee loan programs that it must account for in accordance with FASAB standards and applicable legislation such as the Credit Reform Act. Direct loans with an outstanding principal balance of approximately $14 billion are made in both dollars and foreign currency. USAID has approximately $8.8 billion in outstanding loan guarantees.

According to JFMIP, accounting and servicing of direct and guaranteed loan portfolios is not a part of an Agency's core financial system. As such, functionality for loans in AWACS would be expected to be generally limited to funds management, receipts and payment management and general ledger posting. However, USAID's original BAAs stated that AWACS was intended to fully account for the Agency's direct and guaranteed loan portfolios.

Some aspects of the functionality for loan management have been developed for AWACS but it has not been tested. We attended a demonstration of the test version of loan management in AWACS and viewed certain functionality such as loan header information and calculation of amortization tables. Linkages to funds management, accounts receivable and accounts payable, as well as the calculation of subsidy allowances have not yet been developed.

During FY 1997 USAID outsourced some of the servicing functionality of one of its guarantee programs. USAID officials noted that they would like to outsource the loan servicing requirements of the remaining programs for both direct and guaranteed loans. USAID will need to make a final decision on this outsourcing and develop a complete set of requirements for the needed functionality it must maintain in AWACS for loan management. Loan functions will need to be developed and carefully tested prior to implementation.

iv. Lack of Cost Management Functionality

According to FASAB, managerial cost accounting should be a fundamental part of a financial management system and should be integrated with other parts of the system. Five managerial cost

accounting standards have been identified by FASAB and include the need to accumulate and report the costs of activities on a regular basis, establish responsibility segments to match costs with outputs, determine full costs of goods and services, recognize the costs of goods and services received from other federal entities and use appropriate costing methodologies to accumulate and assign costs to outputs. JFMIP has identified specific functionality for core accounting systems to address cost management needs. These functions have not yet been developed for AWACS. USAID will need to review their cost management requirements and develop the necessary functionality to be tested and implemented.

v. Reimbursable Agreements Not Fully Supported

In addition, to activities undertaken and funded through the budget authority received from the appropriation, USAID often performs work for another agency on a reimbursable basis. In such cases, USAID enters into an interagency agreement which sets forth the work to be performed and prices to be paid based on obligation limitations established by the ordering Agency. In effect this interagency agreement provides budget authority to USAID in addition to that provided through direct appropriations. Just as for direct budget authority, this reimbursable resource authority is subject to funds control and must be apportioned, allotted, committed, obligated and expended. In order to effect this basic funds control, USAID needs to provide a means for separating common accounts into elements related to the appropriation and the reimbursable agreements. Referred to as a two-track system, this mechanism for accounting for reimbursable is necessary to avoid inadvertently over obligating or over extending its interagency agreement. AWACS does not provide for this basic funds management of reimbursable agreements. Similarly, legacy systems did not address the need for proper funds management of these agreements.

USAID will need to develop policy and procedures for properly accounting for and controlling of reimbursable agreements. From this policy, requirements can be defined and the necessary programming for funds management and general ledger transaction codes can be developed, tested and implemented.

C. Acquisition and Assistance (A&A)

This section presents an overview of the Acquisition and Assistance (A&A) application and modules, a description of the functions currently available and other needed functions, and an analysis of the gaps between current and necessary functionality.

1. Application Overview

The Agency for International Development relies on the Acquisition and Assistance (A&A) application to acquire goods and services and provide assistance. The modules of the system were originally developed around USAID's Business Functions of Planning, Award Formation, Award

Administration, and Acquisition and Assistance Support. During the course of development, specific legal requirements governing small dollar value procurements were issued. As a result, a fifth module was added to the A&A application to provide specific functionality for Small Purchases.

The A&A application project scope is outlined in the A&A Business Area Analysis (BAA). This document addresses activities that support the procurement functions and models data requirements in accordance with the Business Functions. The A&A development project was intended to reduce redundancies, create consistency, increase accountability, encourage teamwork, and minimize adversarial roles between organizations.

The ***A&A Planning*** module was intended to automate the process by which USAID identifies the goods and/or services necessary to support agency headquarters and mission activities. The intended functionality of the modules includes the following:

- generate schedule and cost estimates
- determine procurement vehicles and competition types
- query vendor information
- assign a contracting official responsible for the action

The ***A&A Award Formation*** module automates process needs through the award of the goods and services to a provider authorized to do business with USAID. The contracting officer staff uses the system to support the creation, approval and transmittal of all required CBD notices; create solicitations; record responses to solicitations as they arrive; and maintain a record of the status of the evaluation. The OSDBU has the capability to review all CBD notices. At award, funds can be approved and forwarded to AWACS where they are integrated for financial system needs.

The ***A&A Small Purchase*** module was created to handle many of the special needs, required under FASA, for small purchases. It provides specific functionalities that are not necessary for other procurements. For instance, this module can generate purchase orders, prepare a request for quotes, and record quotes.

The ***A&A Award Administration*** module automates process needs from award to close out. These general contract administration functions include:

- invoice tracking and payment
- amendment creation
- recording protests
- recording correspondence with vendors
- modifying awards, and
- de-obligating funds

The ***A&A Support*** module is intended to automate all other process needs related to the procurement of goods and services. The system was intended to support the agency in collecting information about its vendors to be used in award selection and auditing.

2. Legal and Regulatory Requirements

Nearly every element of functionality in the A&A module is governed or impacted by federal procurement laws and regulations. Furthermore, the implementation of the A&A module was implemented during the course of a turbulent period in procurement law during which major new legal and regulatory guidance was promulgated. Many of the requirements of these laws do not need to be automated by USAID. Table 4-6 outlines some important provisions of recent legislation that should be a part of USAID's A&A system.

Name of Regulation	Key Requirements
Federal Acquisition Streamlining Act of 1994	
Past Performance	FASA states that contractor past performance "is one of the relevant factors that a contracting official of an executive agency should consider in awarding a contract." In addition, the law authorizes a contracting officer to use a bidder's past performance "as an indicator of the likelihood that the offeror will successfully perform a contract".
Earned Value Tracking System	FASA requires agencies to track actions in terms of the amount of dollars expended in relation to the deliverables received.
Debarment	Agencies debarred from doing business with one agency must not do business with any agency.
1997 DOD Authorization Act	
Electronic Commerce	Agencies should establish, maintain, and use, to the maximum extent that is practicable and cost-effective, procedures and processes that employ electronic commerce in the conduct and administration of procurement systems.
Federal Acquisition Regulations	
FAR 37.6, Performance Based Contracting	Agencies should use Performance-Based Contracting to achieve better activity goals and objectives.

Table 4-6: Legal and Regulatory Compliance

3. Evaluation of Demands and Capabilities

The IBM Team identified 80 elements of functionality in the A&A application, based on the BAA, user demands, and other agency documents. Forty-six of these functional requirements were deemed necessary. The overall necessity of each element was scored as shown in Table 4-7:

	Impact Level			
	Not Necessary	Desired	Necessary	Total
A&A Application	9	25	46	80

Table 4-7: Impact Level of A&A Application Functions

For each impact level category, the IBM Team reviewed the functionality that had been implemented and whether it was working from a technical, process and organizational standpoint.

- 39 worked technically, procedurally, organizationally
- 13 were never created
- 12 were in place but not working from any perspective
- 16 were in place and working from some perspective but not all

4. Analysis of Gaps

In addition to identifying the necessary functional elements of the A&A application, the IBM Team analyzed the degree to which each area is implemented and functioning. The IBM Team defined differences between necessary functionality and system capability according to technology, organizational, or process gaps. The Team found that many of the necessary functionalities, 28 out of 46, are fully operational. For the 18 functionalities that are not fully operational, the Team identified 16 functionalities that exist but have gaps, and 2 that have not been addressed.

The matrix in Appendix E-6 summarizes the 80 A&A application functions, the impact level ratings, and the gaps identified between the user requirements and system capabilities. This matrix also identifies the relevant FAR clause supporting this need. (Note: A legal requirement does not mean the functionality should be automated.)

These gaps are a mix of Technical, Process, and/or Organizational shortcomings. Presented below is a summary of the primary A&A gaps identified. These gaps are discussed in the paragraphs that follow.

- System cannot be Satisfactorily Queried for Information
- Cannot Record and Use Vendor Past Performance Information

- Does not Systematically Account for Receipt of Goods
- Invoices Can be Paid After Money is De-obligated

a. System Cannot be Satisfactorily Queried for Information

Users cannot query the database for the data they need to prepare reports. The Impromptu system is the main tool for more detailed searches, but few users have access to it or are trained to use it. Further, the data infrastructure is not prepared to permit widespread use of Impromptu, even if it were provided for all users.

b. Cannot Record and Use Vendor Past Performance Information

Section 1091 of FASA states that contractor past performance "is one of the relevant factors that a contracting official of an executive agency should consider in awarding a contract." In addition, the law authorizes a contracting officer to use a bidder's past performance "as an indicator of the likelihood that the offeror will successfully perform a contract". While the NMS A&A application can readily retrieve and display cost and technical scores in the course of evaluating offerors, it cannot do the same for past performance. The Agency would have to be able to evaluate performance references submitted as part of the sender's proposal. However, to review all recorded past performance, a contracting officer would need to contact an individual who maintains past performance evaluations in a word processing file. While this approach may permit the consideration of Agency recorded past performance, its difficulty to access reduces the likelihood that it will be considered in earnest. The USAID A&A implementation team intends to integrate past performance data in the NMS system; however, there is little reason to believe this will be achieved in the short term.

c. Does Not Systematically Account for Receipt of Goods

The system does not track actions in terms of the amount of dollars expended in relation to the deliverables received. While the system can track deliverables, this functionality is not regularly used. In essence, the Contracting Officer's Technical Representative (COTR) approval for payment amounts to sign-off that all deliverables were received.

d. Invoices Can Be Paid After Money is De-obligated

Entries by Program Managers in the A&A application are visible in the AWACS application in 24 hours or less. While Program Managers obligate and de-obligate funds, COTR's approve the payment of invoices. This process leaves a small window of time whereby the agency could pay invoices after money is de-obligated.

D. Budget (BUD)

This section presents an overview of the Budget application and modules, description of the functions currently available and other needed functions, and an analysis of the gaps between current and necessary functionality.

1. Application Overview

In August 1994, USAID conducted a Business Area Analysis (BAA) for Budget and Fund Allocation. The BAA team included personnel with mission and Headquarters budget experience. The BAA Team was tasked with defining and documenting the budget business processes, delineating a vision for reinventing the budget process and providing recommendations for automating the processes. The Budget System was built based on the results of the BAA analysis.

The Budget application was originally designed to support decision making on resource planning and allocation, streamline and control the distribution of funds, and facilitate budget submissions. Application development began in 1995, with rollout in 1996. The USAID staff believes that most of the core functions have been completed.

The Budget application is comprised of the following seven modules:

- **Budget Formulation** – this module provides a means of recording budget information through the various phases of planning and negotiation, distributing Operating Year Budgets (OYB), and compiling budget information
- **Budget Guidance** – this module provides on-line instructions and guidance about Agency and Administration management priorities
- **Funds** – this module provides a means for creating and editing Funds and Fund Accounts
- **Emphasis Area** – this module provides a means for recording and editing information about Direct and Indirect Emphasis Area categories
- **Budget Query** – this module provides a means for building customized searches of the NMS database
- **Object Class** – this module provides a means for establishing and modifying Object Class and Resource Categories
- **Reporting Region** – this module provides a means of grouping countries together for reporting purposes

While much of the functionality is in place, there is a difference in the level of user experience with the application. For example, the Budget Formulation module provides the bulk of operational functionality. Headquarters, bureau and mission personnel have used this module for distributing OYB amounts. However, they have not used the budget development functionalities to generate a

budget. The Agency intends to use this module for generating the FY 2000 budget. This effort is scheduled to begin Spring, 1998.

The Funds, Emphasis Area, and Object Class modules are system maintenance functions and are only accessible by select personnel in the Central Budget Office. Therefore, these modules have not been widely used.

The Budget application is designed to interact with the other NMS applications. For example, the Emphasis Area module provides emphasis area coding for use in the Operations application. In addition, the AWACS application shares information on funds distribution for the OYB.

2. Legal and Regulatory Requirements

Within the general framework of laws and regulations that govern executive level government agencies, there are few that address budget and none address requirements for a budget system. Those that do address budget requirements largely provide guidance on budget submission. For example, the Federal Acquisition Regulations (FAR) provide guidance that a general budget for an agency should be prepared.

In addition, there is internal USAID guidance that addresses the format and schedule of budget formulation activities. These USAID supplemental regulations indicate that a budget must be prepared and provide some specific guidance as to what should be included. Specific guidance as to the substance of budgetary submission has been provided in a series of documents and memos provided by USAID management. The topics in the internal USAID guidance deal with primary codes and related secondary codes by agency goals and objectives, how to prepare an R-4 report, and 1999 Bureau Budget Guidance. Each one of these documents provides specific information in relation to an aspect of the budgeting process. There is currently no guidance which deals with "cradle to grave" budgeting. It should be noted that this guidance can be found within the Budget Guidance module.

The actual budget process of initial submission through negotiations, from missions, to bureaus, to Washington has not incurred major problems over the past several years. Based on the information reviewed, we believe that the budgeting system within NMS does meet any criteria which has been presented in general and specific agency regulations as outlined above.

3. Evaluation of Demands and Capabilities

As a result of interviews, documentation review, and system demonstrations, the IBM Team developed a list of functionalities that are currently in place, functionalities that are planned for implementation, and functionalities that are needed but which are not yet planned. The Team organized the functionalities according to the appropriate Budget modules, with several identified as having cross-cutting implications. In total, the IBM Team identified 35 elements of functionality. Of

those 35 elements, the IBM Team determined that 29 were necessary. The summary of Budget application functions according to impact level is shown in Table 4-8.

	Impact Level			
	Not Necessary	Desired	Necessary	Total
Budget Application	3	3	29	35

Table 4-8: Impact Level of Budget Application Functions

The distribution of functionality across module is as follows:

- The Budget Formulation module provides functionality that supports the core processes of budget formulation and distribution of OYB that is considered necessary. Desirable or not-necessary functions are those that were originally envisioned in the BAA but have not yet been implemented. The users interviewed do not believe these to be critical functions.
- The Budget Guidance module was rated as being desired, but not mission critical. Budget guidance can be distributed in alternate means other than through NMS.
- The Funds, Emphasis Area, and Object Class modules were rated as being necessary because they provide basic system maintenance capabilities that feed the Agency's finance and accounting functions and the agency GPRA reporting structure.
- The Budget Query module is rated as being a necessary part of this module; however not all functionalities are deemed as being critical. Specifically, with the capability of downloading data into a Lotus format, the module does not need to duplicate the ability to graph and manipulate data.
- The Reporting Region module is not critical because it could be included as a parameter for the query function.

In addition to the above, the ability to generate canned reports and maintain connectivity between missions and Headquarters were identified as being desired functions.

4. Analysis of Gaps

In addition to identifying the necessary functional elements of the Budget application, the IBM Team analyzed the degree to which each area is implemented and functioning. The IBM Team defined differences between necessary functionality and system capability according to technology, organizational, or process gaps. The Team found that many of the necessary functionalities, 15 out of 29, are fully operational. For the 14 functionalities that are not fully operational, the Team identified 3 functionalities that do not exist and 11 that have at least one gap in process, organization, and/or technology.

The matrix in Appendix E-7 summarizes the 35 Budget application functions, the impact level ratings, and the gaps identified between the user requirements and system capability.

The following main gaps in the Budget application were identified:

a. Establishing, Reporting, and Tracking Operating Expenses Budget by Object Class and Resource Category

USAID needs to plan, aggregate, distribute, track, and report its budget by both Strategic Objective/Activity and Object Class/Resource Code. However, the Budget Module does not allow for a link between these two types of coding which necessitates USAID to compile object class code data outside the system. Further, the Object Class sub-module does not allow users to establish or edit codes, nor is it programmed to allow indexed searches of the codes. The IBM Team views this problem as being a gap in technology and a resulting process breakdown.

b. Identifying Congressional Earmarks and Directives

While the Budget application allows users to enter the amount of earmarks and directives, and this information is available through query functions, the module does not identify this money on the screens where OYB money is allocated. The IBM Team views this situation as being a technical and process gap because it is important for bureaus and missions to explicitly know about constraints on spending.

c. Generating Accurate Query Results

The Budget Query module allows users to query the NMS database by selecting any combination of criteria such as organization, fund accounts, geographic area, fiscal year, and earmark directive. This module also allows users to save results to Lotus or Excel spreadsheets where it can be manipulated and graphed. However, these query functions do not always perform as intended and the data generated is not always accurate. In addition, the users believe the function needs to be "tweaked" to meet their needs better. The IBM Team views this inconsistent query function performance as being a technical gap with a resulting process breakdown.

E. Operations (OPS)

This section of the report provides a discussion of the Operations Application by presenting an overview of the application, a description of the foundations associated with the applications, and the gaps discovered in the system functionalities.

1. Application Overview

The Operations Application within NMS is a tool that fosters the sharing of program information between different missions as well as between the missions and Washington. Also, it is a management tool that allows staff in offices and missions to document and track schedules, timelines, and milestones on a daily basis. This application was developed to facilitate several aspects of the reengineered Operations Systems as outlined in the Business Area Analysis (BAA). In order to describe the module, it is important to first understand the rationale behind reengineering and what the new system looks like.

In 1994, guided by the Agency's four core values (customer focus, teamwork, results orientation and empowerment/accountability), a cross-functional team set out to make the Operations System more responsive and supportive as well as to correct deficiencies in the current system. The Agency wanted to delegate more decisions to the field as well an increase its emphasis on strategic planning and use of information technology. By the same token, it desired to decrease the amount of time staff, contractors and partners were spending establishing paper trails. Finally, they wanted to be able to demonstrate that the Agency's programs were achieving significant results.

Therefore, the redesigned system focuses on achieving results and insuring that all involved from Congress to customers, agree and focus on achieving the same objectives. Also it makes strategic planning a dynamic process and management tool for the Agency. Moreover, the new system possesses a more flexible implementation process and provides analytical structure and integrity through the definition of a results framework as well as through continuous monitoring and feedback. The operating culture is one of greater collaboration, clearer roles, orientation toward achieving common objectives and increased attention to participation and customer needs and at the same time, documentation preparation is less burdensome. Lastly, the implementation of these ideals relied heavily on streamlined budget, obligations and procurement processes.

The baseline requirements as outlined in the BAA state that an information system, which supports the new Operations System, should track results and support implementation/planning. More specifically, it was intended to:

- Outline strategic objectives (SO), i.e., objective, indicator, target and date
- Track Emphasis Area Coding which relates the SO to a particular area within the agency
- Hold baseline data
- Track results data
- Contain evaluative analysis
- Serve as a repository for other statistical data
- Contain links with other corporate information systems
- Have a sophisticated reporting system

- Provide data for the Agency's Congressional Presentation and the basis for the agency's implementation for the Government's Performance and Results Act (GPRA)
- Be a repository of the information kept on specific interventions/results packages. This includes the relationships of the results package to objectives, schedules and targets, budgeted fund, team members and actual results/deliverables and other activity-related information.
- Budget Planning – create "what-if scenarios" for budgeting

After the completion of the BAA, USAID identified the following additional functionalities:

- Results Planning – a separate module to create draft results tracking
- Operations PC which is a local version of the entire module for the missions without NMS to use and upload it to the rest of the system
- Facility to Print Screens
- Query functions

The Operations Application is the backbone of the entire NMS system because it is where strategic objectives, activities and frameworks are established and flow through to the AWACS, A&A, and Budget applications. Thus, it is integrated with all applications but it has a heavy integration on the Budget application. With this integration, one important report that the module produces is the Performance Data Report which is the basis for reporting back to Congress under GPRA. Specifically, the Operations Application consists of the following modules: Results Tracking, Results Planning, Activity, Participation, Team, Results Package and Lessons Learned. These six modules were intended to provide the functionality described below:

- **Results Tracking** – This module provides each mission and office with the ability to record its development hypothesis and link its objectives to the overall Agency goals and objectives. It graphically depicts their results framework and allows teams to determine causal relationships, critical assumptions, objective indicators/measures and to project targeted results. Results Planning is an exact replica of Results Tracking. It provides a place for users to create draft frameworks, objective, indicators, etc.
- **Activity** – This module is where users define actions undertaken to achieve a program objective. They organize these actions into hierarchical units, which form the basis for the financial structure of NMS. All funds are distributed through this activity structure. Also, this application is where users assign emphasis area codes to the activities, which enables the Agency to report on its program plans and expenditures and to track earmarks and directives.
- **Participation** – This module allows users to develop the customer service plan for each development objective. Tasks that can be accomplished include: define a customer, stakeholder or implementor group, record engagement plan, rate the value and power of each customer, stakeholder and implementor group and generate a customer service plan

- **Team, Results Package and Lessons Learned applications** – These modules are collaborative management tools, which foster interaction between missions and programs. Team allows a team leader to coordinate objective team membership, responsibilities and goals. Also, a team member can keep a team journal in this application. Results Package allows a person to manage results packages and define relationships between the strategic planning module of NMS and the financial or implementation information. Lastly, Lessons Learned provides a place where teams can document successes and difficulties during implementation.

Currently, the Operations application is on-line in Washington and in the 39 NMS mission locations. Users from around the world commented that the application is user-friendly and easy to use. Painstaking efforts were taken to incorporate all system functions outlined in the BAA that could be automated and were put into the system. At present, approximately 1,000 program and Washington staff are able to use the system for creating activities and developing strategic frameworks. Some users are using it to track results, and indicators. This year, the Office of Programs and Planning (PPC) has asked bureaus to use the tool to enter their results so that they can use it next year to create their Performance Report to Congress. Two bureaus have committed to using the OPS application for this purpose.

2. Legal and Regulatory Requirements

Based on the requirements for the Operations Application as stated in the BAA, we have found no overall government regulations, nor specific USAID regulations that govern this section.

In addition, we have found no internal control problems within Operations, although there are consistency problems in how activities are coded. There is no specific manner in which either bureaus and missions are required to code work (based on the SO system). Bureaus and missions are coding down to different levels of detail. This can cause a lack of consistency in comparing where dollars have been assigned or are being used.

3. Evaluation of Demands and Capabilities

The IBM Team identified 26 functions within the Operations Application. Sixteen of these functions were deemed necessary to do business. Six of these 16 are either currently not working or are not being used to the extent intended. The summary of impact level values of the Operations application functions is shown in Table 4-9.

	Impact Level			
	Not Necessary	Desired	Necessary	Total
Operations Application	9	1	16	26

Table 4-9: Impact Level of Operations Application Functions

For example, users and functional experts identified that the Activity and Results Tracking modules are mission critical functions in OPS because they establish activities, track emphasis areas and results. Furthermore, all functions in these two modules work technically yet users are only inputting activities and some are tracking results and emphasis areas through use of the application. People are not using those functions fully because they can conduct business using processes or resources outside NMS. Also, not all mission personnel have access to the OPS application and can not input results and indicators directly into NMS. On the other hand, the missions with access to the system experienced so many communications problems with all applications that Washington did not require them to use OPS to track results.

Functions that are necessary but not developed include:

- Team Security
- Printing Screens
- Ability to obtain reliable data out of AWACS

Within the other 10 functions one is considered desired but the other nine are deemed not necessary. The one that is desired, OPS PC is nice to have because it provides a way to get the application out to the missions. At this point, it has been programmed but the upload and download procedures have not been written.

The remaining functions such as: Budget Planning, Results Planning, Schedule, Participation, Team, Results Package and Lessons Learned were considered not necessary because those functions can be performed using other software or manual means.

4. Gap Analysis

In addition to identifying the necessary functions of the Operations application, the IBM Team analyzed the degree to which each area is implemented and functioning. The IBM Team defined differences between necessary functionality and system capability according to technology, organizational, or process gaps. The matrix in Appendix E-8 summarizes the 26 Operations application functions, the impact level ratings, and the gaps identified between requirements and system capabilities.

The primary gaps related to the OPS Application are organizational in nature. In other words, the technology functions satisfactorily but the organization has not fully utilized the application in the right way. The intention of the OPS Application was to provide a standard management tool to help the programs and missions plan and implement their activities and track results and indicators. Many users commented that the application tool has been used to perform tasks and not pull information out of in order to make decisions and manage work. Offices and programs have delegated inputting data to a central person instead of by the "information owner". Moreover, in the reengineered operating system, a key component was empowerment and accountability. One interview participant, stated that people see putting some of the data into the tool makes the mission people

feel as though Washington is trying to keep track of what is going on in the field, which is contradictory to its intended purpose. Therefore, to maximize the value of this tool, all missions need to have access to this system and more importantly need to understand its inherent value and that it is not meant as a tool for Washington to keep track of the mission's business.

Due to the fact that, the OPS module is being used only to perform minimal functions, it did not help them produce their 1994 Performance Report to Congress. Again, all offices and missions are using the Activity application and some are using Results Tracking. Users commented that those applications are working well and view them as mission critical functions. Also, a key report called the Performance Data Table that is the basis of the R4 process works and is useful. Activity is being used because they have to in order to fund activities. Most offices and missions are not using Results Tracking and the other OPS applications because the are not required to use them and they can do these things manually. Also, they could not rely on AWACS and A&A data that accompanies the performance data. Consequently, there was limited results data in the system for their 1997 Performance Report to Congress and could not compile statistics for this report. They brought the data in manually to Washington and input it into their own database.

V

NMS Technical Review

This section of the report provides a discussion of the technical review of the New Management System performed by the IBM Team. The discussion in this section is presented by each technical area that was examined.

A. Overview

Technical subject matter expert members of the IBM Team performed a review of the NMS system in support of the overall alternatives analysis effort. The technical team examined the system from several perspectives, including: System Architecture, Networking, Security, Oracle Database, Visual Basic Code review, and Year 2000 readiness. A summary of the technical review findings is shown in Table 5-1 below, with discussions of each area in the sections that follow.

Technical Area	Finding Description
System Architecture	• NMS was designed and implemented as a distributed two-tier client/server architecture; detailed review of system infrastructure is required
Networking	• Banyan VINES provides adequate networking facilities for USAID and can be expanded to meet future needs. VINES has little or no impact on NMS functionality • The current VSAT network can support near-real time batch-style data replication. It can also adequately support the recommended centralized data base three-tier client server architecture
Existing Hardware Assessment	• Currently NMS operates on 47 IBM RS/6000 servers. Eight are located in Washington and 39 are in the missions • The IBM S/390 mainframe has ample space and could be used as a data warehouse to house the core business applications
Security	• An Information Systems Security Management Program does not exist at the Agency level • Ownership of NMS is not defined • Management and technical controls are inadequately implemented in NMS

Technical Area	Finding Description
Database Review	• Haphazard database design practices have resulted in an undocumented and poorly integrated NMS system • Developers were unskilled in the use of Oracle resulting in low quality code and poor application performance. Poor testing procedures exacerbated this problem • While Oracle itself is fully Year 2000 compliant, the applications accessing the database have many Year 2000 coding errors
Visual Basic Code Review	• The current Visual Basic code does not employ good coding standards, is poorly documented, includes much redundant and dead code and has many reliability and performance problems. Lack of proper testing has failed to identify and isolate many of these problems • Configuration control is poor resulting in many modules of running code that do not have matching Visual Basic source • The version used (Visual Basic Version 3) will need to be upgraded to the latest version (Version 5) which provides new cost and time saving functions and Year 2000 support
Year 2000	• USAID management does neither yet appear to be fully aware of how serious the Year 2000 problem really is nor how difficult it will be to fix it in time. The Year 2000 problem is the critical path for USAID over the next two years, and will be costly both in resources and dollars • Both NMS and legacy systems are exposed to significant Year 2000 problems. Although NMS uses 4-digit dates in its files, there are very many instances where NMS programs do not handle dates, date-related calculations and date-related decisions correctly. No standard way was developed or used to handle all date/time manipulation • USAID will have difficulty carrying on its mission and meeting its Federal reporting obligations when legacy and new applications start failing or producing wrong information due to the Year 2000 problem. For example, a system shutdown in the final days of a Fiscal Year could result in an anti-deficiency act violation for USAID

Table 5-1: Technical Review Summary Findings

B. Methodology

The technical review methodology employed by the team was similar across the various technical areas. We used two primary sources of information:

- Interviews with NMS functional and technical personnel
- Existing documentation, including diagrams, design documents and memoranda, audit reports, outside reports, and other technical documentation

Additions and exceptions to this methodology, if applicable, are highlighted within each technical area discussion.

C. Technical Discussion

The following sections provide discussions of the analysis and findings in each technical area.

1. System Architecture

This section of the report presents a discussion of the system architecture that is being used to operate the New Management System (NMS).

a. Overview

A properly designed enterprise-wide system architecture plays a critical role in the performance, reliability and scalability of USAID computer systems worldwide. When evaluating the total system architecture, there are several key components to consider: mainframe/server capacity, network architecture, database design, and application architecture. The total interaction between all these components and how they are implemented determines how effectively they will work together as a complete system.

b. Findings

Below are the findings of the NMS system architecture review focusing on the key areas.

i. Mainframe/Server Capacity

NMS is implemented using 43 IBM RS/6000 Model R20 UNIX servers, 4 at USAID Washington and 39 at remote mission sites worldwide; along with 4 IBM RS/6000 Model R24 UNIX servers at USAID Washington. Each RS/6000 Model R20 is configured with:

- Single Central Processing Unit (CPU)
- 512-Megabytes (MB) Random Access Memory (RAM)
- Dual Ethernet Network Interface Cards (NIC)
- 4-Gigabytes (GB) System Disk Storage
- 7-Gigabytes Mirrored Data Disk Storage (for a total of 14GB)

Each RS/6000 Model R24 is configured with

- Single Central Processing Unit (CPU)
- 1-Gigabyte Random Access Memory (RAM)
- Dual Ethernet Network Interface Cards (NIC)
- 6-Gigabytes System Disk Storage
- 26-Gigabytes, 34-Gigabytes, or 62-Gigabytes Mirrored Data Disk Storage

These systems follow standard industry practices for sizing database servers and appear to have sufficient memory and disk space to run NMS. However, increased system performance throughput could be achieved for the Washington-based R24 servers by increasing the number CPUs from 1 to 2.

While NMS does not currently make use of the S/390 IBM mainframe, it should be considered for use as a centralized data warehouse in any future designs, since it is only used in a minor capacity compared to it's load potential. The mainframe has a total of 167GB direct access storage device (DASD) disk capacity, while only using approximately 32GB for current applications.

Additionally, worldwide administration, maintenance and spares of UNIX servers is more cumbersome and costly when compared to the administration, maintenance and spares of the mainframe.

ii. Network Architecture

USAID has a dual global network architecture which is comprised of the following: the State Department Diplomatic Communications System (DTS-PO) for Banyan VINES e-mail message traffic, along with a Very Small Aperture Terminal (VSAT) satellite communications system for TCP/IP message traffic between USAID Washington and the remote mission sites.

The VSAT network was originally designed to accommodate overnight batch processing of NMS data. It was subsequently decided that NMS would process transactions on a real-time basis. Analysis performed by USAID proved that that current VSAT network architecture could not support real-time NMS processing. The choice of a VSAT network for TCP/IP message traffic limits the type of database design and application architecture that can be efficiently supported.

iii. Database Design

During NMS development, no coherent or unified database design was developed to accommodate a worldwide implementation of NMS. Subsequently, by default, a centralized database design evolved. This centralized design proved to be functionally inadequate when deployed worldwide over the VSAT network because of the performance limitations of the VSAT network with database transactions. Taking into consideration the worldwide deployment of the application the database should have initially been designed to operate optimally in a distributed environment. One downside

to such a distributed database design is that the implementation, administration, security and maintenance is more difficult and costly when compared to the implementation, administration and security required for a centralized database design.

iv. Application Architecture

The current New Management System was designed and implemented in what is known as a two-tier client/server architecture. Client/server refers to the way in which the software components interact to form a system. There is a client process, which requires some data resource, and a server process, which provides the data resource. In the case of NMS, the client process is a Visual Basic program residing on a Pentium-class personal computer (also known as the front-end), while the server process is an Oracle database residing on an IBM RS/6000 RISC-class server (also known as the back-end). Two-tier refers to the fact that the business logic is embedded in the client application, in this case the Visual Basic program, creating what is known as a "fat" client.

Industry standard practices dictate that two-tier client/server application architectures should be limited to departmental implementations of 50 clients or less because they typically do not scale well in large-scale enterprise environments that require high performance, availability, and reliability. Given the requirement that NMS be deployed worldwide over a VSAT network, a more robust implementation should have been deployed using a three-tier client/server architecture.

Three-tier client/server refers to the fact that the application is designed with three distinct logical layers: the presentation layer, the application logic layer, and the data management layer. The presentation layer resides on the front-end client workstation and handles client and local processing, presenting a graphical user interface to the end-user, as well as creating what is known as a "thin" client. The application logic layer is a collection of services that enforce business rules, process information and manage transactions. The data management layer is typically a relational database management system (RDBMS) such as Oracle.

Three-tier client/server applications are more difficult to develop than two-tier client/server application, but provide high performance, scalability, availability, and reliability for enterprise-wide implementations.

c. Recommendation

In the near term, USAID needs to perform a detailed review to verify that their current system infrastructure will support worldwide implementation of the selected alternative. This review should focus on mainframe/server capacity, network architecture, database design and application architecture.

2. Networking

This section of the report discusses the network operating system that is being used for email, application and file management.

a. Overview

USAID operates in 90 countries around the world and networking is critical to data transmission and e-mail communication between Washington and the missions. The network review included analysis of the following technical areas: Banyan Virtual Inter-Networking Enterprise System (VINES) and satellite communications facilitated by a Very Small Aperture Terminal (VSAT) system. VINES is in place for wide area network (WAN) capabilities that include file transfer, Email and application exchange and support. The VSAT exists for international network communications within USAID and also serves as backup for VINES.

b. Findings

The IBM Team determined the following based on its review of relevant networking documentation, test data, and interviews.

i. Banyan VINES

Banyan VINES provides adequate networking facilities for USAID and can be expanded to meet future needs. VINES has little or no impact on NMS functionality. There is only one executable file located on each Banyan server, which means that any user with a Banyan login can go to Windows, click on an icon and be connected to the IBM RS/6000 servers to run NMS. All of this is transparent to the user.

Banyan and all subsystems will be Year 2000 compliant by June 1998 (Version 8.5). USAID has not decided if they are going to upgrade to v8.5 or if they will convert to a Microsoft NT environment. It is assumed USAID would need Banyan to remain in place to meet the needs of international communications. The majority of the PC's attached to the Banyan network are also not Year 2000 compliant. These PC's are running MS Windows 3.1 and are 486's or older Pentium machines.

ii. Satellite Communications (VSAT)

A USAID test team was brought together in late 1996 for a two-month investigation of the VSAT network to determine the effect it might be having on the slow response times reported by NMS users. The team used one Banyan server, two IBM RS/6000 servers and a PC configured to the latest available release of NMS to conduct its evaluation. The network had the following configuration: 10MB LAN and 64 KB VSAT configured to emulate a "Mission-to-Washington"

connection. A Network General Sniffer was used to monitor network traffic (packets) along with NETscout RMON probes.

The USAID test team also performed "on-line" network testing after the "internal" testing was completed. Online tests of VINES and the VSAT occurred three times per day on twelve different dates during January and February 1997.

The findings from the USAID testing efforts are as follows:

- During an "add user" procedure (i.e., adding additional NMS login accounts for users), the RS/6000 would run at 100% utilization. This means no other processes could be performed for NMS during the time required to complete the "add user" procedure. This alone would not be a cause for slow response times but could contribute to the problem when transaction loads increase.
- The USAID team began their evaluation at the "Physical Layer", which is the lowest level of networking. The Physical Layer includes basic wire level connectivity and data transmit rates. (Refer to the OSI model in Figure 5-1 for detail of all seven networking layers). The system did not experience any loss of connectivity. In addition, no transmission errors were reported to indicate poor line quality or problems.

OSI Layer	Apple Computer	Banyan Systems	DEC DECnet	IBM SNA	Microsoft NetBeui/Msg	Novell NetWare	TCP/IP Internet	Xerox XNS	OSI Protocols
Application Layer 7	Application Programs and Protocols for file transfer, electronic mail, etc.								
Presentation Layer 6	AppleTalk Filing Protocol (AFP)	Remote Procedural Calls (Net RPC)	Network Management Network Application	Transaction Services Presentation Services	Server Message Block (SMB)	NetWare Core Protocols (NCP	Application Specific Protocols	Control and Process Interaction	ISO 8823
Session Layer 5	AppleTalk Session Protocol (ASP)		Session	Data Flow Control	Network Basic Input/Output System (NetBIOS)	Network Basic Input/Output System (NetBIOS)	(Telnet, FTP, SNMP, SMTP, ICMP, etc.)		ISO 8327
Transport Layer 4	AppleTalk Transaction Protocol (ATP)	VINES InterProcess Communications (VIPC)	End Communications	Transmission Control	Network Basic Extended User Interface (NetBEUI)	Sequenced Packet Exchange (SPX)	Transmission Control Protocol (TCP)	Sequenced Packet Protocol (SPP)	ISO 8073 TP0-4
Network Layer 3	Datagram Delivery Protocol (DDP)	VINES Internet Protocol (VIP)	Routing	Path Control		Internet Packet Exchange (IPX)	Internet Protocol (IP)	Internet Datagram Protocol (IDP)	ISO 8473 (CLNP)
Data Link Layer 2	Network Interface Cards: Ethernet, Token-Ring, ARCNET, StarLAN, LocalTalk, FDDI, ATM, etc. NIC Drivers: Open Datalink Interface (ODI), Network Independent Interface Specification (NDIS)								
Physical Layer 1	Transmission Media: Virtual Satellite (VSAT), Twisted Pair, Coax, Fiber Optic, Wireless Media, etc.								

Note: The Open System Interconnection Reference Model (OSI Model) was developed by the International Standards Organization (ISO) in 1978. This seven-layer model was designed to build a standard framework to allow various computer communication networks to work together.

Figure 5-1: OSI Model

During the evaluation, the USAID test team observed some network retransmissions. A "retransmission" occurs when an initial transmission is not processed/delivered. This observation lead the team to believe the retransmissions were caused by "time-outs". It was discovered in one of

the USAID test team evaluations that the total number of retransmissions observed was 448 out of 31,081 total frames. (A frame is an electronic envelope used to encapsulate a message.)

Utilization of the network was very low on either side of the VSAT link (Washington or Mission). The highest utilization was observed to be 6% (i.e., very little traffic over the VSAT). Note that this test was performed within a controlled environment where Internet traffic was not being monitored. In the environment where the actual VSAT link was tested, a "ping" was determined to take approximately 2.5 seconds for a round trip, also known as a propagation delay. (Note: a ping is a single burst of frames that are used to make sure you can access another site/Internet Protocol.) In contrast, the test estimated that the "Add User" function (which is about 300 frames) required 6.25 minutes (single direction from site to site) at 1.25 seconds per frame.

Another part of the USAID test effort looked at the actual transmit rate of the SQL*Net. SQL*Net produces very high numbers of packets/frames to protect mission critical data. Almost every packet/frame requires an acknowledgment from the database. Under this setup, the same "Add User" function that was estimated to take 6.25 minutes could require up to 3.66 hours to transmit. This time frame was calculated from the number of frames gathered from the Sniffer. These findings indicate that client/server SQL applications are inefficient in this network environment.

In conclusion, the high number of packets/frames being sent between client and server in order to process NMS application functions and in combination with the high propagation delay is likely to cause slow NMS response times.

c. Recommendations

USAID should maintain Banyan VINES. The Agency will need to upgrade the network software soon after the Year 2000 compliant version is released in June 1998. The systematic approach must include the planning of a core business application based on the current network architecture. The application must be capable of keeping up with evolving design requirements, network architecture and protocols.

3. Existing Hardware Assessment

This section of the report discusses hardware that is being used for NMS as well as for USAID's legacy systems.

a. Overview

Currently NMS operates on 47 IBM RS/6000 servers. Four (IBM R24s) of those servers are located in Washington. Four IBM R20s are located in Washington and the other 39 IBM R20s are housed around the world in USAID missions. At this point, the server capacity is sufficient for using NMS.

Moreover, USAID has an IBM S/390 Mainframe located in Bethesda, MD which houses mission critical legacy systems such as FACS, Payroll, LAIS, Personnel and Time and Attendance. Currently, the mainframe is being upgraded to become Year 2000 compliant by replacing the operating system with OS/390 v2r4 MVS. Also, it has approximately 167GB (gigabytes) of storage of which only approximately 32GB is being used for various Legacy applications. (Note: 1GB = 1 Billion bytes.) USAID is upgrading the capacity of the mainframe by increasing the amount of direct access storage device (DASD) drives.

MACS is another mission critical system. It is housed on a Sparc Station 10 Sun OS 4.1 (Unix) and is in the process of being upgraded and made Year 2000 compliant. Two additional programmers, in addition to the current one, are planned to be in place to assist in upgrading MACS.

b. Findings

FACS is scheduled to be shut down by January 31, 1998. For the last 2 years, no new data has been input into FACS yet it still acts as archive storage. More importantly, it interacts with numerous external systems such as US Treasury systems, Federal Express and internal systems such as LAIS and STARS. Thus, the impact of shutting down the system is unknown.

MACS also is still being used by all Mission sites for all financial processing. There is an interface between MACS and AWACS.

Payroll and STARS will be made Year 2000 compliant due to their current reporting systems.

Loan Accounting and Information System (LAIS) may be made Year 2000 compliant, but USAID has not confirmed a decision on this action. General Ledger Accounting and Reporting System (GLARS) will not be made Year 2000 compliant because Financial Management (FM) stated they could use AWACS General Ledger model for FY98.

c. Recommendations

The IBM S/390 mainframe has ample capacity and could be used as a data warehouse to house the core business applications. Also, it has the capacity to maintain a world-wide database of information to be used in a centralized database three-tier client/server architecture.

USAID should also upgrade and maintain the current UNIX servers that are in place for MACS. Each UNIX machine needs to be tested for Year 2000 compliancy and upgraded accordingly.

4. Security Assessment

This section discusses an overview of Information Technology security, the IBM Technology evaluation of NMS security, the findings from our conclusions and our recommendations to enhance the current USAID security program.

a. Overview

Security programs are implemented in order to protect systems and data in corporate information systems from internal as well as external corruption. An important element to security management is the development of an Organizational Security Program. A successful program should address the generic and unique security aspects of the network. The security program takes planning, structure and organization. To be effective, the program must implement an organization's security policy in a consistent, comprehensive, and layered manner. It must be capable of keeping up with evolving network architectures, new protocols and services, and competitive pressures for connectivity to inherently insecure networks such as the Internet. Security plans are put in place so that data remains reliable and accurate. Managing the configuration of a network is difficult enough. Making sure that security is preserved as changes are made during corporate reengineering and mergers is even more challenging.

b. Methodology

In order to evaluate NMS security, the IBM Team conducted interviews with NMS management and staff personnel, observed operations of the system and the physical facilities and resources within the buildings and reviewed all IT security program related documentation.

During the entrance interview with system management and staff personnel, the IBM Team's mission and methods were explained in detail. We also, reviewed the following federal regulations and policies as guidelines for an assessment:

- OMB Circular A-130, Appendix III, "Security of Federal Automated Information Systems"
- OMB Bulletin 90-08, "Guidance for Preparation of Security Plans for Federal Computer Systems that Contain Sensitive Information"
- Public Law 100-235, the "Computer Security Act of 1987"
- Department of Commerce, "Guidelines for Conducting Information Technology Security Verification Reviews of Sensitive and Classified Systems"
- Foreign Affairs Manual Volume 12, Chapter 500 "Information Security"

NMS was evaluated as to how well it complied with OMB Circular A-130 requirements. OMB Circular A-130 incorporates all requirements originally issued in OMB Bulletin 90-08. The circular requires all federal agencies to plan for the security of all sensitive IT systems throughout the system's life cycle. The circular also establishes a minimum set of controls that must be in place in Federal Information Technology (IT) Security Programs. An agency's program must include the implementation of policies, standards, and procedures which are consistent with government-wide laws and regulations, to assure an adequate level of protection for IT systems whether maintained in-house or commercially. The circular directs agencies to ensure that:

- IT systems operate effectively and accurately

- there are appropriate technical, personnel, administrative, physical, environmental, and telecommunications safeguards in IT systems
- the continuity of the operations of IT systems that support critical agency functions is preserved

c. Findings

The requirements as outlined by OMB can be classified according to the following four categories: responsibilities, system planning, security review and authorization. The IBM Team assessed whether or not the categories were addressed, implemented and adequate within NMS. Table 5-2 shows the nine OMB requirement areas and indicates the extent to which a policy exists whether the policy is implemented and if the implementation is adequate.

OMB Circular Requirements	Addressed In NMS Policy	Implemented by NMS	Adequate In NMS
Assignment of Responsibilities	Yes	No	No
System Identification and Planning	No	No	No
Screening of Users	Yes	Yes	No
Security Training	No	No	No
Risk Management	No	No	No
Incident Reporting	No	No	No
Authorization to Process Data	No	No	No
Review of Security Safeguards	No	No	No
Contingency Planning	No	Yes	No

Table 5-2: OMB Requirements Compliance Analysis

Through the investigation of NMS security, we found that the security system addressed the assignment of responsibilities and screening of users. Screening of users had been implemented but was not adequately addressed to ensure a secure NMS environment. Therefore, NMS is not in compliance with the requirements identified in OMB Circular A-130. The other three areas had not been adequately addressed by policies or procedures in NMS.

OMB guidance states that the responsibility for the establishment of an NMS IT security program begins at the highest level within the Agency (i.e., The Administrator) and flows down through management of all divisions and organizations to the individual users. In the case of USAID, they have not established a security program at the Agency or Bureau levels. Moreover, security management has fallen short at the major system level, i.e., NMS. Although each application (AWACS, A&A, Budget and OPS) has a specific owner, there is no overall NMS-wide system owner. Therefore, it was difficult to assign responsibility for security to one person.

A second example of a security shortfall is the lack of security and contingency planning. Because there is no one assigned responsibility for NMS security, no security plan that defines standard system rules, security training, incident reporting, and contingency planning and technical controls was created and those facets were not incorporated into the system.

As shown in Table 5-2, the area of review of security safeguards was found to be inadequate. First of all, access privileges in each application were granted through the use of Role Based Access Controls (RBAC). When the applications were consolidated as one system, the roles were not redefined and adequate analysis of the use of RBAC in NMS after consolidation was not conducted. In order to implement the system worldwide, the "public privilege" which allowed any role to have the necessary access was given to all NMS users. This created a large security hole in the NMS system and caused several security issues. For example, a user was able to move money through the system that he was not supposed to be allowed to move.

An area that is addressed, but not adequately implemented is screening procedures. Screening procedures allow user access to NMS resources. Management controls such as separation of duty, individual accountability requirements, and limitations on processing privileges of individuals are inadequately implemented and enforced in NMS. For example, a user can request and approve a resource. Along the same lines, certain users require and are assigned multiple roles in order to complete a specific NMS task. A considerable problem exists in that often roles are cumulative and the combination of roles may give users more privileges than they need or are required to perform their tasks.

As a general note, Management has not yet conducted a security verification review on NMS. Security reviews were not done on any of the applications for NMS at any point during development or production. Certification is a requirement for all sensitive and classified General Support and major Application systems. The technical certification evaluation results are the basis for the system owner's certification statement in the accreditation request. New IT systems or those not fully operational must complete all certification requirements and be accredited prior to full implementation. The system did not undergo the process of technical certification and accreditation prior to being placed into production.

d. Recommendations

USAID should take a systematic approach to developing an Enterprise Wide security program that addresses IT security planning for the entire agency. The approach should focus on primary and supplementary IT security issues in an effort to identify all areas of concerns. This systematic approach to developing an enterprise security management program must include planning, structure, and organization. The results of this type of an approach should lead to the effective development of an IT security program that implements the organization's security policy in a consistent, comprehensive, and layered manner. The program must be capable of keeping up with evolving network architectures, new protocols and services, and competitive pressures for connectivity to inherently insecure networks such as the Internet. There are several services such as

authentication, access control, confidentiality, integrity, non-repudiation and audit which systems must take into consideration in order to be secure USAID-wide systems. A discussion of the various mechanisms that can be used now and in the future to implement and strengthen a security policy that meets the business needs of the enterprise can be found in Appendix F.

In order to secure NMS, USAID should implement a security program beginning with the establishment of an organizational IT security infrastructure and the assignment of broad responsibilities. Individuals appointed to security officer positions must be accountable for compliance with all USAID and federal laws, regulations and policies related to the assigned responsibilities. The responsibility for the NMS IT security program must start at the Agency level and flow down through management of all organizations to the individual users.

Table 5-3 outlines a suggested internal IT security organization based on OMB requirements and the current organization structure of 8 Bureaus, 3 regional offices, 39 missions and one Washington hub. The numbers below reflect the OMB requirement that a primary and assistant (alternate) security officer be identified.

Security Official	Agency	Bureau (8)	IRM	Regional (3)	Unit	Mission (39)	Number	Grade
Program Manager	2						2	15
Senior ISSO		2 Each	2				16	14-15
ISSO						2 Each	78	14-15
Sub-org ISSO				2 Each			6	13-14
UISSO					2 Each			13-14
Security Administrator					2 Each	2 Each		12-13
Total	2	2	2	2	4	4	84	

Table 5-3: Suggested IT Security Infrastructure

Items i through vi below identify several security officer titles and include a brief job description of each. In the absence of the security officer the alternate shall perform all functions normally assigned to the security officer for the operation of the IT security program.

i. Security Program Manager

Located in the office of the Bureau of Management, the IT Security Program Manager should be responsible for the protection of information while being processed and/or transmitted electronically, and for the security of the resources associated with these functions. The Program manager should monitor, evaluate and report, as required, to the Assistant Secretary for Administration on the status of IT security within the Agency and the adequacy of operating unit IT Security programs.

ii. Senior Information System Security Officer (ISSO)

The Senior ISSO should monitor, evaluate and report, as required, to the CIO on the status of IT security within the Bureaus and the adequacy of the programs administered by the operating units.

iii. Site ISSO

Each operating unit site security officer should conduct a security program that ensures appropriate and adequate levels of protection for all AMS IT systems within the operating unit.

iv. Unit ISSO

The operating unit security officer should serve as the central point of contact for the operating unit IT security program with the site security officer.

v. Subordinate Organization ISSO

Not all operating units within the Agency will require this level position. A major subordinate organization is defined to mean any large organizational component that has management responsibility for a number of individual IT systems performing separate functions (i.e., Line Office, Laboratory, Regional Office.) The subordinate organization security officer should serve as the central point of contact for the subordinate organization IT security program with the operating unit security officer. If this level of position is determined to be appropriate for the operating unit, the functions of the security officer for the subordinate organization will generally parallel those specified for the site security officer.

vi. System Security Manager (SSM)

The SSM for each classified or sensitive system should perform the majority of the functional responsibilities. Some of the responsibilities are shown in Table 5-4:

Key Responsibilities
1. Advise the IT system owner on matters pertaining to IT systems security.
2. Develop, implement and manage the execution of the IT system security program.
3. Prepare, or cause to be prepared an IT system security plan in the proper format for the IT system.
4. Conduct, or cause to be conducted, a risk analysis on the system when there are major changes to the system or every three years, whichever is less.
5. Ensure that contingency and disaster recovery plans are developed, maintained in an up-to-date condition and tested at least annually
6. Establish and maintain liaison with any remote facilities or users served by the IT system, the operating unit security officer, or if appropriate, the subordinate organization security officer.
7. Monitor changes in hardware, software, telecommunications, facilities and user requirements to ensure that security is not compromised or degraded.
8. Exercise system responsibility or direct activities for password management and control.
9. Arrange for IT security awareness training for the system staff and monitor the user training programs to ensure that personnel receive security orientation before being allowed access to sensitive IT resources.
10. Ensure that positions requiring access to classified information or resources are identified and that incumbents of these positions receive an appropriate level of security clearance before access is granted.
11. Investigate known or suspected security incidents or violations and prepare reports of findings as required.
12. Ensure that the organization abides by the NMS and operating unit malicious software policies and has the required virus detection and elimination software and procedures available to protect against these threats.
13. Audit all the systems within the organization for illegal software at least annually and maintain inventories of all software on each individual system to verify that only legal copies of software are being used.
14. Review IT related procurement specifications for hardware, software or services to ensure that they include adequate security requirements and/or specifications, which are commensurate with the sensitivity of the system.
15. Conduct, or cause to be conducted, all activities required for the certification of the system, including preparing the certification and accreditation packages for final approval every three years or when major changes occur to the system, whichever is less.
16. Coordinate with the operating unit Security Office or local Security Office on security matters of mutual interest (i.e., IT Security).

Table 5-4: SSM Responsibilities

5. Database Review

This section of the technical review discusses the results of our examination of NMS from a database perspective. Since NMS is a client/server system, the database is one of its two major components. The other major component is the front-end graphical user interface (GUI), which is written in Microsoft's Visual Basic (VB) programming language. In the sections below, we will provide a general overview of the database area, a description the database-specific changes to the overall technical evaluation methodology described above, our findings concerning the database, and finally, our recommendations.

a. Overview

All information in NMS – whether keyed into the system, displayed on a screen, or printed on a report – is stored in and retrieved from the Oracle database. NMS currently runs on version 7.3 of the Oracle7 relational database management system (RDBMS). The three sections of this overview are intended to provide the background information necessary to understand the basic functionality of the Oracle database and its role in the technical architecture of NMS.

i. Oracle in General

Like all relational databases, Oracle stores data in logical structures called tables. Conceptually, a table is a collection of rows and columns, similar to a spreadsheet, where each cell contains a data value. The database is called "relational" because many of the tables it contains are related to one another. Such relationships occur when two tables have one or more columns in common, allowing corresponding rows from each table to be joined together (linked) based on common column values. This relational concept is so simple and flexible that a set of related tables can be designed to store the data required by almost any conceivable information system.

In addition to storing an organization's business data, the Oracle database is capable of enforcing many of the organization's business rules and requirements. Oracle contains a variety of mechanisms for doing so, including declarative referential integrity, check constraints, triggers, and stored procedures. These mechanisms can perform such functions as:

- constraining column values to fall within a specified range or set of acceptable values
- enforcing relationships between columns values (i.e., Start Date < End Date)
- forcing relationships between tables to always be valid (i.e., referential integrity)

Oracle is also capable of enforcing almost any data security scheme a business application may require. The database contains several security-related features including passwords and a granular yet robust set of system and object level access privileges. System administrators and application developers can define roles, which are named collections of privileges that can be used to implement the various levels of data access required by the business application. NMS uses such a role-based security scheme.

The Oracle database supporting NMS contains approximately five hundred tables, as well as hundreds of other supporting constructs, such as indexes, stored procedures, triggers, and views. As a whole, this complex collection of database objects is referred to as the "schema" of the NMS system. We examined the overall design of this schema as part of our review.

ii. SQL and PL/SQL

Oracle databases are created and accessed using an industry standard language called SQL ("sequel"), which is an acronym for *structured query language*. SQL is made up of three basic kinds of statements that are used for creating, manipulating and controlling access to objects within the database. Standard SQL is a powerful but limited language that lacks some of the important features needed to develop real world applications. To overcome these limitations, database vendors are forced to provide extensions to SQL, which enhance the language to make it more useful in application development. Oracle uses a language called PL/SQL to provide procedural programming capabilities within the Oracle database. PL/SQL combines standard programming constructs with SQL to provide a powerful tool for application development. The NMS application programs use both SQL and PL/SQL extensively.

iii. Client/Server Architecture

NMS is built on a two-tier client/server architecture like the one shown in Figure 5-2 below. In this architecture, client workstations (PC's) communicate over a network with a database server. The client runs a front-end application and sends requests to the database server to be fulfilled. These requests come in two forms: reads and writes. Reads are requests for the server to send database information to the client, and writes are requests for the server to receive some data from the client and record it in the database. Writes can add new data to the database, modify existing data, or delete existing data. In NMS, the front-end is the Visual Basic application, and the database running on the server is Oracle7.

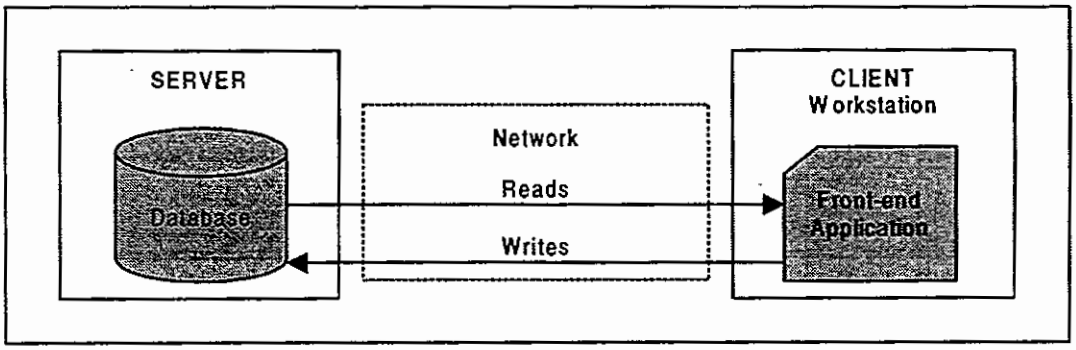

Figure 5-2: Typical Two-Tier Client/Server Scenario

This two-tier scenario is duplicated at each mission and at the USAID office in Washington (AID/W). From a system standpoint, AID/W is treated exactly like a mission. There is also another instance of

the database, called the *data warehouse*, which resides on a separate server in Washington. All of these database instances – the missions, AID/W, and the data warehouse – have the same internal structure and contain roughly identical data. This arrangement is known as a *distributed database* because the data is physically distributed across multiple connected servers. The information in each database instance is kept in synchronization with the other instances by a process called *replication*. Figure 5-3 shows this network architecture.

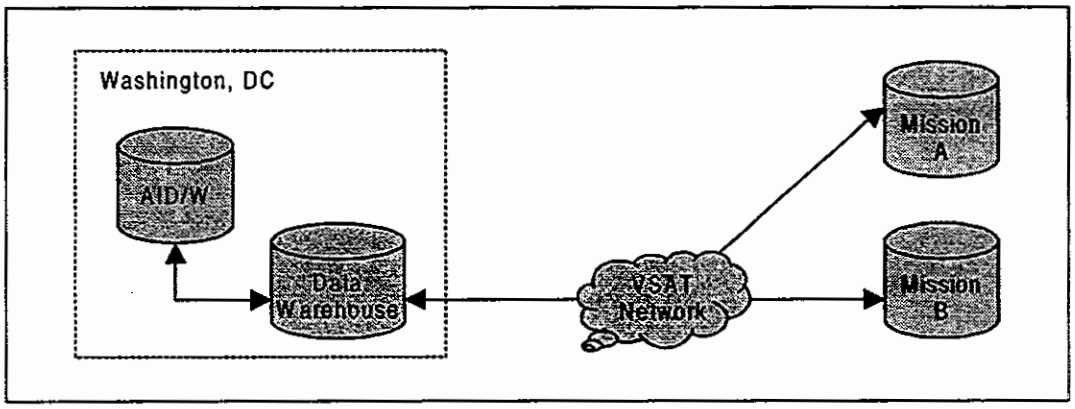

Figure 5-3: NMS Network Architecture

The data warehouse acts as the "master" site for the replication process. When a user at a mission (or AID/W) makes a change in NMS, that change is made to the mission's local database and to the data warehouse. This strategy ensures that the data warehouse always contains a current, up-to-the-minute version of agency's data across all missions. A batch replication process runs nightly to bring each mission's local database up-to-date with the data warehouse. This synchronization process is called a "refresh", and it occurs every 24 hours. Therefore, the data in the local database is often out of date because changes made at other sites are not visible until the next refresh, which can be up to 24 hours away.

The reason for this distributed approach using batch replication is that many of the missions are connected to AID/W using a VSAT satellite network. Due to the propagation delays inherent in such a network, it would be impractical to run a client/server system on it. Instead, the client/server application runs at the local (mission) level, and the data is replicated over the VSAT network during evening hours. While this approach works to a degree, it has some potential problems because the data at a mission is not usually current. Users in the missions are then left with a choice between making decisions based on potentially out-of-date information, or waiting until the next day for the data to be refreshed. With certain NMS processes, it is impractical to wait twenty-four hours between steps.

b. Methodology

We conducted this database review using a modified version of the overall technical review methodology described in an earlier section of this report. In addition to the sources of information mentioned previously, we also examined the NMS schema by looking at its internal structure and stored PL/SQL code. To do so, we wrote SQL scripts to extract the desired information from the internal data dictionary tables and dump it into text files. We then examined the contents of those text files.

Given the size and complexity of the NMS database schema, we were unable to examine all aspects of it within the timeframe allotted to this effort. We therefore focused on several key areas, starting with those outlined in the statement of work. These areas included: Year 2000 compliance, segregation/de-linking of database tables and continued NMS development. We also examined system design and architecture, performance, code quality, and security. Our evaluation of these areas is based on our combined years of experience in the design and development of Oracle-based information systems. In drawing our conclusions, we considered various standards and accepted practices in the areas of relational database design and application development. These standards and practices include:

- relational design and normalization rules
- use modular programming techniques
- use of standards for coding, object naming, commenting and readability

Our findings and recommendations concerning the database area are summarized below.

c. Findings

Table 5-5 shows some of the more significant findings from the database review. The sections following the table discuss these findings and provide background information where needed.

Area	Finding
Database Design	•The database was designed and built in an ad-hoc manner •Design documentation is scarce, incomplete, and often out-of-date •There is little evidence of the initial high-level design work that should normally precede development •No integrated, enterprise-wide data model exists •The data modelers are documenting instead of designing
SQL and PL/SQL Code	•Overall code quality is low •Programs are large and overly-complex (i.e., not modular) •"Production" programs contain debugging/diagnostic code
Security	•Two different methods are used to determine role assignments •Security roles are confusing and poorly documented.
Performance	•SQL statements are not written to perform well •PL/SQL code has many unnecessary "select from dual" statements •Use of ODBC when Oracle Objects for OLE (OO4O) is faster/better
Year 2000 Compliance	•Some tables store date information with two-digit years •SQL statements and PL/SQL code contain non-compliant date conversions and/or arithmetic
Segregation of Database Tables	•Four independent (stovepipe) designs have led to little integration •Segregation of AWACS tables would affect BUD and A&A most •Further integration should build on aborted Common Tables effort

Table 5-5: Significant Database Review Findings

i. Database Design

Our findings in the area of database design may be among the most important, because problems at the design level can have far-reaching consequences and can be extremely difficult to fix. Our findings all support the common theme that the design work done on the NMS system was inadequate. NMS evolved as four independently developed (stovepipe) systems instead of a single integrated one. An enterprise-wide data model encompassing the entire system was never developed, which resulted in a lack of integration between the four subsystems. Tight integration generally occurs only when it was properly designed prior to development. It is often difficult and costly to integrate systems that are already built or are being developed. Such attempts often result in duplication of data and functionality, as is the case with NMS.

As they were building NMS, the developers employed a haphazard approach in which they modified the database design on an as needed basis to support whatever functionality they were attempting to implement. This ad-hoc process resulted in a less-than-optimal design that is confusing and poorly documented. In fact, the database changes made during the development of NMS were so frequent and numerous that the data modelers were unable to keep up. Instead of being active participants in the design process, they switched to performing a documentation function, tracking the current database design by reverse-engineering the as-built structure into their CASE (computer-aided systems engineering) tool.

Spending inadequate time in design is a common problem in software development efforts. The problem has many causes, but it primarily occurs because of inexperience and time pressure. Inexperienced developers are often anxious to "jump right in" and start coding, so they spend little if any time on initial design work. Sometimes, they are unaware of the importance of design, or they simply do not know how to do it properly. Time pressure is a factor because developers will often shorten the design and testing phases to give themselves more time to write their code, especially if they have an unrealistic development schedule. Upper management often contributes to the time pressure by pushing for more "tangible" results. This occurs because they often do not perceive the value of proper, up-front design work until they are faced with the problems resulting from a bad design.

Most of the business logic in the NMS system is built into the application's Visual Basic programs. We consider this to be a design flaw, because the logic could have been implemented using PL/SQL procedures and packages stored in the database. This approach has several benefits, including better performance (especially over the VSAT network), simpler maintenance, and standardization. Currently, it is up to each individual programmer to implement the business logic properly, which is a difficult task because most of the business rules are not documented anywhere (even in the code). If the logic was moved to the server, all VB programs would be able to call the a single server-side routine to perform a given function. This is what we mean by "standardization". Maintenance becomes simpler because changes to the business logic are only made in one place, and also because PL/SQL programs are easier to change than VB programs.

In summary, we find that the NMS database:

- was designed without any formal process or methodology
- has not been adequately documented
- is not well-integrated because of multiple independent development efforts
- does not enforce business rules in an optimal manner

The items listed above pose a level of risk for USAID. The main area of risk is in the maintainability of the NMS system. The system will most likely be difficult and expensive to maintain because of its ad-hoc design and lack of documentation. Additional integration efforts are likely to be more difficult as well because integration works best when it is fully designed early in the development process.

ii. SQL and PL/SQL Code Quality

In our investigation of SQL and PL/SQL code quality, we found examples of very well-written code and of very poorly written code. This finding indicates a range of programmer skill, which is quite common in development efforts. It also indicates a lack of certain vital quality control measures, such as code reviews and enforced coding standards. We could find no evidence that such practices were used during the development of NMS, which points out the fact that the organization as a whole lacks a disciplined software development approach.

Overall, the quality of the SQL and PL/SQL code in the application is low. The code does not follow accepted standards for readability, maintainability and understandability, which indicates an obvious lack of knowledge and skill among the programming staff. Specifically, we identified the following problems with the code:

- coding and naming standards are neither identified nor enforced, so code is written according each programmer's individual style
- programs are large and overly-complex, with very little use of modular programming techniques
- the amount of commenting is generally inadequate, and existing comments are not useful
- much of the production code contains a debugging message and code for generating performance and timing statistics

These problems present a major development risk because they make code extremely difficult and expensive to modify or maintain.

iii. Security

We stated earlier that the Oracle7 database has many built-in mechanisms for implementing data security measures. The primary mechanisms are roles and privileges, but several additional features are available to augment a role-based security scheme, such as views (information hiding), stored procedures (controlled access), and auditing. Several new password management functions are available in Oracle8. Developers can also build custom table-driven security systems to suit their specific requirements or to provide functionality that is not easily achieved using the built-in security features. From a regulatory standpoint, all of these features can be used to implement a security scheme that complies with the applicable federal regulations, but it is up to the developers of a particular application to design and implement that scheme properly.

Unfortunately, the inadequate design processes described above have affected how security was implemented in NMS. The system's security measures were not designed or implemented uniformly across the four subsystems, which is partially a result of the stovepipe implementation. Although all four builds use role-based security, they use two different methods to determine whether or not a user has a specific role enabled. One method queries the internal data dictionary tables that automatically track such information in Oracle. The other approach uses custom application tables

(i.e., Employee_Role) that have been created to track role assignments. The NMS security module was built to integrate these two approaches, but we have learned that the information in the custom security tables does not always match the contents of the internal dictionary tables. Of additional concern is the fact that the system contains no internal controls to prevent a single user from being granted a dangerous (or illegal) combination of roles. For example, a single user may have the ability to create a request and approve a payment to himself.

We found that the NMS security scheme is poorly documented and confusing. The database contains a large number of roles, many with overlapping privileges. Some subsystems use a small number of roles, which often indicates that more thought went into the definition of those roles. Others have a large number of roles – approximately 65 for AWACS. Though it is possible that AWACS actually requires that many distinct roles, it is more likely that the large number is the result of a poor design.

These findings lead two types of risk for USAID. The first is that a poorly designed and documented security scheme will make the system more difficult to maintain. The second and more serious risk involves the potential for unscrupulous or untrained individuals to cause errors (intentional or not) in the agency's financial data.

iv. Performance

This section discusses our findings in the area of system and database performance. When NMS initially went into production, there were widespread performance and functionality problems, which resulted in the decision to place the system in a "limited production" mode. As of this writing, the NMS system is being used mainly by the USAID staff in Washington, with only minimal use by the staff at the field missions. This situation makes it difficult to gather accurate data on system performance because the system is not being fully utilized.

Replication over the VSAT network was the main cause of the system's initial performance problems. The native replication facilities in Oracle generated a volume of network traffic for which the VSAT network was not designed. Consequently, the network became a bottleneck, and system performance dropped to an unacceptable level. Attempts to replicate the data overnight did not succeed because the process of refreshing the database often could not complete in a single night. To fix this problem, the NMS team developed a custom solution to improve data transmission times by packing the data into a few large packets instead of the many small ones generated by the native replication facilities (a packet is an "envelope" of data transmitted over a network). The solution they developed is generic enough to be used in both the nightly replication process and in on-line transactions within the NMS system. However, not all builds have been willing to make the code changes necessary to use this new technology. Overall system performance has improved, but this new "packing" scheme has not yet been tested with the system in full production.

There are two risks in this approach. The first is that the custom replication solution increases maintenance costs by introducing additional complexity into the system. The second is that NMS is

no longer a true "on-line" system because the nightly replication cycle means that the data at any one site could potentially be up to 24 hours old.

A second major component of the initial NMS performance problems was poorly written SQL code. There is often more than one possible SQL statement that will achieve a given result, and the developer must choose the alternative that will have the best performance. Experience and training are the tools that enable a developer to make such a determination. Performance tuning experts will agree that the largest performance gains are usually achieved by rewriting SQL statements to be more efficient.

It was clear from our review that most of the developers did not write their code with performance in mind. This may be because they lacked the time to tune their SQL statements and were more concerned with programming the correct functionality, but based on our observations of code quality and other factors, it is more likely that they simply lacked the necessary knowledge. In one instance, a single login procedure was taking several minutes or longer to complete because it contained an extremely inefficient SQL query. The NMS database administration staff tuned this query, enabling the modified procedure to complete in seconds. Some of the performance problems we noticed in our examination of the code included:

- PL/SQL code contains many unnecessary "select from dual" statements
- select statements performed unnecessary sorts (select distinct, order by)
- code for generating debugging messages and collecting performance statistics will unnecessarily degrade performance

One other point that came out of our interview with the DBA team was that some NMS subsystems are using other database connectivity (ODBC) software to access the Oracle database, while others are using Oracle Objects for OLE. It is generally a good idea to use a single package in order to standardize the software architecture and obtain consistent performance and functionality across applications. According to the DBA's, Oracle Objects has been demonstrated to have performance, reliability and functionality superior to that of ODBC.

v. Year 2000 Compliance

The Oracle RDBMS is fully capable of handling the Year 2000 problem. The internal date format used by the database supports and requires four digit year values. It is able to store any date value between January 1, 4712 BC and December 31, 4712 AD. This range is sufficient for the date processing required by most information systems, including NMS.

There are two important caveats to this statement. The first is that, while the Oracle database is fully able to address the Year 2000 issue, *an Oracle-based application is not automatically able to do so.* A Year 2000 compliant application must be designed and written such that it always passes the correct date values to the database for storage. An application that passes two-digit year values to the database may not be Year 2000 compliant because Oracle is forced to "guess" which century value to store. Oracle has two different ways to guess the century, and it may use either method (or

both) depending on how the application is written. It either assumes that all two-digit year values are in the current century, or it makes a modified guess using a one hundred year "window" centered on the century boundary nearest to the current date. In either case, an application using two-digit year values may be vulnerable to errors resulting from incorrect guesses made by the database.

The second caveat is that the application may store date-related information in columns that do not use the internal date format. An example might be a column which stores the fiscal year associated with a financial transaction. Such a column might be designed to store only the last one or two digits of the fiscal year, which would not meet Year 2000 requirements.

Because of these two caveats, we have concerns about the NMS system's ability to handle the Year 2000 problem. From a database perspective, there are three areas of potential Year 2000 risk in NMS:

- the database design (table structure) contains some columns that store date information in character and numeric columns, some of which store only two characters/digits
- some PL/SQL programs use non-compliant date conversions and/or arithmetic
- SQL statements in Visual Basic and PL/SQL programs use non-compliant date conversions and/or arithmetic

vi. Segregation of database tables

The statement of work for this effort included the following task description:

> The contractor shall perform an analysis of the lowest management risk and cost to de-link or segregate BUD, OPS and A&A database tables from AWACS database tables in order to assess options for implementing A&A in the field, suspending AWACS operations or pursuing a COTS solution to meet financial management requirements. Perform a comparable analysis of lowest management risk and cost to further integrate or link BUD, OPS, A&A and AWACS database tables.

We studied the integration between the various subsystems in an effort to make the assessment required by this task. We found that, in general, there is little integration or linkage between the tables in the four subsystems. Because the four builds were initially developed independently, their database tables are fairly segregated already, although some minor integration occurred when the four schemas were consolidated into one. The OPS and BUD modules have the highest degree of integration because they were developed in close cooperation.

Despite an overall lack of effective integration in the system, there are some important linkages between AWACS from other modules, specifically A&A and BUD. The primary linkage between AWACS and BUD is through Funds Management (FM), and the primary linkage between AWACS and A&A is through Accounts Payable (AP). As they are designed, neither A&A nor BUD would

operate effectively without access to their corresponding AWACS functions (AP and FM). So, any replacement of AWACS would need some sort of interface for providing this information to A&A and BUD. In the absence of such interfaces, A&A and BUD must be redesigned to remove the functions that rely on a link to accounting data from AWACS.

In our review, we discovered a document called "NMS Common Tables Handbook – Release 1.0 (Draft)". This document described an effort in late 1995 and early 1996 to define the "common" tables in the NMS database. In a fully integrated database design, common tables would be those tables relatively static, global tables that are referenced throughout the various modules of an application system. Lookup tables are a primary example of what is normally considered "common". We believe that any effort aimed at further integration of the NMS database tables should build upon the information in this "Handbook".

d. Recommendations

Our recommendations in the database area are outlined below.

a. If USAID opts to continue developing the NMS system, certain measures are needed to help improve the chances for success of the development effort. These measures should include the following:

   - create an integrated, enterprise-wide database design for NMS
   - move as much application/business logic as possible into server-side PL/SQL
   - force all builds to use the custom "batching" solution developed to fix replication
   - force all builds to use the same connectivity tool – either ODBC or Oracle Objects
   - adopt a more structured software development methodology
   - institute and enforce coding standards and code reviews for VB, SQL and PL/SQL
   - consider rewriting NMS in a more functional fourth generation language (4GL)
   - consider replacing/retraining the NMS development staff to increase their skill level

b. If USAID opts to implement COTS software to replace all or part of NMS, the existing network infrastructure should weigh heavily in the definition and selection of alternatives. Particularly, the agency should consider a centralized solution using mainframe or web-based technology instead of a two-tier client/server solution. We recommend this approach because these technologies tend to operate more effectively in the agency's current network environment. We also realize that reverting to a mainframe solution may be perceived as a "backward" step technologically and may encounter significant resistance.

6. Visual Basic Code Review

a. Overview

USAID chose to implement NMS in the Visual Basic language because it provides support for a client server architecture and substantially improves the user interface at the PC workstation. The IBM Team obtained the December, 1997 version of the NMS Visual Basic source code and used this version as the basis of our analysis. We reviewed all four NMS applications for this report, plus the additional "NMS Module" which provides logon and security facilities to the four applications.

b. Methodology

The IBM Team used a business tool called CodeReview by NuMega to help evaluate the overall NMS system in terms of software quality, reliability, maintainability, and performance. CodeReview provides a rigorous examination of source code for hundreds of potential problems in the applications and provides the following functionality:

- Recommended solutions to problem areas
- Coding standards enforcement
- Statistical quality control metrics
- Links to Visual Basic help and Microsoft Internet Knowledge Base to give exact problem descriptions
- Utilization of an external BugBase to store its rules
- Flexibility to change rules, as needed, to test for various conditions
- Identification of five categories of errors:
  - –Errors in the logic of the program
  - –Errors that can affect the performance of the system
  - –Errors resulting from lack of adherence to programming standards
  - –Errors that affect usability
  - –Errors that can affect the portability of the program to other platforms

After we executed the CodeReview software tool on the Visual Basic Code, we produced a detailed listing of errors. We determined that there are a number of errors that point to serious problems and concerns with the NMS Visual Basic code.

c. Findings

The findings of our analysis are summarized in Table 5-6. This table presents a description of identified errors in all of NMS and the percentage of NMS code subject to these errors. The number of occurrences for each of the five types of errors (logic errors, performance-related errors, errors in the use of standards, usability and portability errors) is shown. The column entitled "Identified Errors" presents the total of identified errors, and the column "Usable Lines of Code" shows the number of lines where we were not able to identify specific errors. (It is important to note that these "usable lines of code" may still have other unidentified errors and may not be Year 2000 compliant.)

NMS Summary							
	Logic	Performance	Standard	Usability	Portability	Identified Errors	Usable Lines of Code
Total	25,205	65,147	46,204	12,250	3,805	152,611	545,813
Percentage	4.6%	11.9%	8.5%	2.2%	0.7%	28.0%	72.0%

Table 5-6: NMS Summary

Table 5-6 illustrates the following key findings:

- There are significant programming logic errors resulting from poor coding practices. Often the code will not operate as expected, resulting in errors or program termination.
- There are numerous performance issues. The code is not operating as fast as it can, and the application size is larger than it needs to be.
- There is poor compliance with standards. This means that the code will be hard to maintain and debug, and is subject to many errors.
- There are usability issues that will impact the productivity of USAID's end users. Users are finding that the applications are slow and difficult to understand and use.
- The Visual Basic code as written is not portable and will require modifications to operate on other platforms.

Appendix G, Tables G-1 through G-5 provide specific details on each of the four NMS applications and their major functional parts, plus the supporting NMS logon and security facilities module.

d. Recommendations

This section of the report provides recommendations to help address the poor coding practices identified during the review of the NMS Visual Basic source code described above.

a. **Create a Software Development Design & Coding Standards Manual:** This manual should set the rules and guidelines for developers to follow while they design, document, and code software applications for USAID. Once developed and written, USAID technical management must ensure that the guidelines are followed. Adherence to the standards will help ensure that all USAID programs and databases behave consistently and reduce training needs, technical support, and documentation to implement updates, modifications or additions to NMS. Applications will become easier to use, fewer errors will be made, and developer productivity will be improved.

b. **Standard headers:** Descriptive header sections should be used at the beginning of each module file and all subroutines of any size to help make the code self-documenting. At present, some NMS source files contain headers and/or are well commented, while others contain neither headers nor comments.

c. **Code commenting:** All source code should contain comments in order to make the code more readable and understandable both for the current programming team and the future programmers. A primary goal of commenting source code, along with proper choice of names for variables, constants, and subroutines, is to make the source code largely self-documenting. The requirements to comment source code properly are based on experiences from many software projects. The key benefits for commenting are as follows:

   - Because USAID must assume some level of analyst and programming staff turnover over the duration of a project, commenting provides good documentation for replacement staff
   - It improves the maintainability of the system. The cost of maintaining a system far exceeds the cost of building it
   - It allows programmers to document their methodologies and thoughts over time

   Failure to establish, follow, and enforce professional coding standards results in a software system which is difficult or impossible to maintain.

d. **Commented code that should have been deleted:** The NMS Visual Basic source code contains a large amount of code that should have been deleted instead of using comments to exclude them from being compiled. When unneeded code is left in the document it inflates the comment ratio while decreasing, rather than increasing, the readability and understandability.

e. **Code that performs the same operation twice:** The IBM Team found many instances where two different modules duplicate the same operation. Unneeded modules should be deleted so that less space is consumed.

f. **Naming conventions:** Proper naming conventions need to be followed. Names should be short to save space in the source code editing windows and in the printed source code; however, they must be readable and understandable. It is apparent from the review of the NMS source code that no standard was established or followed. Naming rules need to be developed, followed, and enforced to have consistency among same or similar modules.

g. **Files without *Option Explicit* statements**: One rule for Visual Basic programming which is extremely critical for software robustness and reliability is that the Option Explicit statement must be at the head of each source code module (including form files). For ease in verification, these statements should appear before the Option Explicit statement and the module descriptive header. Without it, if a programmer misspells a variable or constant in a code statement, Visual Basic assumes the programmer intended to create a new variable and will do so. This can create very hard-to-find software bugs. Also, the new variables data type will be the default data type if no type-specification character was appended to its name.

7. Year 2000

The OMB estimates that correcting Year 2000 problems may cost Federal Agencies more than $3.9 billion over the next two years. It is a very serious problem at USAID.

The Year 2000 problem typically arises from the common practice of describing the year in two digit format, e.g., "98" for "1998", where the "19" in front is assumed. When application programmers continue to use this abbreviation to refer to years including and after 2000, a date such as "01" would be treated as "1901", rather than the "2001" intended. Thus date-related calculations e.g., loan expiration dates, and date-related decisions e.g., determining if a particular Federal Regulation applies, may result in wrong answers, and perhaps even application or system failures, even though the database itself has defined the year as a full four digits. Errors may also occur in the transfer of data between systems.

a. Overview

With the start of Fiscal Year 2000 just 20 months away, Year 2000 readiness is ***the critical constraint*** in planning for USAID IT systems. The deadline is not movable, and the OMB estimates (and other Year 2000 experience shows) that a minimum of six months of testing and another six months of implementation and cut over will be needed even after systems renovation or replacement is completed. Hence, there is little flexibility for USAID to change the recently revised OMB targets, as shown below in Figure 5-4:

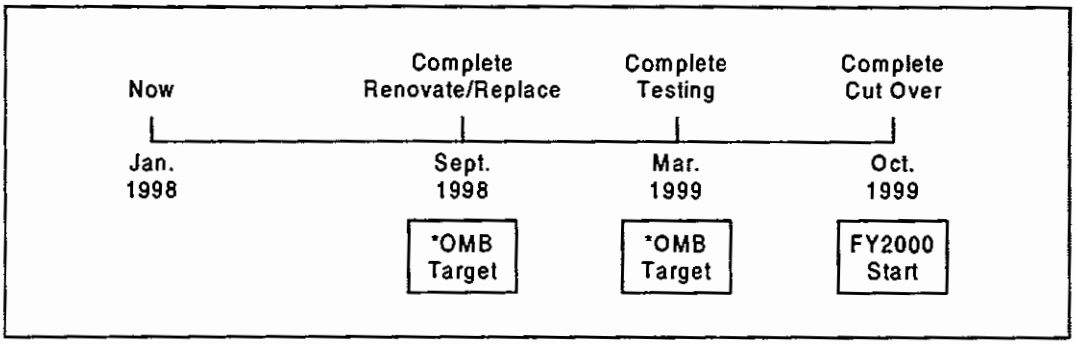

Figure 5-4: Year 2000 Target Dates

Year 2000 renovation of all of NMS was estimated by Mitretek (November, 1997) to cost USAID approximately $8.5 million, requiring 85 person/years. In addition, we estimate that the remaining Year 2000 renovation work on legacy systems that will not be replaced by NMS will represent an additional 14 person/years of effort and $1.4 million. (Note: This estimate for application code renovation does not include approximately $17,000,000 estimated by USAID for upgrading the hardware/software base to Year 2000-compliant versions, since these changes were planned regardless of Year 2000 issues – though they are now mandatory for USAID to achieve Year 2000 compliance. Also, these estimates do not include the recent (January 1998) requirement for separate IV&V testing, the costs of which have yet to be assessed).

Although our reassessment in cooperation with USAID's Year 2000 team has reduced the application renovation estimates to about $7 million and 70 person/years, we believe it is a very high risk that USAID can find the resource skills or obtain the necessary additional funding to carry out such an effort in time to be ready for FY 2000 start. See Appendix H-1 for USAID resource and cost estimates for Year 2000 renovation. Further, year 2000 renovation work on NMS should take place ***after*** the Visual Basic and PL/SQL code for the currently missing functions is completed and the code quality improved to an acceptable level. This will increase the total costs and resources required and make it even less likely that NMS can be made Year 2000 ready in time. This is one of the controlling factors in our recommendation that USAID move to a COTS solution that meets USAID's requirements and is Year 2000 ready.

USAID should continue the definition of a *minimum subset* of Washington and Mission requirements that was begun in cooperation with our team during this study period. This definition should be completed no later than March 1st, 1998. The subset of functions should be those that are *mission critical* and meet *absolute minimum requirements* for USAID's operation through the year 2000 transition period. This work should guide the final selection of a COTS solution and will set the priorities for implementation and roll-out. The renovation of MACS, estimated by USAID to cost $750,000 should continue as an "insurance" plan to reduce risk.

Further, USAID urgently needs to *raise the level of executive attention* to the Year 2000 problem, including establishing an adequately staffed full time *Year 2000 Project Office* to manage all Year 2000 USAID and contractor efforts through the year 2000 period. The seriousness of the problem to

USAID must be thoroughly understood and *decisions made quickly*, with *top priority* given to meeting the Year 2000 deadline on time. Capabilities for *contract management, project management* and *configuration management* (managing software versions and interoperability) will need significant strengthening as well.

b. Methodology

The statement of work asked IBM to assess NMS and possible alternatives, with Year 2000 readiness as one of the NMS issues that needed to be addressed. We were asked to review and assess the Year 2000 readiness analyses previously conducted by USAID on NMS and FACS, including the November 1997 Mitretek study, and potentially identify modifications and associated impacts including an assessment of MACS Year 2000 costs. Costs, benefits and risks in meeting Year 2000 requirements were to be included in the overall alternatives analysis. We also considered other Year 2000 areas, such as non-IRM facilities and infrastructure ("embedded chips") and trading partner requirements, (e.g., - Treasury).

We used interviews and various technical documents, including the *Year 2000 Compliance Assessment and Recommended Strategy* document and appendices (Mitretek Systems, November, 1997), as well as the *Audit of USAID's Efforts to resolve the Year 2000 Problem* (AIG/A Audit Report No. A-000-97-005-P, July 11, 1997), and the OMB Report of Dec. 16, 1997. Then, with the considerable help of George Moore, Sharlene Febrey and John Bridendolph (IRM's Year 2000 Project Managers), we updated the lines of code estimates and legacy systems renovation plan status and cost estimates. We then used the evaluations made by other members of our team who, with USAID managers and users, studied each component of NMS with respect to the relative importance of each function, requirements fulfilled and gaps still remaining.

We also used Year 2000 experience already gained by others in government and industry, and a detailed checklist/question list we previously developed for Federal Government Agencies and updated to reflect specific USAID requirements. This checklist/questionnaire is found in Appendix H-2. This allowed a preliminary definition of the *"Minimum Mission-Critical Subset"* of functions absolutely required by USAID during the Year 2000 transition and the accompanying resource and cost estimates, as summarized above in the Overview section

We reviewed standards of Year 2000 compliance and the expansion to these standards proposed by George Moore to meet USAID's specific requirements. Accepted definitions in the industry include:

a. ***Year 2000 compliance – definition[5]:*** Year 2000 compliance shall mean that neither performance nor functionality is affected by date/time-related data prior to, during and after the year 2000. In particular:

- No value for current date will cause any interruption in operation until at least the year 2050 (refers to the possible use of "windowing" techniques)
- Date/time-based functionality must behave consistently for dates prior to, during and after year 2000 until at least the year 2050
- In all interfaces and data storage, the century in any date must be specified either explicitly or by unambiguous algorithms or interfacing rules
- Year 2000 must be recognized as a leap year

b. ***Year 2000 event horizon – definition:*** The time when a given system or function will begin to fail due to processing dates beyond the year 2000, – e.g., a business application may well process future dates, such as loan expirations, leading to initial failures well in advance of January 1, 2000.

[5] Source: British Standards Institution Committee, modified by Mitretek and by George Moore for the USAID environment. This is consistent with the more detailed definition developed specifically for USAID by George Moore and the Year 2000 Project Team

Finally, we reviewed the events shown in Table 5-7 summarizing the recent background of Year 2000 considerations by the Federal Government and USAID:

April, 1996	Inquiry sent to USAID and other agencies by House Subcommittee on Government, Management and Technology: Agency's plans to manage and resolve Year 2000 problem ? The USAID response: "a system migration to newer technology [and the use of Oracle] has addressed the problem"
September, 1996	Subcommittee rated USAID as an "A" for its preparedness [in retrospect USAID had significant problems]
January, 1997	USAID established a Year 2000 Program Office and appointed a Year 2000 Program Manager
February, 1997	GAO added the Year 2000 problem to the *high risk series* – vulnerabilities to widespread operational and financial problems. GAO issued: "Year 2000 Computing Crisis: An Assessment Guide" – framework and checklist. USAID contracts with Mitretek to assist with Year 2000 planning
July, 1997	AIG/A Audit: "USAID may experience system problems in 2000 which could materially impact critical agency functions. USAID must act aggressively to achieve year 2000 compliance before January 1, 2000". [Note that this report, drafted in April, was based on the February guidance, later modified and strengthened]
September, 1997	OMB placed USAID on its list of agencies "in which there is insufficient evidence of adequate progress" (third of three OMB assessment levels)
October, 1997	Mitretek's Year 2000 Compliance Assessment; Both NMS and legacy systems exposed; $8,500,000 cost estimate to fix, plus additional costs for areas not assessed (e.g., - Missions)
December, 1997	House Subcommittee on Government, Management and Technology graded USAID's Year 2000 program as "D-"
December, 1997	OMB accelerated timetables for Year 2000 fixes: – Repairs or replacement to be finished: September, 1998 (was December, 1998) – All testing to be completed: March, 1999 (was November, 1999) – OMB said it would use the budget for FY 1999 to redirect money in agency IT accounts toward fixing the Year 2000 problem and away from other IT projects if an agency failed to make sufficient progress on its own

Table 5-7: Federal Government and USAID Year 2000 Considerations – 1996-1997

c. Findings

While considerable recent progress has been made by the USAID Year 2000 Team on assessments and planning, more than 90% of the work remains to be done. The availability of skilled resources to accomplish this work in time will likely be an even more important constraint than the availability of funding, in many instances. These resource requirements not only include skilled programmers, but those with particular skills in requirements definition, procurement, contract and project management.

Tradeoffs of spending money (e.g., for tools) that can reduce resource requirements and save time should be seriously considered. The cost consequences of data / report errors and system breakdowns will probably be far greater than tool costs, for example. Our findings are:

i. USAID management does not yet appear to be fully aware of how serious the Year 2000 problem really is nor how difficult it will be to fix it in time. **The Year 2000 problem is *the* critical path for USAID** over the next two years, and will be costly both in resources and dollars.

ii. Both NMS and legacy systems are exposed to significant Year 2000 problems.

iii. Although NMS uses 4-digit dates in its files, there are very many instances where NMS programs do not handle dates, date-related calculations and date-related decisions correctly. No standard way was developed or used to handle all date/time manipulation.

iv. USAID will have difficulty carrying on its mission and meeting its Federal reporting obligations when legacy and new applications start failing or producing wrong information due to the Year 2000 problem. For example, a system shutdown in the final days of a Fiscal Year could result in an anti-deficiency act violation for USAID.

v. OPS is already experiencing problems – e.g., a date entered as 2001 becomes 1901 or 0001. As such errors occur in calculations, resulting wrong answers may have serious consequences, such as deciding that a particular date span does not require application of a specific Federal regulation, when in fact it does. Other examples are reporting errors that do *not* stop the system resulting in erroneous data being sent to trading partners such as Treasury or FPDS (Federal Procurement Data System) without first being caught, or failing to flag prompt payments required within 30 days.

vi. Year 2000 failures will become much more frequent during the next two years, well before 2000.

vii. Applications with "event horizons" earlier than 1/1/2000 need to identified and prioritized for renovation.

viii. IBM S/390, Wang, PC platforms will need upgrades to be Year 2000-compliant.

ix. The IBM RS/6000 is compliant now, though applications running on them may not be.

x. Banyan VINES will become compliant with Version 8.5, scheduled for June 1998, if USAID decides to upgrade.

xi. For NMS systems that will be retained either partially or in full, USAID will need to upgrade from Visual Basic version 3 to the Year 2000-compliant base of VB version 5.

xii. Some legacy systems will need to be Year 2000-renovated, since legacy systems will not be completely replaced by NMS.

xiii. Some of these legacy systems can be rewritten in other languages and/or for other platforms as a cost and resource-effective alternative to renovating the current

version. Others may best be handled with PC application packages or even with spread sheets or manually.

xiv. While a decision has been made to renovate MACS, non-IRM mission systems such as Voucher Tracking and Electronic Certification have not yet been considered, nor have other mission-critical non-IRM mission systems been identified and a plan developed for their Year 2000 renovation or replacement.

xv. Since FACS today is used primarily for historical data over two years old and does not meet current requirements such as JFMIP and loan processing, Year 2000 renovation of FACS is probably not cost-effective.

xvi. Non-IRM systems (so-called "embedded chip" systems) in USAID domestic and mission locations are just beginning to be assessed for Year 2000-compliance, and there is as yet no sizing as to the exposure and costs that may be incurred.

xvii. Although the submission from USAID to OMB in November, 1997 described the significance of IT systems sponsored by USAID and developed for and provided to host country governments as a tool for achieving development objectives, no plan has been developed to address their Year 2000 needs, such as with awareness and contacts. The scope should be expanded to include "embedded chip" systems that may be date sensitive in manufacturing and other areas sponsored by USAID missions.

xviii. Both contract management of participating vendors and project management techniques and practices need to be strengthened significantly to ensure that requirements, project schedules and performance milestones can be clearly understood in detail and managed effectively. Current configuration management is also very weak, as exemplified by the many source modules that do not match production code or are missing completely.

xix. USAID needs a detailed tactical plan as the basis for all Year 2000 renovation, testing and implementation. Thorough requirements planning involving end users is a prerequisite for this plan.

xx. A strategic architectural decision is required, including the potential future role of mainframe (Beltsville, Maryland) systems, and the possible use of Oracle on the mainframe. Such mainframe use would be an important component in the detailed Year 2000 plan.

xxi. There is no detailed emergency contingency plan, despite the fact that there can be no guarantee that 100% of the planned Year 2000 renovation can be successfully completed before errors and application or system stoppages occur.

d. Recommendations

In order for USAID to address Year 2000 compliance successfully and avoid serious consequences from unexpected data and reporting errors, and application and system stoppages, current Year 2000 efforts should be significantly increased, starting immediately. Only 20 months remain before FY 2000 start, and just seven months before the OMB target of renovation/replacement completion is reached. A tremendous amount of work needs to be compressed into this period.

i. USAID should decide its *long-range IT architectural direction*, and the place of NMS, COTS and Legacy systems within it. Year 2000 compliance of each of these architectural elements (host, servers, PCs) should be considered in a two year tactical and contingency context. Specific Year 2000 renovation decisions should be consistent with and contribute to the long-range direction. Temporary use of PC-based financial management and reporting programs (e.g., Quicken) and even spread sheet or manual processing should not be ruled out where resource/cost/schedule factors eliminate a short-run IT solution.

ii. A *Year 2000 contractor* should be selected who can provide skilled, Year 2000 experienced resources nearly immediately. USAID's own resources are nowhere near sufficient or at the right skill level to meet Year 2000 efforts and schedule dates.

- Both *contract management* and *project management* practices should be strengthened, to a CMM level 2 if possible, so that detailed requirements, project schedules, milestones and tracking are defined and used to ensure effective contractor and subcontractor management, and to have the best chance for successfully meeting the deadlines of the Year 2000 project. *Configuration management* and other *software development, testing and management practices* should be strengthened through the use of additional tools and professional hires or contractors

- There are now many Year 2000 tools available that can help in reducing the time and expense of application renovation and testing. The contractor selected should have the right tools for USAID's architecture ready to use. Where extra tools costs are involved, decisions on their use should be made in the context of the severe resource and schedule constraints present. Where it is practical to spend money and save resources and time, this should be a top consideration

iii. If COTS vendor(s) are selected, USAID should request written assurance that the *COTS solutions are already fully Year 2000-compliant* to the detailed standards defined by USAID. As soon as possible, a pilot application test should be run using USAID sample data to test Year 2000-readiness. A clear detailed understanding should be obtained or created as to how the COTS programs can interact with and exchange data with NMS and legacy systems undergoing Year 2000 renovation. Integrated testing programs and implementation cut-over plans should be created for combined COTS/NMS/Legacy testing and installation.

iv. The current Year 2000 project team should be expanded to a fully staffed Year 2000 project office whose responsibility and authority should include:

- Management of all Year 2000 renovation or replacement activity at USAID with a worldwide scope
- Definition of specific requirements for contract management and project control for Year 2000 vendors who contract with USAID
- Liaison with any selected COTS vendors to ensure their Year 2000 compliance and plan for data bridges and interchanges with remaining NMS and legacy systems as their renovation goes forward
- Year 2000 renovation of Non-IRM mission-critical systems, such as Voucher Tracking and Electronic Certification, and others to be determined
- Development of a plan to provide Year 2000 planning advice to foreign governments who have been the beneficiaries of USAID-sponsored IT systems or other systems exposed to Year 2000 embedded chip problems
- Adequate emphasis on planning for local and mission "embedded chip" non-IRM systems and building infrastructure

v. Work to define in detail the components of *USAID's minimum mission-critical subset of requirements* should be completed as soon as possible, no later than March 1st, 1998, with end-user participation. Only then can a final decision be made on how much Year 2000 renovation is needed and what alternatives might be employed.

vi. *Testing* has been shown to be 40% - 70% of the total cost and resources expended in Year 2000 renovation. Detailed test planning should be started in parallel with renovation and replacement efforts. Particular attention should be given to integrated testing of old and new components, and any mixed NMS/Legacy/COTS solutions. USAID should use industry standard Year 2000 practices and procedures. For example, USAID should find and fix all date/time-related code in one pass. (Fixing a few problems, testing, then fixing a few more, testing, etc. will increase, not decrease the cost and time to compliance.) USAID should use standard date/time processing functions in a single package, callable by all applications, rather than having to test many diverse functions written to different standards.

vii. USAID should create a *detailed implementation cut over plan.* Again, this can be done in parallel with renovation and test planning. Data clean up and migration, bridges and interchanges must be an important part of this plan. The use of parallel operation, or in some cases "weekend cut-over" should be decided. For more details and questions to be addressed in renovation, testing and implementation planning, see *Appendix H-2: USAID Year 2000 Questions/Checklist.*

viii. Since even the best-executed plan is not likely to "bat 1.000," an *emergency contingency plan* should be put in place. This plan will need to address:

- Errors in reports or data that "sneak through." The plan will need to address manual correction of the data and program fixes to prevent future errors. Thorough manual review of output reports for the first weeks or months to catch such errors should be part of the plan, both in Washington and, where applicable, the missions.
- Application abends and system crashes. Determination should be made as to whether a "SWAT" team or similar approach makes sense. How best to deal with the broad geographical spread of the missions under possible emergency conditions will be an important consideration.
- Embedded chip-related infrastructure failures. Often the help of local manufacturers or service people will be required. In other cases, U.S.-based manufacturers will need to be contacted.

IBM

VI

Process and Organization Issues

This section of the report summarizes process and organization issues that have seriously impeded system development and performance to date. These issues must be addressed to ensure the success of future USAID development efforts and system operations. This section also includes cost estimates for addressing these problems through process reengineering and organizational change management initiatives.

A. Organization Issues and Implications

Table 6-1 provides a summary of organization issues and the implications resulting from the presence of these issues at USAID.

Issue	Implications
•Inadequate NMS project management structure, staffing, skills –"One-man" project management office –Inadequate skills, knowledge, abilities in system development and acquisition management	•Lack of control and accountability •High risk of cost, schedule, and performance breakdowns
•Unclear/fragmented roles, responsibilities, and accountability across functions	•Lack of control and accountability •High risk of cost, schedule, and performance breakdowns
•Absence of linkages between NMS and USAID strategic plans –NMS is a critical infrastructure and enabler of agency missions, goals, and objectives –ITMRA requires that IT investments be justified by contribution to mission performance, as defined in GPRA strategic plans; also requires resolution of mission-critical performance gaps prior to investment	•Reduced opportunity for leveraging IT-related mission performance benefits •Non-compliance with legislative and regulatory requirements •High risk of losing funding support

Issue	Implications
•Lack of communications and change management required to support technology enabled, enterprise-wide performance improvement	•Increased vulnerability to: –Organizational resistance –User rejection –Cost overrun –Schedule slippage –Implementation failure

Table 6-1: Organization Issues and Implications

B. Process Issues and Implications

Table 6-2 provides a summary of process issues and the implications associated with these issues at USAID.

Issue	Implications
•Process improvements have primarily automated functions, rather than reengineered processes based on performance metrics and best practices, as required by "Raines' Rules."	•Missed opportunities to optimize overall process performance •Non-compliance with legislative and regulatory requirements •High risk of losing funding support
•Inconsistent levels of detail and functionality across NMS modules (e.g., inadequate functionality to provide financial control across NMS modules). Examples: –Funds control is performed in multiple systems – creates vulnerability to Anti-Deficiency Act violations –Invoices can be paid after funds are de-obligated –Prompt payment discounts are not being negotiated and taken.	•Lack of control and accountability •High risk of cost, schedule, and performance breakdowns •Anti-Deficiency Act violations carry severe personal penalties for USAID managers •Increased vulnerability to fraud, waste and abuse
•Inadequate software development processes. Major deficiencies found in: –Requirements development –Software Configuration Management –Life cycle application development	•Lack of control and accountability •High risk of cost, schedule, and performance breakdowns •NMS products do not meet customer/business needs
•NMS has been used only as "operational" tool, rather than decision support tool, as originally "sold" and consistent with how NMS should be justified under today's IT investment rules (A-11, ITMRA, OMB Capital Programming Guide)	•Reduced opportunity for leveraging IT-related mission performance benefits •Non-compliance with legislative and regulatory requirements

Table 6-2: Process Issues and Implications

C. Reengineering and Change Management Cost Considerations

The issues presented in Tables 6-1 and 6-2 are typical of problems that the IBM Team uncovered throughout the USAID organization, business processes, and system development and acquisition environment. While some of these problems may have been recognized before this assessment, they were generally misunderstood as system or design flaws within NMS, rather than as problems in underlying processes and the USAID organization. It will be impossible for USAID to optimize the performance of NMS or any successor system by simply applying new technology solutions within the existing environment. Regardless of the investment alternative chosen, USAID will require a comprehensive "transformation" process that integrates process, technology, and organizational change management initiatives, as shown in Figure 6-1. The cost of these initiatives will be similar across the investment alternatives considered.

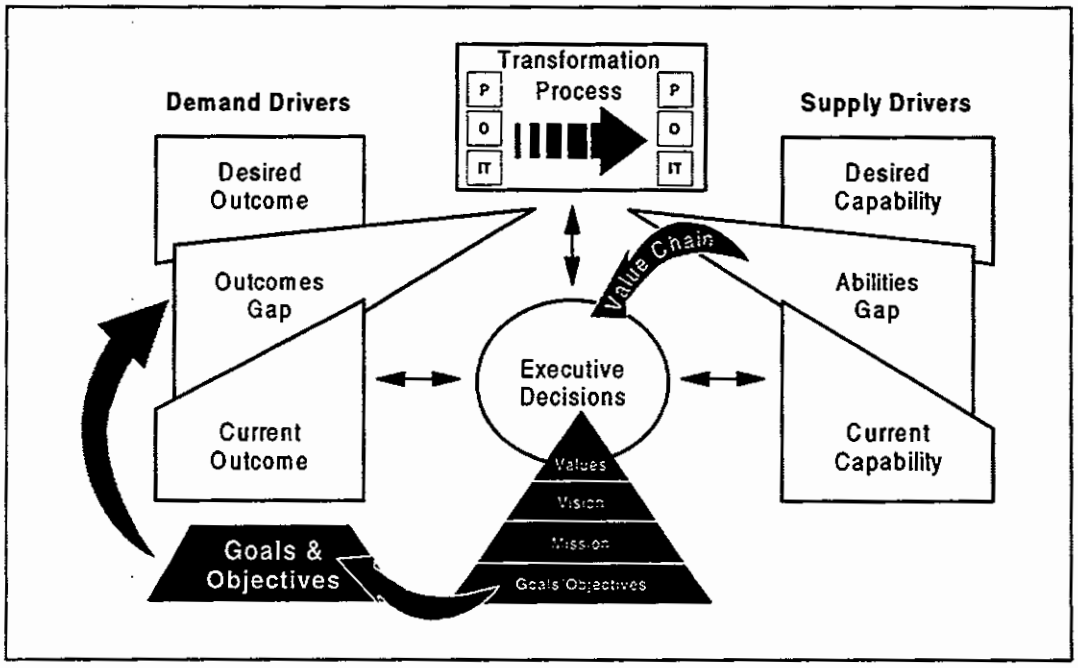

Figure 6-1: Transformation Process

1. Reengineering Costs

IBM's reengineering estimate assumes that the following processes and sub-processes are to be addressed:

Process	Sub-Processes
Budget	Distribution of Operating Budget Budget Formulation
Operations	Operations
AWACS	Accounts Receivable Accounts Payable General Ledger Funds Management Loans Management
A&A	Procurement Process General Procurement Process Small Purchases

IBM's estimate further assumes the use of a comprehensive methodology, such as the five-step approach described below.

Step 1: Initial Planning Activities. Planning tasks are needed to identify project resources and develop plans, schedules, milestones, and a baseline for monitoring progress. Resource and timing requirements are estimated at approximately 800 to 1,400 professional hours over 4 to 7 weeks of work. The specific tasks include:

- Develop high-level management framework, including
  - –Enterprise-wide IT governance model, reporting structure, roles and responsibilities, and decision making process
  - –High level strategy, architectural blueprint, and process framework
- Develop detailed process definitions, including
  - –Process maps and management requirements
  - –Baseline Process Measurements
  - –Template for Service Level Agreements

Step 2: Improvement Planning. Additional planning will be needed to organize the team to perform the work, and educate them about the project's objectives and methodology. A team of about ten professionals is envisioned. Resource and timing requirements are estimated at 400 professional hours over one week. The objectives should be to educate team members on strengths and weaknesses in USAID processes and organization, and ensure that they understand the inter-relationships among processes, technology, and organization.

Step 3. Identify Critical Success Factors/Performance Requirements. The next task will be to establish a common vision of process, organization, and information technology, and to identify critical success factors and performance requirements for business processes and enabling information technology (i.e., NMS) for each functional area. A few examples of success factors are shown in Table 6-3.

Business Process Critical Success Factors	IT Critical Success Factors
Customer Service	Service
Cost	Productivity
Productivity	Reliability
Growth	Integrity
Future Requirements	Adaptability
Legislated Requirements	Integration Capability

Table 6-3: Examples of NMS Success Factors

The objectives of this task are to ensure that decisions to integrate processes and sub-processes are driven by customer and business requirements, rather than merely technical considerations, and consistency is achieved in performance and use of best practices across subsystems and functional areas. IBM estimates timing and resource requirements for this task at roughly 6,400 hours of professional effort over some 16 weeks.

Step 4: Analysis and Design. In depth analysis will be needed to identify root causes of process, organization, and system problems, and separate symptoms from true underlying causes. This analysis will prepare the team to redesign process for maximum performance improvement. The team should consider entirely new, "outside the box" solutions to meet performance objectives, in addition to limitations imposed by real world constraints. Gaps should be identified between the "as is" and the "to be" vision, and plans to bridge the gaps should be developed. IBM estimates approximately 6,400 hours of professional labor over some 16 week will be required to accomplish this task. The deliverable work products should include blue prints documenting all process changes and benefits to be realized and an action plan for implementation.

Step 5: Implementation. During the implementation phase, progress should be monitored relative to established blueprints and baselines. Tailoring of solutions must be cost justified and documented. IBM estimates approximately 3,000 hours over 15 weeks to complete implementation.

2. Organizational Change Management Costs

Change management is a systematic way of orchestrating and communicating the goals, rationale, and implications of major organizational change to the employees, customers, and stakeholders who are most directly affected. It is also a way to mitigate disruption, anxiety, and uncertainty often associated with change and the unknown.

During IBM's assessment of NMS, several change management issues emerged, including the following:

- Functions tend to be "stovepiped," so that managers and employees lack visibility across entire work processes
- Numerous job roles and responsibilities (e.g., leadership roles in NMS development) are not clearly defined, resulting in confusion, duplication, fragmentation, and gaps many areas
- Communication gaps exist throughout the organization – up and down the chain-of-command, and within and across business processes
- A perception exists that NMS is a way for Washington to track field activities, rather than a helpful management tool that can be used effectively to run the business.

These kinds of issues can best be addressed through change management initiatives addressing definition of roles and responsibilities, communications, skill development and training, and rewards and recognition.

Change management should precede, parallel and follow USAID's process reengineering and system development initiatives – no matter which alternatives are selected for implementation. Change management should incorporate and/or address the following elements and imperatives for successful change:

- Strong executive level sponsorship
- Understanding of business imperatives and rationale for change
- High sense of urgency with constituencies at all level of the organizations
- Clear, tangible and specific vision
- Integrated, holistic, staged plan with measurable goals
- An effective, two-way communication program
- Availability of appropriate resources
- A framework for thinking about the structure and process of change

Change Management targets barriers to strategic, process, information technology and organization transformation, and builds capability and commitment to new ways of operating. It aligns people, process and information technology during transition from the current to the desired state. Change management involves the three stages described below.

Stage 1: Envisioning. Envisioning is a sponsor led process which continuously adds increasing levels of clarity and detail to the desired future state. It includes forming and communicating a change vision so that it is understood and seen as attainable and necessary by people within the organization. Business imperatives must be identified and carried out so that they become part of the fabric of the organization. Finally, sponsors must create a sufficient discomfort with the ways

things are done in order to overcome barriers to change, including building a sense of urgency to reach the future desired state. Critical success factors for envisioning are:

- Involving all constituencies
- Opening channels for effective two-way communication
- Identifying and leveraging appropriate consequences
- Providing adequate time and resources to establish and communicate the vision
- Engaging sponsors as leaders rather than managers, and
- Engaging employees as team members rather than opponents.

Stage 2: Formulating. Formulating continuously identifies, and proactively manages the risks to successfully achieving the desired future state. It includes identifying and analyzing the potential risks to achieving the desired future state. The organization must develop detailed strategies to minimize the depth and duration of the performance disruption brought about by introducing change. Finally, it means identifying and allocating resources and defining individual responsibilities to successfully achieve the desired state. Critical success factors for formulating are:

- Utilizing a common understanding and framework for the change process
- Accessing sufficiently robust change management tools and techniques
- Accessing adequate change management skills, and
- Continually assessing hard data.

Stage 3: Implementing. Implementing involves executing the detailed strategies of the integrated change management plan. It involves identifying and opening communication channels to successfully execute the integrated change management plan. Finally, successful implementation involves monitoring progress by continuously gathering the data necessary for formulating and implementing the integrated change management plan. Critical implementation success factors include:

- Allowing sufficient time for the change
- Allocating appropriate quantities of quality resources, and
- Providing access to key individuals, constituencies and data.

IBM recommends that USAID use a straightforward, leadership-driven approach to change management, including the following steps:

- Assess the current environment for readiness for change
- Analyze the key issues that identified in the assessment process
- Create a comprehensive change management plan to address identified issues
- Develop a communications strategy and plan

- Implement the change management and communications plans
- Evaluate the impact of the change management plan actions on the success of the project

We also recommend using a team approach to change management. Change management must come from within, it is not something that an outsider can "do" to an organization. The team should be comprised of senior level management within USAID, facilitated by skilled change management professionals. The change management process should run throughout the course of the entire project, or about two years, at a total cost in the neighborhood of $1.5 million.

IBM

VII

Legacy Systems

A. Overview

Prior to the implementation of NMS, USAID used a variety of non-integrated systems to accomplish the functions of the four main applications of NMS. The legacy systems that comprised the core financial management system and their primary functionality are presented in Table 7-1.

System	Primary Functionality
FACS	**Financial Accounting and Control System**: This mainframe-based system was USAID's primary accounting system for Washington operations. The main function of FACS was funds control. FACS interfaced with the Cash Journal and the Country Financial Reporting System.
MACS	**Mission Accounting and Control System**: Originally a Wang system, MACS has been converted to a UNIX platform and remains the Agency's primary accounting system for field missions. The main function of MACS is funds control and disbursements for the missions. MACS produces monthly reports for external and internal reporting. MACS also produces an electronic file that is uploaded to the Country Financial System.
LOCSS	**Letter of Credit Support System**: This stand alone system is designed to track the establishment of letters of credit and subsequent draw downs and liquidations. LOCSS does not interface with FACS, therefore financial transactions entered must also be manually entered into FACS.
CASH JOURNAL	**Cash Journal System**: This system was the Agency's primary payment management system and was interfaced with FACS and the Country Financial Reporting System for the processing of Advice of Charges.
ACCOUNTS RECEIVABLE	**Accounts Receivable System**: The accounts receivable system is a stand alone system that was used to issue bills and record collections.
AWACS GL I	**General Ledger I**: This system was the predecessor to the current version of the general ledger (GL II) in AWACS. GL I was a stand alone Oracle-based system which did not automatically post by transaction code. GL I could not directly produce formatted reports but was interfaced with the report writer, Impromptu, to produce trial balances.

System	Primary Functionality
GLARS	**General Ledger Accounting and Reporting System**: Developed in COBOL in 1963, this general ledger is used exclusively by the Loan Management Division to account for the transactions related to the Agency's Direct Loan Program.
LAIS	**Loan Accounting and Information System**: Like GLARS, LAIS was developed in 1963 and serves as a subsidiary ledger for USAID's direct loan program. The main function of LAIS includes keeping track of loan disbursements, receipts, amortization schedules, accrued interest and issuance of notices of payment due.
HGPMS	**Housing Guaranty Program Management System**: Although HGPMS was never designed as a financial system, it provides the majority of the data used to account for the Agency's Housing Loan Guarantee Program.
PPS	**Participant Payment System**: PPS was used to track funds placed into an MDA to fund training. The system tracks and allocates costs. This system is currently being phased out since training is no longer funded by MDAs.
CFR/U101	**Country Financial Reporting System**: The CFR/U101 system interfaces with MACS to receive obligation, accrual, and disbursement data monthly. Based upon information received, the CRF/U101 system creates the corresponding two-sided G/L entry. This G/L entry is then recording on a journal voucher and posted to the G/L manually.
FOREIGN CURRENCY	**Status of Foreign Currency Funds**: The Status of Foreign Currency Funds is a Lotus spreadsheet based application used to track United States controlled trust funds by country.

Table 7-1: Core Financial Management Legacy System

B. Analysis of Legacy Systems

To evaluate USAID legacy systems, the IBM Team interviewed financial management personnel and reviewed available documentation. During our field work, we noted issues concerning the functionality of the legacy systems, lack of compliance with regulations and directives, data integrity, and system design and maintenance. These deficiencies are described below.

1. Federal Manager's Financial Integrity Act (FMFIA)

USAID's legacy systems do not comply with the Federal Manager's Financial Integrity Act. USAID's legacy core financial management system is not a single, integrated financial system. The core financial system consisted of FACS and MACS, but also was supported by ten other systems. Due to the lack of integration, USAID has received an FMFIA Top 100 "High Risk" designation.

2. Joint Financial Management Improvement Program (JFMIP) Compliance

Even though we did not perform a detailed review to determine if USAID's legacy systems comply with the Joint Financial Management Improvement Program (JFMIP) core financial management system requirements, we did identify compliance issues through interviews and documentation reviews. Table 7-2 provides some of the compliance gaps identified.

Core Financial Management Functional Area	JFMIP Functional Requirements Non-Compliance
Core Financial Management	Does not provide for: • integrating of planning, budgeting, and accounting • lack of synchronization of data between systems
General Ledger Management	Does not provide for: • subsidiary ledger support standard general ledger support • processing of system generated entries such as accruals, year-end closing, cost allocation, and recurring payments • the processing of data on-line • transaction codes that automatically generated required debits and credits
Funds Management	Does not provide for: • the accounting and control of 511/517 funds • tracking the use of funds against operating or financial plans • reporting plan to actual • a control that ensures the amount reflected in the funds control is in agreement with the General Ledger
Payment Management	Does not provide for: • calculating the payment amount to include discounts taken, interest or penalties due as required by the Prompt Payment Act. • tracking and reporting of Prompt Payment Act statistics such as interest taken/lost, interest and penalties incurred • recording the receipt, inspection, and acceptance of goods or services received • matching of documents before payment • generating 1099s
Receipt Management	• Does not provide for establishing offset (IRS, federal salary, etc.) of payments to collect accounts receivable
Cost Management	• Does not provide the functionality to accumulate and distribute cost
Reporting	• Does not provide for generation of all required internal and external reports

Table 7-2: Legacy Systems Non-Compliance With JFMIP Core Financial Management

3. Year 2000

We reviewed the legacy systems to determine compliance with Year 2000. Table 7-3 provides the estimated cost to modify the legacy system to comply with Year 2000 requirements. The legacy systems are presented by functional area: core financial management, procurement, budget, and operations.

Legacy System	Estimated Cost to Modify for Year 2000 Compliance
Core Financial Management System	
FACS	$4,108,956
MACS	750,000
LOCSS	93,466
CASH JOURNAL	16,000
ACCOUNTS RECEIVABLE	Not Included In Y2K Review
AWACS GL I	Not Included In Y2K Review
GLARS	62,550
LAIS	90,000
HGPMS	32,564
PPS	14,152
CFR/U101	153,002
FOREIGN CURRENCY	Not Included In Y2K Review
Procurement	
CIMS	541,360
APS	41,962
VPD	14,494
Budget	
OYB	31,408
PBDS	17,270
FUN	60,000
Operations	
PMIS	5,700
Total Estimated Cost	***$6,032,884***

Table 7-3: USAID Legacy Systems Y2K Compliance Costs

4. Data Integrity

Data integrity issues exist concerning the data maintained in the legacy systems and also with migrating data from NMS to the legacy systems.

a. Current MACS Data Integrity Issues

On July 11, 1996, the Inspector General (IG) of USAID issued an audit report titled *Audit of the Controls Over the Quality of Financial Management Data*, (Audit Report No. 9-000-96-005). The stated objective of the audit was:

> "Does the Mission Accounting and Control System (MACS) contain systemic weaknesses which may reduce the accuracy of financial management data?" (page 2)

The IG's review included sampling data from 33 missions to determine accuracy of the financial data recorded in MACS. The IG determined accuracy by tracing selected transactions to the original source document. Based upon the review performed, the IG found that the data accuracy rate was 67%. Data inaccuracy was the result of:

- mission did not update data timely
- accounting personnel made errors doing data entry or did not understand the coding process
- missions did not review data for accuracy

The IG made numerous recommendations for the missions to correct data entry and documentation maintenance, but overall recommended the Office of Financial Management "establish a system to ensure data integrity at all accounting stations." Per the IG, the established system should:

- perform edits during data entry to help ensure data integrity
- establish criteria for documentation maintenance
- establish a criteria for replacing lost documentation
- provide for information flow between the Office of Financial Management and the accounting stations

The Office of Financial Management agreed with the deficiencies and replied that the planned NMS would address the system weaknesses noted.

Also, the IG concluded that 15% of the errors detected resulted from lacking functionality in MACS. MACS does not have the functionality to automatically calculate the value of certain fields based

upon data residing in MACS. This deficiency, requires the user to manually calculate the value and record it in MACS. The IG recommended that opportunities for automating the calculation of values be included in the functionality of USAID's AWACS system.

b. Migration of Data from NMS to Legacy Systems

Interviews with USAID Financial Management personnel provided the IBM Team with an estimate that it would require at least a year to migrate the data from NMS back to the legacy systems. The ability to migrate NMS data accurately is complicated by the following factors:

- only summary legacy data was loaded into NMS
- the partial implementation of NMS
- the scope of the transaction to be migrated
- NMS data integrity

USAID summarized legacy data loaded into NMS during implementation and maintained the historical transactions detail in the legacy systems. Therefore, if NMS data were summarized and loaded in FACS/MACS, the historical transaction detail prior to the implementation of NMS would be overwritten. To avoid overwriting the historical data maintained in FACS/MACS, USAID would have to migrate NMS at the detailed transactions level. Another option is for USAID to run and maintain two incidents of FACS/MACS. One incident for transactions detail before NMS implementation and the other for subsequent to the NMS implementation. Running and maintaining two incidents of FAC/MACS would increase maintenance costs and also funds control could be compromised since data is maintained in two separate database.

USAID implemented NMS world-wide on October 1, 1996, but subsequently reverted the missions back to MACS in April of 1997 due to system problems. USAID is entering summarized MACS data monthly into AWACS by manual journal voucher. We learned that this has caused some data to be duplicated in NMS or not recorded in NMS. USAID is currently reconciling mission data to Headquarters data to ensure that the NMS data is complete and accurate.

USAID would need to convert all transactions posted to NMS since October 1, 1996 or at minimum 16 months if conversion began February 1, 1998. In addition to the volume of data that USAID would need to convert, the data crossing fiscal years.

5. Other Issues

We also identified the following miscellaneous issues pertaining to FACS and MACS:

- antiquated reference manuals
- high maintenance costs
- antiquated programming language

The lack of system documentation would hamper any efforts to modify the code to comply with year 2000 requirements and enhance the functionality of either application. Also, we have been told that the level of effort required to maintain the legacy system is higher due to the out-dated system architecture and design. Most of the legacy systems are programmed in COBOL which is considered to be an antiquated programming language. Therefore, maintenance or modification of system written COBOL require a special skill set which may be difficult and/or costly to acquire.

IBM

VIII

Commercial Off the Shelf Software Solutions

USAID is in a unique position to capitalize on the latest technology available in the revitalization of their agency-wide financial information systems. The alternative solutions to NMS include its integration and/or replacement with Commercial Off The Shelf (COTS) solutions available to the Federal government. This section presents those COTS alternatives and their high level functionality. Various decisions are required of USAID before continuation with COTS selection activities. These decisions include a determination of the preferred platform and network technology to be utilized and the degree to which legacy or NMS remedial intervention is preferred.

The COTS alternatives are presented in terms of both the overall functionality, as well as the technical environment that can support the software. The General Services Administration (GSA) Financial Management Systems Software (FMSS) schedule is the source for procurement of financial systems in the Federal government. We have included a brief introduction to the GSA FMSS schedule and each vendor on the GSA FMSS schedule. Two additional vendors whose newly developed Federal financial systems are projected to be available to the Federal government via the GSA FMSS schedule in the near future are also introduced. Further, many vendors have systems in production at various agencies and departments of the Federal government. Federal government experiences conveyed to us during interviews conducted for this project are discussed. Additionally, we have developed a summary of the general costs from price lists made available by the vendors; although these costs do not include potential vendor incentives. The estimated costs associated with a number of actual agency implementations were also obtained. Lastly, the benefits and risks associated with the respective decisions required of USAID before more detailed COTS selection activities continue, is presented.

A. Financial Management COTS

The following sections provide an overview of the Financial Management COTS options. These sections include overviews on the GSA FMSS Schedule, GSA and non-GSA vendors, characteristics of the COTS applications, agency COTS implementation experience, costs associated with implementation of COTS, and the benefits and risks with a COTS solution.

1. GSA FMSS Schedule

The Financial Management Systems Software (FMSS) schedule was established in 1989 as a result of OMB's government-wide financial management systems software program. The use of the FMSS schedule of systems vendors is mandatory for all Federal Government (Executive Branch) agencies/departments that seek to purchase software for primary financial management (accounting) systems and to purchase services to support the systems implementation of the software packages. The Joint Financial Management Improvement Program (JFMIP) established core requirements as the minimum standards for Federal financial systems. The GSA FMSS vendors are tested to provide basic assurance of compliance with the baseline standards. Currently, a Federal initiative is underway to re-engineer the JFMIP requirements and improve the vendor testing methodology. The benefits and risks of GSA FMSS schedule usage are presented in the Consideration of the Benefits and Risks of COTS Alternatives section.

The objectives of the FMSS schedule are several-fold. The basic intent is to assist Federal Agencies in purchasing Federal financial management software packages. The schedule ensures that a number of commercial off the shelf (COTS) financial software applications are available and meet the minimum JFMIP core requirements. It also helps to streamline the procurement process by eliminating the need for each agency to go through an extensive competitive procurement process. The schedule sets forth a more streamlined procedure. FMSS schedule contractors are also required by the terms of their contract to distribute FMSS schedule price lists to all requesting agencies within 15 calendar days. Agencies can use the schedule to obtain core financial management software applications, support services (training, technical assistance, conversion) and additional add-on modules (e.g., procurement, asset management, travel). As of October 1, 1997 the GSA will apply a surcharge to users of the FMSS schedule to cover the costs of establishing and administering the schedule contracts equal to 0.75% of the total dollar value of each delivery/task order issued under the FMSS schedule program.

2. GSA FMSS Schedule Vendors

There are currently nine vendors available to agencies on the GSA FMSS schedule. The various software solutions offered in the financial system products provide: client/server technology, graphical user interfaces, integrated modules, and compatibility with numerous platforms. GSA FMSS schedule vendors include:

- American Management Systems Inc.
- Computer Data Systems Inc.
- Digital Systems Group Inc.
- ICF Information Technology Inc.
- KPMG Peat Marwick LLP
- Keane Federal Systems Inc.

- Oracle Corporation
- Orion Microsystems Inc.
- Rel-Tek Systems & Design Inc.

The following paragraphs provide a description of selected GSA schedule vendors and their COTS products.

American Management Systems

American Management Systems (AMS) Inc., offers an approved core Federal financial system in a traditional mainframe platform version that has been upgraded for the Year 2000. AMS also offers an approved core Federal financial system utilizing client/server technology. AMS has been the market leader of Federal financial systems, with over 33 licensed sites. Several federal organizations have purchased the package, Momentum Financials, but none are currently in production. The AMS mainframe package, Federal Financial System (FFS) is in production in many Federal agencies including Department of Veterans Affairs (VA), Department of Interior, and Department of Housing and Urban Development (HUD). AMS also offers Procurement Desktop, which is a stand-alone contract and procurement management application. Procurement Desktop that can be fully integrated with FFS and Momentum Financials.

Computer Data Systems, Inc.

Computer Data Systems, Inc., (CDSI) has been working with the Federal Government for over 25 years. CDSI has offered products utilizing either a mainframe platform, or client/server technology. Their traditional mainframe financial system product is Federal Accounting and Reporting System (FARS) and their client/server version is called *i.e.* FARS. Clients operating FARS (mainframe version) include Department of Commerce (DOC) – Office of the Secretary, Peace Corps, US Secret Service, and Department of Labor (DOL). Clients using *i.e.* FARS include Department of Education (ED) and the U.S. Export Import Bank. CDSI does not intend, at this time to continue offering upgrades beyond the short term for their mainframe Federal financial system.

KPMG Peat Marwick

KPMG Peat Marwick (KPMG) also offers core financial systems for both a traditional mainframe platform and an environment utilizing client/server technology. The mainframe platform financial system is Federal Accounting Management Information System (FAMIS) and their new client/server technology financial system is Performance Series. FAMIS is in production at approximately 12 Federal agencies including, the Equal Employment Opportunity Commission (EEOC), Office of Personnel Management (OPC), and Department of Agriculture (USDA) Food and Nutrition Service. The National Aeronautics and Space Administration (NASA) is currently performing an agency-wide implementation of the Performance Series applications.

Oracle

Oracle US Federal Financials is a GSA FMSS core Federal financial system. Oracle has sold its financial applications to both commercial and public sector clients for over ten years. Oracle Financials can be implemented in either a Graphical User Interface (GUI) or character-based interface using either a client/server or mainframe-based architecture. Federal clients of Oracle Financials include the U.S. Coast Guard and the Overseas Private Investment Corporation (OPIC).

Keane

Keane Federal Systems has been available to Federal agencies by the GSA FMSS schedule since 1996. Their original software product, Federal Solutions used a traditional approach on a mainframe. However, Keane has recently offered a Federal Solutions version which utilizes client/server technology. Federal Solutions offers the full core accounting capabilities as well as a budget formulation module. Federal Solutions (mainframe version) is in production at the Department of Labor. Keane intends to continue to offer upgrades to its mainframe applications at this time.

3. Non-GSA FMSS Vendors

A number of vendors are prepared at this time to enter the Federal market with their newly developed Federal financial system which utilize the latest technology available. Although, not currently listed on the GSA FMSS schedule, these vendors are undergoing the necessary processes to be available to Federal agencies in the near future. Two such vendors, SAP and PeopleSoft, are leaders in providing financial management systems to the commercial and public sector markets. Each of these vendors is described below.

SAP

SAP, based in Waldorf, Germany, is the number one vendor of financial applications in the world. SAP's client/server financial system, SAP R/3 is the leading choice of Fortune 500 companies. SAP plans to have completed the JFMIP certification during 1998. Several key advantages of the SAP R/3 product include support of a 3-tier client/server environment, integration of the various modules, and flexibility to support client-specific configurations. As part of the suite of products, SAP R/3 provides a comprehensive procurement module with full contracts management capability. Public sector clients of SAP R/3 include the Canadian government, New Zealand government, and Massachusetts Institute of Technology (MIT).

PeopleSoft

PeopleSoft, Inc. is the market leader in providing Human Resource applications. PeopleSoft has developed versions of it's Human Resources and Payroll applications that support Federal specific requirements and has sold these products to numerous agencies in the past two years. Clients include Veterans Administration, Census Bureau, and Social Security Administration. In addition, PeopleSoft also provides a leading client/server financial application to both the commercial and

public sector markets. PeopleSoft Financials provides clients the flexibility to configure the package to meet the client's organization needs without performing extensive programming changes. The modules that are part of PeopleSoft Financials include General Ledger, Purchasing, Payables, Receivables, Budgets, and Asset Management. PeopleSoft, Inc. plans to receive JFMIP certification and be listed on the GSA FMSS schedule in the near future.

4. COTS Core Accounting System Characteristics

The approved core accounting module is required to meet all JFMIP defined core requirements. Additional functionality can be achieved through integration of the core accounting module with supplemental modules, such as procurement, or budget formulation. Further, USAID also has unique requirements in the area of foreign currency and loans management. In some cases, the GSA schedule vendors include these additional functionality in their core financial systems. Other characteristics which USAID will need to consider include whether the system utilizes client/server technology, if it can be installed on a mainframe, has a resident web-enable application, and is Y2K compliant. Table 8-1 presents the characteristics of each COTS financial system discussed and whether increased functionality can be achieved through additional modules or sub-modules as available from the vendor.

Vendor (Product)	Characteristics												
	Y2K Compliant	Client Server	MF Platform	GSA Schedule	User Interface			Basic Modules			USAID Unique Requirements		Additional Capabilities
					GUI Interface	Character Based	WEB Enable	Core Acctg	Budget Formulation	Procure-ment	Foreign Currency	Loan Mgmt	Payroll HR
CDSI (I.e. FARS)	Y	N	Y	Y	N	Y	N	Y	N	Y See Note 1	N	Y	N
AMS (FFS)	Y	N	Y	Y	N	Y	N	Y	Y	Y See Note 1	N	N	N
AMS (Momentum)	Y	Y	Y	Y	Y	N	N	Y	Y	Y See Note 2	N	N	N
KPMG (FAMIS)	Y	N	Y	Y	N	Y	N	Y	Y	Y See Note 1	N	N	N
KPMG (Performance Series)	Y	Y	Y	Y	Y	N	N	Y	Y	Y See Note 2	N	N	N
Oracle (U.S. Federal Financials)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y See Note 1	Y	N	Y
SAP (R/3)	Y	Y	Y	N	Y	N	Y	Y	Y	Y See Note 1	Y	N	Y
PeopleSoft (Financials)	Y	Y	Y	N	Y	N	Y	Y	N	Y See Note 1	Y	N	Y
Digital Systems (IFMIS)	Y	Y	N	Y	Y	N	N	Y	N	Y See Note 1	N	N	N
Keane (Federal Solutions)	Y	Y	Y	Y	Y	Y	N	Y	Y	N	N	N	N
Orion (Glows)	Y	Y	N	Y	Y	N	N	Y	N	Y See Note 2	N	N	N
Rel-Tek (FFMS)	Y	Y	N	Y	Y	N	N	Y	Y	Y See Note 1	N	N	Y

Table 8-1: COTS Characteristics Matrix

NOTES:

1. Provides small purchase activities (e.g., purchase requisition, purchase orders), but does not support development of contracts or contract management activities.
2. Supports development of contracts and contracts management activities.

5. Agency COTS Implementation Experience

The following provides a description of several agencies that have implemented COTS solutions from GSA FMSS vendors. Each description identifies the package and associated modules implemented, the timeframe, costs, and overall experience of the implementation, and a brief overview of the size and composition of the agency.

a. Department of Education

The Department of Education (ED) selected the vendor Computer Data Systems Inc. (CDSI) from the GSA schedule of vendors. ED is implementing CDSI's client/server Financial Accounting and Reporting System (i.e. FARS) core financial systems package that includes general accounting, purchasing, payment management, accounts receivable and cost allocation modules. They also supplemented i.e. FARS with SACONS, procured from a non-GSA FMSS vendor (CACI) for additional functionality. ED subsequently implemented an automated interface from SACONS to the CDSI core financial applications.

The implementation is still in progress and has been a fairly difficult process according to the Department staff interviewed. The software has actually been in production since October yet modifications are still underway and are expected to be completed by July 1998. The product was purchased in 1995 and implementation was begun in October 1996. Contributing factors according to Department personnel were due to changes in the software and data conversion difficulties, certain agency resistance, and the product not being market-ready at the time of the procurement. The vendor provided approximately 6 full time equivalents (FTE), on and off site, to support the implementation and conversion process. ED provided one full-time systems integrator and an average of 30 full-time contractors and 20 FTEs over a two year period to the implementation effort. This implementation was a single component of a much larger systems purchase and implementation program at ED.

The ED is composed of approximately 4,900 employees and 1,500 core financial systems users. The i.e. FARS application is implemented at ED's 10 regional offices. The regional offices interface with i.e. FARS either through direct links to the network or in remote locations via web access to the system

b. Department of Labor

The Department of Labor (DOL) selected Keane Federal Systems Inc. from the GSA schedule of vendors. DOL implemented Keane's Federal Solutions systems package which currently complies with the core accounting, standard general ledger, accounts receivable, and accounts payable requirements set forth in the JFMIP core requirements. They purchased the core financial and accounts payable modules and asked the vendor to build other modules including accounts

receivable. At the time of agency implementation (roughly 6 years ago) the vendor did not have additional modules. DOL continues to be very pleased with the vendor and the system selected.

They originally projected an 18 month window to install the systems. Actual installation required 15 months to fully implement. They hired a systems integrator (Ernst & Young) to assist and provide oversight. The integrator provided 2 program analysts full-time. There were also 5 to 6 other data base administrators over a 24 month period. At the height of the implementation process DOL had approximately 20 accountants and information technology professionals, and 3 to 4 contracted Certified Public Accountants (CPAs) to provide liaison with the Office of Inspector General. The system was not year 2000 compliant. Subsequently, DOL obtained an upgrade to Federal Solutions which they described as a relatively easy and cost effective process.

For comparative purposes, DOL has a budget of approximately $18-20 billion, 18,000 employees, and $3-4 million in transactions processed through the DOL accounting system annually. The version of Keane's Federal Solutions selected was a mainframe based system. The system is fully integrated with 13 major finance servicing centers and 7 regional centers around the nation which use the system. Federal Solutions supports an estimated 250-300 users.

c. Export Import Bank

The Export Import Bank selected the COTS financial system vendor, Computer Data Systems, Incorporated (CDSI) from the GSA schedule of vendors, for procurement of its client server Federal financial system, *i.e.* FARS. Export Import Bank staff expressed frustration with the implementation process. Agency personnel explained that they were not experienced in system implementation and often their expectations differed from reality. The Export Import Bank also is implementing an interface from the *i.e.* FARS core financial system to a separate non-GSA, COTS solution, CACI SACONS. There have been delays related to ED adjustments to SACONS and the two systems currently are not integrated.

The *i.e.* FARS core financial system provides for the core accounting functions of the agency. Export Import Bank also purchased a fixed asset module and a separate travel management module which has been implemented as a test module in two different divisions. *i.e.* FARS is not used in agency-wide program lending operations.

Implementation of the COTS core financial and related modules began in September 1996 and *i.e.* FARS went into production in October 1997. However, due to continued delays of *i.e.* FARS integration with SACONS, manual entry of data by Export Import Bank staff to both systems separately is required. CDSI has provided daily, on-site support to Export Import Bank since the start of implementation. The CDSI core staff included two information professionals and several data entry staff.

Export Import Bank has approximately 420 personnel located in DC and some field offices. The system is centralized and located at Export Import Bank Headquarters in Washington, DC. Users

are also located at Headquarters and no interfaces are needed with the field offices. There are an estimated nine current users of i.e. FARS at Export Import Bank.

d. Department of Housing and Urban Development (HUD)

The Department of Housing and Urban Development (HUD) selected AMS from the GSA schedule of vendors, for procurement of the FFS core financial package. The implementation process spanned approximately 18 months. One year of the implementation process involved the actual purchase and contracting process. HUD completed implementation in August 1997. The implementation began in a pilot program for three months. The pilot results were used to determine the necessary software modifications. The subsequent agency wide rate of implementation covered ten agency offices each month. AMS provided an estimated 30 professionals which included programmers and other specialists. HUD also provided approximately ten individuals dedicated to the system implementation.

HUD has approximately 10,000 employees and a budget of $25 billion. HUD operates in more than 50 sites across the nation. All 50 sites are fully integrated with FFS. HUD trained 400 potential users of the new system.

e. Defense Agency #2

Defense Agency #2 selected AMS from the GSA schedule of vendors for procurement of the client/server technology based Federal financial system, Momentum. The agency determined the AMS product met the most Agency requirements. The implementation schedule spanned the fiscal year, from September 1996 to October 1997. It was considered a fast track implementation time frame. The vendor provided the professionals to assist with the implementation. The vendor provided 20 support professionals, on average, which included: GL experts, management support, and information system professionals. The Agency provided 12 staff; six of whom where government employees. The Agency expressed satisfaction with the vendor and implementation experience.

The Agency budget is in the range of $5 billion. They currently have 40 users of the core financial systems and this number is expanding. Momentum was implemented at their primary location and is expected to be implemented in 4 additional sites, one of which is overseas.

f. US Coast Guard

The U.S. Coast Guard (USCG) selected and purchased Oracle Federal financial system software via the GSA schedule. They purchased the full suite of Federal core financial modules and have subsequently purchased most of the additional Federal financial modules such as inventory and others. Their approach to the system implementation has been incremental. The system has been implemented in one site to date. The implementation of the site required approximately 18 months; of which, 6 months were due mainly to data conversion issues. They are also currently installing the

system at their Finance Center. This Finance Center implementation started 18 months ago and is scheduled to be completed in April 1998.

Oracle has provided approximately six professional staff to support USCG during the implementation process. The USCG provided an additional four staff which included one project manager (part-time for the first 6 months, now full-time), one programmer (full-time) and two professionals (now full-time).

For comparative purposes, USCG operates with a budget of roughly $4 billion and employs some 43000 personnel. They have some 3,000 units across the US. There are approximately 350 users in the Finance Center of the core financial systems and another 3,000 users of the purchasing module

g. US Department of Agriculture (USDA)

The U.S. Department of Agriculture (USDA) selected KPMG Peat Marwick (KPMG) from the GSA schedule of vendors. They have had a favorable experience with the implementation process. They are currently planning migration from the KPMG mainframe system, FAMIS, to their new client/server Performance Series. They estimate that over time they will purchase the full suite of Performance Series products.

The FAMIS implementation period was two years, from 1990 to 1992. The installation was conducted within the planned budget. The vendor provided an estimated 12-14 professional staff during the implementation process. USDA also provided an estimated 12 staff to the implementation team. Their decision to upgrade their mainframe system to newer client/server technology is based on expected cost savings. The move to the client/server technology will also provide system users with desired full GUI interface, additional query & report capabilities which are available using a relational database.

USDA has approximately 1,700 employees and a budget of roughly $40 million. Their financial system must support 100 users. The FAMIS system is based in 1 site (Kansas) with user interfaces for 9 additional sites. The new Performance Series system will be installed in Washington, D.C. and will interface with 8 additional sites

6. Implementation Costs

a. Vendor Costs

The vendor costs matrix shown in Table 8-2 was developed on the basis of price information as made available by each of the GSA schedule vendors. The total costs reflected in the matrix are list price for license, manuals, and user fee costs. This does not include other related costs of implementation including professional GSA vendor labor hours, training, maintenance, and other variable costs. The parameters established for the matrix are based on one server license fee, 200 concurrent systems users, and 50 copies of basic systems manuals. It is also important to note that

each vendor offers varying discounts in the range of 10-15% on their products that depend on such variables as prompt contract payments, quantity and other variables. These discounts may mean substantial price reductions and are dependent on negotiations with each vendor.

Vendors	List Price			Total
	License/ Server	Manuals	User fee	
Client Server				
Computer Data Systems	$85,500	$32,500	$379,754	$497,754
Keane Federal Systems	$200,000	$11,000	N/A	$211,000
Oracle Corporation	$37,500	$20,000	$600,000	$657,500
KPMG Peat Marwick	$376,200	$48,000	N/A	$424,320
AMS	$292,500	–	$479,017	$771,517
Mainframe				
Keane Federal Systems	$200,000	$11,000	N/A	$211,000
KPMG Peat Marwick	$250,000	$48,000	N/A	$298,000
AMS	$176,280	–	N/A	$176,280

Table 8-2: Vendor Costs Matrix

i. Cost Model Assumptions – Client/Server

In the information below, we have identified the assumptions applied to the price lists provided by each vendor of client/server products.

KPMG

- license fee – based on core financial, client/server using base of 200 concurrent users, 1 server installation
- manuals/documentation – used 50 manuals, 2 are included within license fee
- note – license fee does include such items as certain number of training, technical services, and manuals

AMS

- license fee – based on Momentum core financial module, 1 site license using base license fee plus user license fees using 200 users
- manuals/documentation – price list did not provide information for this cost category

Oracle

- license fee – based on per module cost multiplied by the number of modules in core accounting (4) and on the basis of one server installation
- user fee – based on 200 concurrent "devices" multiplied by "sum of base modules"
- manuals/documentation – based on system, user and operations documentation provided by vendor with 200 copies

Keane

- license fee – based on core accounting modules price for one server
- user fee – no separate fee is added in vendor pricing
- manuals/documentation – based on core accounting user, operations, and systems manuals with 50 copies

CDSI

- license fee – based on server fees category using hardware IBM/MVS all core financial modules (schedule A) for one site
- user fee – based on all core financial modules fee for 200 concurrent users
- manuals/documentation – based on all i.e. FARS manuals provided by vendor with 50 copies

ii. Cost Model Assumptions – Mainframe

In the information that follows, we have identified the assumptions applied to the price lists provided by the vendors of mainframe products.

(Note: A standard assumption applied to mainframe packages is that the license fee applies to a one site mainframe system: 1 site mainframe system solution license fee.)

AMS

- license fee – used FFS Basic Systems DB2/CICS category fee which includes a 30 year license, based on one site
- manuals/documentation – price list did not provide information for this cost category

KPMG

- license fee – used mainframe chart Federal FAMIS (core accounting) fee which is a perpetual license, based on one site
- manuals/documentation – used 50 manuals, 2 are included within license fee

KEANE

- license fee – used Federal Solutions core accounting software category which can be installed on any ANSI standard relational database management system including IBM mainframe DB2 or Client/Server Oracle and is a 99 year license
- manuals/documentation – based on core accounting user, operations, and systems manuals with 50 copies

b. Government Agency Implementation Costs

The Agencies/Departments interviewed provided varying examples of systems implementation cost experiences which, may serve as a useful indicator of potential cost to USAID. The U.S. Government agency/department respective implementation costs were approximate amounts obtained from the respective agency points of contact provided via the GSA FMSS schedule. The costs reflect those costs associated with implementation including license fees, labor costs, training and documentation.

i. US Department of Education

The ED spent an estimated $800,000 on the purchase of the core financial package, *i.e.* FARS from CDSI. The original contract amount was approximately $2 million to implement and modify the COTS package. The actual expenditure on implementation will be closer to $5 million. These figures include labor hours, training, and systems manuals/documentation. The ED specific modifications significantly increased the implementation costs.

ii. US Department of Labor

The DOL spent approximately $5 million in its systems package purchase implementation of Keane's Federal Solutions package. This included license, user fees, labor hours and training. This also included approximately $2 million in contract changes for DOL specific requirements and training. Additionally, they spent $3 million in building and developing new modules. Finally, DOL spent more recently approximately $400,000 to purchase an upgrade to their system to ensure Year 2000 compliance.

iii. Department of Housing and Urban Development

The purchase and implementation cost for the AMS FFS Federal financial system were approximately $5 million. This estimated contract cost included software package, conversion, implementation and training costs for approximately 400 system users. The total cost of the system implementation to HUD including HUD IM-IT overhead costs was an estimated $10 million.

iv. Defense Agency #2

The total contract for the AMS procurement and implementation was approximately $2.2 million. An estimated 75% of the total was installation, consulting services, and user documentation costs. The Agency purchased the requisite hardware as part of a much larger systems migration program moving the Agency to a windows NT environment. The software license was 23% of the cost. Basic training on the product and its capabilities was approximately 2% of the cost. The implementation also included pilot testing. Minor systems modifications were needed for reporting requirements and security purposes. The Agency spent an additional $500,000 for the security modification and assistance from the vendor for data migration from the old legacy systems to the new. Finally, the

Agency incurred other implementation costs related to the clean-up of legacy data. The six month effort to clean-up legacy data represented additional cost in the range of $600,000-700,000.

v. U.S. Department of Agriculture (USDA)

The fixed price contract for the implementation of the KPMG FAMIS system was $2.9 million. This included approximately $200,000 for the software and license fees, $200,000 for design and implementation, $200,000 for contract management, $500,000 for interfaces with applications, $400,000 for data conversion, $350,000 to customize screens, $200,000 documents and training, $250,000 formal training, and $600,000 design for applications. USDA is now in the process of purchasing KPMG's Performance Series client/server software including core accounting, budget and procurement modules. Actual costs for the Performance Series procurement was not available.

7. Additional Considerations

a. GSA Vendor vs. Non-GSA Vendor

Selection of a COTS solution from the GSA Schedule is a detailed process. It requires determination of the unique functional and technical requirements, other requirements not specified in the FMSS solicitation, reporting requirements and specification of the operating environment, system interfaces and system performance requirements, which this study provided. Further studies of specific applications and software selection activities would be performed once the determination of the type(s) of system(s) to be procured is made as a result of this study. The GSA FMSS schedule provides a minimum standard which software must achieve to be considered by agencies. As such, utilization of the GSA FMSS schedule provides agencies with a minimum level of assurance before additional resources are invested in the software selection process.

The GSA schedule provides Federal agencies standard financial packages that meet the JFMIP requirements and streamlines the procurement process by eliminating the need for each agency to go through a competitive procurement. However, GSA FMSS schedule vendors recently surveyed cited that difficulties ensue when agencies do not make full use of the COTS packages as certified. Vendors have indicated that the testing process for GSA FMSS certification is inconsistent and that

JFMIP requirements are too broadly defined. Often agencies prefer to modify the software procured rather than change the existing business processes required to support the application; while, the existing business processes may be inefficient and need to be updated and improved to make full use of the COTS functionality.

Complaints by Federal agencies of the GSA FMSS schedule include that the packages are not state-of-the-art, the schedule limits the agencies' choice of vendors, and the schedule limits vendor incentive to enhance their COTS systems. Federal agencies complain that extensive modifications to the GSA FMSS COTS Federal financial systems procured are required to meet agency needs.

Many top vendors in private industry are interested in entering the Federal market and many have indicated an intention to attempt GSA FMSS certification in the near future. Strengths of non-GSA FMSS schedule financial systems include newest technology, robust functionality and flexible implementation. However, non-GSA schedule COTS vendors lack direct knowledge and experience with the Federal market place and are not currently compliant with all necessary Federal core system and reporting requirements. The GSA is currently in the process of reengineering the FMSS Schedule certification and selection process.

b. Client/Server Technology vs. Mainframe Platform Usage

A system supporting client/server technology can be implemented in a variety of technical environments. This has led to varying interpretations of what constitutes true client/server technology usage. The client/server technology environment offers the user friendliness of the graphical user interface (GUI) clients. Client/server architecture generally conducts operations on a network between client work-stations, and the server(s). Applications and data can be maintained on the client and/or the server(s) terminals in essentially three case scenarios: 1) remote access to data places application execution on the client work-station and all calls are sent to the database management system from a remote location, 2) distributed processing also places the database entirely on the server; however, execution of the application is done partly on the client workstation and partly on the server, and 3) distributed data allows data to reside in more than one location with specific application procedures residing on separate platforms accessing their own related database.

The traditional mainframe architecture provides centralized data and application processing that does not require multiple calls across a network to process data. The user-interface is character-based and requires a transmittal of data to the mainframe at the screen level. Unlike client/server applications, a traditional mainframe application does not require high-end computers. Users are able to either use an emulation package on their desktop computer or a "dumb" terminal to access the application and data. As databases and tools have evolved, traditional mainframe applications have become more user-friendly with better data access, querying, and reporting.

Either a mainframe platform system or an appropriate client/server configuration, requires an understanding of the technical constraints of the agency. USAID current technical constraints include either continued use of the current distributed network, reverting to the traditional mainframe platform, or utilizing web-enabled software.

A COTS Federal financial system which utilizes client/server technology and provides the necessary functionality with minimal customization could be procured and implemented either on the existing network or on the mainframe platform. Another option available to USAID is to revert to traditional mainframe data processing using the existing mainframe. Several COTS Federal financial system vendors have continued maintenance and upgrades of their mainframe applications including those upgrades required for the Year 2000. A decision at this time to revert to a traditional mainframe system may force a subsequent future conversion to next generation client/server technology if mainframe technology usage industry-wide continues to decrease and future upgrades become unavailable. The third option is to implement a system that utilizes web-enabled software to reduce the network traffic. A web solution would provide a centralized application and database that users could access through the Internet using a web browser. The web browser would provide the ability to move all processing logic off of the client to the central location and reduce the issues related to the network configuration.

c. Security

Prior to being certified on the GSA FMSS schedule, a core financial system must support a series of security requirements as outlined in the GSA's FMSS Request for Proposal. Examples of these requirements include the following:

- The system must support authorization for access to specific system functions to be defined by the system administrator for the users of the system, so that separation of duties is maintained for system maintenance, transaction input, approval of transactions, and retrieval of information.
- The system must control individual user access to specific transactions. Parameters limiting user authority to access and perform specific transactions will be controlled by the system or security administrator.
- The system must prevent the alteration of financial data except through the posting of transactions that are entered through the normal edit and update process under proper security.
- The system must maintain records on the system use, including the actions of every user on all terminals, the time and date of use, and the type of transaction by user-id.

As an example of the security capabilities supported by COTS applications, a brief description of the security features provided within one vendor's product is provided below.

Vendor X provides a comprehensive security facility that controls each user's access to data and to processing functions. The security system is built on three key concepts: Principals, Security Categories, and Security Actions.

- ***Principals*** are users. Each Principal has unique information such as logon ID and the types of approvals that he or she may apply. Principals may also be combined into

Security Groups for ease of maintaining security profiles. The profiles of the group apply to each principal who is a member of the group.

- ***Security Categories*** are entities with the system, to which security applies, including data entry forms and database tables. The most detailed type of security category is a "specific security category." Specific security categories are combined into related groups called "general security categories." As with principals, being able to manage groups of entities eases the burden of managing the security of the system and provides the flexibility to apply exceptions to detailed items that override the general rules that apply to an entire group.
- ***Security Actions*** correspond to system operations that can be performed. A security action is performed by a principal to a security category. Security actions include such operations as access, add, amend, approve, and cancel. A total of 16 security actions are defined.

The security system of this product combines Principals, Security Categories, and Security Actions to define what actions a user may perform. The data structures that support this security also provide the basis for the menus that display only the actions that a given user is permitted to perform. Changing a user's security profile will dynamically change the menu selections that the user sees on the screen.

B. Procurement COTS

For the purpose of the COTS review, we identified three vendors that offer a comprehensive procurement system that includes full contract management to the federal market place. The three vendors are American Management Systems (AMS), CACI, and Dynamics Corporation (DynCorp). One of the vendors, AMS, also offers a mainframe and client/server federal financial COTS packages on the GSA FMSS schedule. All of the packages support the full lifecycle of the procurement process from the generation and approval of the purchase request to the close-out of the contract. The packages are designed to be Year 2000 compliant, offer full EC/EDI capabilities, and include workflow processing.

1. Procurement COTS Overview

The following provides an overview of three procurement COTS packages.

a. AMS – Procurement Desktop

Procurement Desktop is a comprehensive procurement management package offered by American Management Systems (AMS). Procurement Desktop automates all phases of the procurement process within a complete workflow management solution from a purchase request to closing out a

contract. The system features include requisitioning, procurement planning, workload management, electronic approval routing, solicitation and amendments, document creation and assembly, vendor management, and receiving. Procurement Desktop is web-enabled to facilitate access to front-end processes, such as requisitioning and approvals, and to simplify processing of release orders against existing contracts. Procurement Desktop also is integrated with AMS' Federal Financial System (FFS) and Momentum Financials and provides a standard interface to link with non-AMS financial systems.

The procurement process begins when a purchase request is created, approved, and routed to the purchasing office electronically either on-line or through the Web using a Java-enabled browser. Users can either create the purchase request from scratch or copy an existing one and change the necessary data. The request is then electronically routed to selected users for approval. Each approver can review the comments and recommendations from previous individuals, add additional comments or recommendations, and either approve, disapprove, or conditionally approve the request. Once the approval process is completed, funds can be committed or verified automatically through an interface to the financial system.

Once the purchase request is approved, users can proceed to the bid and award process or proceed directly to the purchase order process for smaller purchases. Procurement Desktop supports the source selection process by integrating all of the activities between the request and award. The activities include the development and management of documents, tracking of amendments, management of bidder lists, and evaluation of bid responses. A vendor database provides current information about vendors and potential vendors and can be used to automatically generate source lists based on user specified criteria. Users are able to query the vendor database to determine which vendors have been debarred or to review the vendor's past performance. In addition, the system provides the appropriate FAR, agency-specific, and other regulatory clauses from online policy and procedure documents. Procurement Desktop tracks and evaluates bidders at every stage of the pre-award process. This feature incorporates summary and detailed comparisons of each vendor's offer to the evaluation requirements.

For purchase order processing, users can create, process, track, and modify purchase orders. Procurement Desktop allows line items to be combined from multiple purchase requests onto a single purchase order or creation of multiple purchase orders from one purchase request. Detailed accounting information can be maintained for each purchase order line item in addition to all related documents. When completed and approved, the purchase order can be sent via EDI, mailed, or faxed to the vendor with an electronic signature.

Once the contract is awarded, Procurement Desktop supports the contract management lifecycle through the close-out of the contract. Users can utilize milestone templates to capture detailed information on each scheduled activity, including dependencies, dates, task descriptions, and anticipated completion dates. Users can also monitor and track contract performance and contract status.

Procurement Desktop also supports the payment process including supporting two-way, three-way, and four-way matches. Users are able to create and process invoices, payment authorization, cost corrections, and accrual in addition to supporting recurring payments that are annual, monthly, and daily.

b. CACI – Standard Automated Contracting System (SACONS)

CACI provides a windows-based contract management system that is fully ED/ECI compliant called the Standard Automated Contracting Systems (SACONS). SACONS is broken down into three main subsystems. The Purchasing subsystem provides functionality for small purchases. The Contracting subsystem provides functionality for the solicitation and award process. The Contract Administration subsystem provides functionality once a contract is awarded.

As purchase requests, purchase orders, and contract documents are generated, users can route the documents electronically through the review and approval process. Approvers can provide online comments and either approve or disapprove a document. The originator can access the document status to determine where the document is in the approval process, identify the dates and times of each approval action, and review comments.

Once a purchase request is approved, users can either create a purchase order if the request is for a small purchase, or begin the solicitation for bids process. Users can access the vendor file to obtain information on vendors including address, CAGE codes, socioeconomic data, tax ID, and other data. This file also stores associated Federal Supply Classification (FSC) codes and Product Service Classification (PSC) codes provided by the vendor. The vendor data can be used to generate bidder lists and forward solicitations.

SACONS provides a Stock Item file that stores the National Stock numbers along with their descriptions and unit prices. The information can be automatically pulled forward into the various procurement documents. SACONS also provides a FSC/PSC file that maintains FSC and PSC codes to be assigned to buyers and procurement individuals for automatic workload assignment. SACONS also provides users the ability to access FAR and agency-specific clauses and regulations. Users can search the text through "keyword" searches and pull the clauses into the procurement documents. In addition, users can access accounting classification structures through the Accounting file and pull the information into line items on procurement documents.

To assist in the management of the procurement process, SACONS provides templates of milestone events that can occur for a given procurement action. Each event can be established with a suggested number of days for completion and the event it follows. Users can copy the template and modify it as necessary for a particular procurement. These milestones act as ticklers to notify users when an event needs to be completed and help users stay on schedule or if the schedule needs to be adjusted.

Once the contract is awarded, users are able to manage the contract through SACONS. The functionality includes the ability to track the performance and status of the contract, apply

amendments to the contract, and close-out the contract. SACONS also provides the ability to enter receipt and payment records.

c. DynCorp – Acquisition Management Automated System (AMAS)

DynCorp's Acquisition Management Automated System (AMAS) provides comprehensive contract management functionality that is fully EC/EDI compliant. AMAS is a client/server system that incorporates workflow processing through all phases of the contract lifecycle. The functionality extends from the purchase request stage to the close-out of the contract. Functionality includes full lifecycle tracking of acquisitions, generation of solicitations and contracts, an online regulation database, procurement checklist and milestone development, and automated small purchase process.

The process begins with users generating purchase request documents online and routing the documents to the appropriate individuals for electronic review and approval. Each approver can provide comments, and approve or disapprove each document. As the document moves through each approval level, each approver can view the previous approver's comments and add additional comments of their own. Once the purchase request is approved, the process will route the document to the contract and purchase order process.

AMAS pulls information forward from the purchase request into the contract and purchase order process. Users can access online product catalogs that provide information on items including the National Stock number, description, unit of measure, and unit cost. Users can select the requested items and automatically pull the information into the purchase order. For the contract process, AMAS assists in generating the Statement of Work (SOW) by providing standard templates that are prefilled with information from the purchase request. AMAS can also automatically populate the templates with recommended regulation clauses from such sources as the FAR, DFAR, and agency-specific clauses. Users can add additional clauses through a drag and drop process or remove prefilled clauses that are deemed not required for the SOW.

Once the SOW is completed, AMAS provides the ability to automatically generate the information for the CBD and update as necessary. AMAS can also send solicitations electronically to bidders or attach documents to a web site. Bidder lists are generated from a vendor database that maintains vendor information including debarment status. AMAS accepts responses to bid, performs comparisons on vendor responses and recommends a winner. Currently, the comparison and recommendation are based on cost alone but DynCorp plans to incorporate the ability for users to define additional criteria for the evaluation process in a future release.

Once a contract is awarded, AMAS provides the ability to track a contract throughout the lifecycle until contract close-out. Users are able to track and query the performance and status of the contract in addition to applying and tracking modifications to the contract.

2. Procurement COTS Cost-Model Matrix

The procurement COTS costs matrix shown in Table 8-3 was developed on the basis of price information as made available by each of the vendors. The total costs reflected in the matrix are list price for license and user fee costs. This does not include other related costs of implementation including professional GSA vendor labor hours, training, maintenance, and other variable costs. The parameters established for the matrix are based on one server license fee and 100 systems users. It is also important to note that each vendor offers varying discounts in the range of 10-15% on their products that depend on such variables as prompt contract payments, quantity and other variables. These discounts may mean substantial price reductions and are dependent on negotiations with each vendor.

Vendors	List Price		Total
	Base License	Concurrent User License	
AMS Procurement Desktop	$0.00	$136,500.00	$136,500.00
DynCorp AMAS	$0.00	$68,000.00	$68,000.00
CACI SACONS	$0.00	$63,937.44	$63,937.44

Table 8-3: Procurement COTS Cost-Model Matrix

C. Budget Formulation COTS

For the purpose of the COTS review, we identified three vendors that offer a budget formulation system. The three vendors are American Management Systems (AMS), KPMG, and PeopleSoft. All vendors were solicited for product information. At the time of this report, however, AMS had not provided any product information. Two of the vendors, AMS and KPMG, offer both a mainframe and a client/server package. These two vendors also offer mainframe and client/server federal financial COTS packages on the GSA FMSS schedule.

1. Budget Formulation COTS Overview

The following provides an overview of three of the budget formulation COTS packages offered by KPMG and PeopleSoft.

a. KPMG – FAMIS Advanced Budget Preparation System (BPREP)

KPMG offers a budget preparation module as part of the FAMIS mainframe suite of products called Advanced Budget Preparation System (BPREP). BPREP provides the ability to develop operating, capital, grant, and performance-based budgets. BPREP supports the entire life cycle of budget

development. The functionality includes the preparation of work sheets that include historical and current year data, department requests, review and approval process, publication of the recommended budget, and incorporating the approved budget.

BPREP functionality allows users to establish the budget parameters according to the department direction and guidelines. Users can define the accumulators in a budget task, establish accounting classification structure and define edits performed on the structure, and enter and query summary or detailed information. The module also provides performance measurement capabilities and the ability to perform extensive "what-if" analysis on all phases of the budget development.

BPREP module includes a Position Budgeting subsystem that provides the ability to import personnel information from the payroll/personnel system to incorporate personnel costs into both the financial and performance budgets. The subsystem will calculate expenditures for salaries, other earnings, employer-paid benefits, and full-time equivalent counts. Through varying the different personnel cost components, users can determine the impact on the overall budget, and develop the personnel budget to meet the agency's needs and objectives.

Once the recommended budget is developed, BPREP's Budget Publisher (BUDPUB) subsystem allows users to specify budget templates that define the form and content for the published budget. The form and content can include both text and graphic formats. The information in the document can be automatically refreshed when the data in BPREP is updated.

b. KPMG – Performance Budgeting

In addition to BPREP, KPMG also offers Performance Budgeting, which is fully integrated with the Performance Series client/server suite of products. As with BPREP, Performance Budgeting supports the entire life cycle of the budget process. It allows the development, integration, and publication of financial, performance, and position budgets. Performance Budgeting provides agencies the ability to develop, review, approve, and publish their budgets for departmental and/or executive/legislative approval.

The budget process begins in Performance Budgeting with the development of the baseline budget. The module allows historical, current-year or other information to be imported or entered into the system. The information can come from various sources such as the financial system, payroll/personnel system, or any other source required by the agency. Once the baseline budget is developed, the budget can be updated with additional or more accurate data as needed.

After the baseline budget is established, users can perform "what if" analyses and manipulate the data to develop budget requests and to save these scenarios for future use. The data can also be imported into Microsoft Excel for more complex calculations.

Once a budget request is completed, Performance Budgeting will route the document for review and approval at various levels. At each level, users can create and save multiple iterations. Once completed and approved, Performance Budgeting "closes" the budget process and pass the

document to the next level of review. This functionality prevents a budget document from being modified at a lower level, once it is completed, and routed to the next level. The functionality also assures that the higher levels of review authority do not focus on unauthorized modifications.

After the budget request has been reviewed and approved at all necessary levels, Performance Budgeting allows users to determine the budget templates that define the form and content for the published budget. The templates can include financial information and performance measurements in both text and graphic format. The templates can be used for both the budget office and executive/legislative levels of the budget for interim budget reviews.

Performance Budgeting encompasses the Performance Series reporting and inquiry capabilities to support the budget formulation process. Users are able view both summary-level and detail-level information from several different perspectives and at any level in the budget classification structure. High-level analysis can be performed at the summary level or users can use the drill-down capabilities to view more detailed information as needed. The information can then be formatted into a standard report or a custom report developed through on-line reporting capabilities.

c. PeopleSoft Budgets for Public Sector

PeopleSoft provides PeopleSoft Budgets for Public Sector, a comprehensive budgeting formulation module, as part of their PeopleSoft Financials suite of products. PeopleSoft Budgets offers full workflow functionality along with traditional spreadsheet functionality to manage the budget life cycle. The flexible design allows a customer to configure the system to accommodate the way in which the organization operates. The PeopleSoft Budgets module is centralized in the PeopleSoft Financials database, making it instantly available to authorized users and facilitating the flow of budget related documents throughout the customer's organization. PeopleSoft Budgets also offers Tree Manager that lets you depict an organization and identify the preparers and reviewers to represent the entire preparation and approval process.

PeopleSoft Budgets' flexible system design allows the user to customize the application to meet the agency's requirements. An Agency can incorporate congressional and/or departmental guidance for developing budgets, define unlimited business units, and maintain multiple budget types including appropriations, allotments, organization, project/grant, and revenue estimates. An agency also has the ability to define their classification structure used in the budget process and then build budget documents for any combination of elements in that structure.

The data used in the process can be historical, current-year, or forecast information from financial or other systems. Once the data is loaded, users can add itemized lists and textual notations to explain budgeted amounts, establish trends, and spread or adjust data as needed.

Once the budget documents are developed, the system will route the documents to the appropriate levels of review and approval using PeopleSoft Workflow or through e-mail as needed. Budget reviewers and approvers are notified through itemized worklists. They can add comments, update

budget data on-line, and either approve or disapprove the document. Once approved, the system automatically routes the budget to the next approver in the hierarchy.

Users can create and customize budget reports that include both text and graphic formats to publish and submit for departmental and/or executive/legislative approval. Users can also perform ad-hoc queries and reports through on-line query and report capabilities. Users can roll-up budget amounts to view and analyze summary-level information or drill-down to the lower levels to view detail information.

2. Budget Formulation COTS Cost-Model Matrix

The budget formulation COTS costs matrix shown in Table 8-4 was developed on the basis of price information as made available by each of the vendors. The total costs reflected in the matrix are list price for license and user fee costs. This does not include other related costs of implementation including professional GSA vendor labor hours, training, maintenance, and other variable costs. The parameters established for the matrix are based on one server license fee and 50 systems users. It is also important to note that each vendor offers varying discounts in the range of 10-15% on their products that depend on such variables as prompt contract payments, quantity and other variables. These discounts may mean substantial price reductions and are dependent on negotiations with each vendor. (Note: PeopleSoft costs were for the entire COTS package. Therefore, costs for budget formulation could be not broken out.)

Vendors	List Price		Total
	Base License	Concurrent User License	
AMS FFS Budget Preparation	$156,000.00	0.00	$15,600.00
AMS Momentum Budget Formulation	$78,000.00	$28,730.00	$106,730.00
KPMG FAMIS Budget Preparation	$80,000.00	0.00	$80,000.00
KPMG Performance Series Budget Preparation	0.00	$77,000.00	$77,000.00

Table 8-4: Budget Formulation COTS Cost-Model Matrix

IBM

IX

Cross-Servicing

A. Overview

Cross-servicing is defined by the Department of Treasury's Financial Management Service (FMS) as "an arrangement where one agency provides financial support services to another agency on a reimbursable basis. Cross-servicing can range from simply providing computer and software timesharing services to full-service administrative processing."

The breadth of the services each user-agency receives depends on the service contract the user-agency has with the cross-servicing provider. Smaller agencies that do not have a full administrative staff may use the provider for data entry and tracking in addition to providing the computer and software support. Some agencies have the required staff but have limited computer hardware resources, and may use a cross-servicing provider to only supply the computer and software services.

Cross-servicing providers usually offer full implementation and maintenance support for their clients. They will assist an agency with the project management of the implementation, data conversion, modifications to the software, training, and user support. In addition, the core financial management software packages offered by the majority of providers are currently available on the GSA FMSS schedule, and therefore, meet the Joint Financial Management Improvement Program (JFMIP) requirements. Some of the providers even offer more than one software package from the GSA FMSS Schedule. Other providers currently offer custom-developed financial management software, but will soon be upgrading their systems by replacing the software with a package selected from the schedule.

B. Methodology

For our review of cross-servicing, we identified six cross-servicing providers from the Federal Agency Guide to Cross-Servicing, dated December 30, 1997. These providers, who all offer core accounting services to external user agencies, are:

- Department of Commerce – Office of Computer Services (OCS)
- Department of Interior – Washington Administrative Service Center (WASC)
- Department of Interior – Denver Administrative Service Center (DASC)
- Department of Treasury – FMS, General Services Administration (GSA)
- United States Department of Agriculture – National Finance Center (USDA-NFC)

Each provider was interviewed using a standard questionnaire requesting information on their offered services, software packages, and client composition. The information obtained includes the available software packages, the modules offered by each package, the platforms the packages reside on, the timeframe for implementation, and the estimated costs for implementation and annual maintenance. Many of the responses regarding costs, timelines and agency sizes were estimates given to us at the time of the interview.

C. Cross-Servicing Providers

The cross-servicing providers included in this review are the leaders in providing a full range of services to support a government agency's core financial accounting system. Together, they serve hundreds of agencies and process millions of transactions each month from thousands of sites throughout the country. As technology has advanced, they are continually working to keep up to date. Most are currently or will soon be in the process of upgrading to newer versions or newer packages of FMSS. Many are also adapting to client/server platforms and are in the process of resolving the Year 2000 issue.

The following matrix Table 9-1 summarizes the various technical and functional specifications of the six cross-servicing providers identified during our review of the cross-servicing alternative. The specifications include information regarding the software packages supported, the modules offered for each package, the platforms on which the software runs, client information, and implementation services offered. A detailed narrative regarding each provider can be found in the sections following the matrix.

	Commerce-OCS	DOI-WASC	DOI-DASC	Treasury-FMS	GSA	USDA-NFC
Software Offered	Rel-Tek, GLOWS, i.e. FARS, FARS, FINNASST, Performance Series, Oracle Federal Financials, Federal Solutions	FFS Procurement Desktop	FFS Procurement Desktop	FFS, i.e. FARS	NEARS	Central Accounting System (CAS)
Available on FMSS	Y	Y	Y	Y	N	N
Y2K Compliant	Y	N	N	Y	N	N
Operating Platform	IBM ES9000 9121-732, MVS/XA & MVS/ESA O/S, Oracle and Focus, HP 9000K-400, HP9000K-460, IBM RISC 6000, Unix, Oracle, Informix, and Progress	IBM, VSAM	IBM, VSAM	IBM 9672-R83 or Sun Sparc Center 2000, OS 390, VSAM	Amdahl5995-1100A VM/XA SP	IBM/IDMS
User-Interface (GUI or Chara)		Character or GUI	Character, GUI available by summer '98.	FFS: Character i.e. FARS: GUI	Character	Character
# of Client Agencies Using FMSS	4	10 (6 internal, 4 external)	8 (3 internal, 5 external)	8 (3 internal, 5 external)	51 (14 internal, 37 external)	5 (all external)
Number of Years Cross-Servicing FMSS	1.5	10	10	9	12	15
3 Largest Clients*	US Marshal Service (i.e. FARS), Immigration & Naturalization Service (Rel-Tek), Pension Benefit Guarantee Corp. (Performance Series)	Drug Enforcement Agency, House of Representatives, Patent & Trademark Office	Federal Communications Commission, Federal Trade Commission, International Trade Commission	Nuclear Regulatory Commission, Small Business Administration, Inter-American Foundation	National Archives and Records Commission, DC Courts, Japan-US Friendship Committee	U.S. Court of Veterans Appeals, U.S. Merit Systems Protection Board, Federal Housing Finance Board
Multi-Site Implementation	Y	Y	Y	Y	Y	N
Agency-Unique Requirements	Y	Y	Y	Y	Y	Y
Time of Implementation	9-36 months	3-12 months	6-12 months	6-15 months	1-6 months	6-18 months
Costs**						
Implementation	500K-9.5 mil	275K-2.23 mil	75K-200K	250K-3 mil	10K-40K	85K-150K
Annual Costs	300K-1 mil	414K-1.22 mil	70K-290K	140K-$1.5 mil	2K-13K	6.2K-16.5K
Modules						
Core	Y	Y	Y	Y	Y	Y
Budget Prep	Y	Y	Y	N	N	N
Procurement	Y	Y	Y	N	N	N
USAID Specific Requirements						
Foreign Currency	N	N	N	N	N	N
Loan Mgmt.	N	N	N	N	N	N
Offer Full Implementation Support Services	Y	Y	Y	Y	Y	Y

Table 9-1: Cross-Servicing Providers Specifications

* Departments within a provider-agency using the cross-serviced system are not included.

** The range of costs provided are for the 3 largest agencies listed. Implementation costs generally include but are not limited to the following: project management and administration, requirements analysis, data conversion, modifications and customizations, and other coding and development costs. Annual costs generally include help desk support, licensing fees, computer processing, systems operations and maintenance, and technical adjustments.

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1. Department of Commerce – Office of Computer Services

The Department of Commerce's Office of Computer Services (OCS) has been providing cross-servicing for about fifteen years, but has only been cross-servicing core financial systems since October 1996, when it began operating as a Franchise Fund. The OCS provides information technology, administrative, and financial information services to several federal agencies both within and outside the Department of Commerce. OCS will consider teaming with another cross-servicing provider if requested by a potential client-agency. For two cross-servicing agreements, OCS and the Department of Treasury Financial Management System (FMS) have teamed together to provide support for project management, software and hardware, data conversion, and implementation. The Department of Treasury is the prime contractor for the agreement with the Immigration and Naturalization Service (INS) while OCS is the subcontractor. For the other agreement with Pension Benefit Guarantee Corporation (PBGC), OCS is the prime contractor and FMS is the subcontractor.

OCS products include systems for core financial management, executive information, human resources information, travel management, procurement, BankCard reporting, and telecommunication management. The OCS also offers technology solutions services that include Year 2000 conversion, data center consolidation, client/server computing, technical consulting, mainframe computing, Internet/intranet services, network planning and design, and disaster recovery/contingency planning. The OCS relies on its managers to administer vendor or outside contractor tasks as subcontractors to support cross-servicing and provide customer support through a technical help desk.

The OCS generally begins the cross-servicing process with a submission of a proposal to the agency. After the prospective client evaluates the proposal, negotiations may ensue resulting in a Memorandum of Agreement (MOA). The OCS assigns an implementation manager who guides the project through its revisions. The vendor is often on site in conjunction with DOC staff to make revisions to the software. The FMSS currently installed at the OCS consist of Rel-Tek's core financial system, GLOWS from Orion, i.e. FARS and FARS from CDSI, FINNASST from ICF Kaiser, and Performance Series from KPMG Peat Marwick. The OCS also has licenses for Oracle's Federal Financials and Keane's Federal Solutions even though no agency is currently using either of these. In addition, the FMSS travel package, Gelco's Travel Manager, is installed at the OCS. There are a full range of modules depending on the package purchased. An evaluation team can be established as part of the MOA to assist the customer in making a decision. For agency specific interfaces, the vendor can support related COTS packages while the OCS can support interfaces related to the systems network configuration.

There are 27 major customers using OCS applications, primarily for the payroll/personnel package, however, only four are using or will soon be using its FMSS products. The U.S. Marshal Service and INS are in production in their primary location while implementation continues at the field sites. The Equal Employment Opportunity Commission (EEOC) and the PBGC are still in the initial stages of implementation. Full implementation can last from 9 to 24 months. The costs for implementing the U.S. Marshal Services will be about $4 million while the INS engagement will cost about $9.5 million.

The total INS contract with Treasury is for $13 million over a five year period, and from that amount, Commerce's portion will be about $600,000 per year to cover processing fees, licenses, and computer support. The costs are partly attributable to the fact that the INS has hundreds of sites and will eventually have over 1,200 users while the EEOC has less than a dozen. The EEOC is a smaller organizations with less developmental work involved, and therefore its implementation costs should be well less than $1 million.

2. Department of Interior – Washington Administrative Service Center (WASC)

The Department of Interior's (DOI) Washington Administrative Service Center (WASC), otherwise known as the Interior Franchise Fund, is one of two service centers in the Department of the Interior that offer cross-servicing to internal and external bureaus and agencies. WASC has been providing cross-servicing for about ten years primarily through its office in Reston, VA but also through a service center in Denver (WASC-West, not to be confused with the DOI's Denver Administrative Service Center (DASC)). Since 1988, WASC has provided support and management of AMS' mainframe software package, FFS, for its clients. Currently, there are about 40 staff members working with FFS that are about equally split between the two sites. In addition to supporting their own clients, WASC also provides limited support to DASC and its customers because WASC possesses the contract with AMS for the FFS licenses and for its maintenance.

The Financial Systems branch of WASC and AMS have worked with each other for several years and feel they can easily work together to meet specific agency requirements. WASC provides a full complement of services including data entry, project management support, conversion support, table set-up, training, and in some cases, help desk support. Currently, WASC, in conjunction with AMS, is providing help desk support for the Drug Enforcement Agency (DEA). Once DEA becomes more proficient with FFS, it may opt to eliminate this service from their cross-servicing agreement. Such services are entirely at the discretion of the client agency. For software modifications, WASC mainly relies on AMS to actually program code changes due to contractual limitations. Prior to modifying the software, WASC's approach is to first understand the client's needs to ascertain whether or not any costly modifications are necessary at all.

WASC currently offers FFS Program Office Desktop (POD) or FFS 5.1.4, with plans to upgrade to version 5.1.5 this summer. With this upgrade, the system will be Year 2000 compliant. In September 1997, WASC reached an agreement with AMS to offer Procurement Desktop 3.0 to replace its prior choice of CACI's SACONS procurement application. WASC is also considering whether or not to offer AMS's Momentum package or possibly another FMSS within the next couple years. AMS's budget planning application is also available through WASC, but is not being used by any customers. In addition to the standard character-based user interface, WASC-West offers a screen-scraper product, Sterling's Flashpoint GUI, as a user interface.

WASC's 10 clients, which are primarily obtained through referrals and pre-existing relationships, consist of six internal agencies and four external ones. The three largest external agencies are the Drug Enforcement Agency (DEA), the House of Representatives, and the US Patent and Trademark Office. The implementation timeframe can range from three months to twelve months depending on

a variety of factors. The House effort in 1996 was unusually short at just three months because of an immediate need for the system. Unfortunately, this rush job ended up being costlier because the entire requirements phase was eliminated, and this resulted in a system that did not initially meet the House's needs.

The cost of the cross-servicing arrangement varies significantly depending on several factors. In the case of the three external agencies named above, the cost of implementing the core financial system ranged from about $275,000 for the smaller US Patent and Trademark Office to $1,900,000 for the much larger DEA, and $2,230,000 for the House of Representatives.

3. Department of Interior – Denver Administrative Service Center (DASC)

The Denver Administrative Service Center (DASC), the second of DOI's two service centers, began cross servicing payroll/personnel systems, and has since expanded its services to provide FMSS, computer timesharing, quarters management, and computer based training. DASC offers support to the AMS' mainframe package FFS. Even though DASC is an independent cross-servicing provider that competes against WASC for clients, DASC must collaborate with WASC in marketing its financial management systems software because it does not have a direct relationship with the vendor, AMS. In time, these two service centers may merge into one cross-servicing provider.

The Financial Systems Division of DASC has a staff of almost 70 people and is able to provide a full array of services such as customizing FFS, assisting in accounting and conversion, training users, operating and maintaining software, offering a help desk, and even providing data entry support. The data entry services are primarily utilized by the internal and not the external client agencies. In the implementation process, which generally lasts from six months to one year, DASC employees are active in managing the conversion process, including setting up security and reporting requirements. If desired, they are also able to deliver training and have help desk operations for both functional and technical issues.

Through WASC, DASC offers FFS 5.1.4, along with Procurement Desktop 3.0 and AMS's budget planning application. Previously, DOI offered CACI's SACONS procurement application, and even though some older clients are still using it, DOI intends to exclusively use Procurement Desktop in the future. The current version of FFS is not yet Year 2000 compliant, but will be with the next update to FFS 5.1.5 scheduled for the summer of 1998. DASC is currently developing a GUI interface that should be available for use this summer. It will work in conjunction with the payroll/personnel system to offer users the same look and feel.

With regard to FMSS, DASC services three agencies within DOI and five external agencies. The three largest external agencies are the Federal Communications Commission (FCC), the Federal Trade Commission (FTC), and the International Trade Commission (ITC). Although the external agencies are relatively small in size and primarily operate out of one location, the center's internal clients are larger with multiple sites. For example, the Bureau of Reclamation has approximately 150-200 users compared to less than 30 users for each of the external agencies.

The cost of the cross-servicing arrangement varies depending on several factors. In the case of the three external agencies named above, the cost of implementing the core financial system ranged from about $75,000 to $200,000. The annual costs at DASC can be broken down into four components: 1) system administration, which includes supporting the software, 2) system operations, which includes the production and processing labor, 3) technical services, which includes customizing features and programming changes, and 4) computer processing services, the costliest item, which is measured by system resource units. In aggregate, these annual costs ranged from $70,000 to $290,000.

4. Department of Treasury – FMS

The Center for Applied Financial Management of the Department of Treasury's Financial Management Service (FMS) has provided cross-servicing of FMSS since 1988. The Center believes it is unique from other cross servicing providers in that it functions more like a consulting firm and not just as a cross-servicing provider. There are 67 employees in the Center, 20 of which are specifically in the accounting cross-servicing group, while the others provide administrative, general consulting and systems implementation services.

Currently, the FMS has licenses to provide AMS' FFS 5.3 and i.e. FARS. By March of this year, it should also have the rights to offer Rel-Tek and AMS' Procurement Desktop. The next upgrade to FFS 5.4 is scheduled to occur in June of 1998. Treasury FMS also provides consulting services to agencies not using its software. For example, FMS has teamed with the Department of Commerce to provide implementation support during the INS implementation. For example, the Immigration and Naturalization Service (INS), is currently in the process of using RelTek's software package on Department of Commerce's mainframe.

The FMS has eight clients that cross-service AMS' FFS through the Treasury's hardware. The larger clients are cross-serviced through an IBM mainframe, while the smaller ones are on the Sun Sparc Center 2000 in a UNIX computer platform. Excluding the INS, the FMS' three largest external clients consist of the Nuclear Regulatory Commission, the Small Business Administration, and the Inter-American Foundation. The annual maintenance costs for these agencies range from $140,000 to about $1.5 million per year. In the case of the SBA, its annual costs were almost cut in half from $1.2 million once it decided to off-load historical data from the mainframe.

5. General Services Administration (GSA)

The General Services Administration (GSA) has been providing cross-servicing arrangements for about 30 years and cross-servicing arrangements for financial management systems for the past 12 years. GSA currently offers a custom-developed accounting system called the National Electronic Accounting and Reporting System (NEAR), but is in the process of acquiring a new financial management system that will be Year 2000 and JFMIP compliant.

GSA provides full service support for implementation, maintenance, and support of the software and hardware as necessary. In addition, it provides data entry, audit, and correction services for most of

its client agencies. GSA provides cross-servicing arrangements for 37 external agencies, most of which are quite small and typically have only one location.

The agency's three largest client agencies are the National Archive, the DC Courts, and the Japan Friendship Committee. Its largest, the National Archive, uses GSA for its data entry and tracking and processes approximately 350,000 transactions a year. The Japan Friendship Committee also uses the GSA for all of its data entry and tracking. The transactions involve investment funds that are held and tracked in yen but are not reported to Treasury. Because GSA's clients are relatively small and GSA typically performs all of the data entry and maintenance, implementation time lasts from one to six months depending on the system selected and the type of modifications that are required. Implementation costs are considerably lower as well, ranging from $10,00 – $40,000.

6. United States Department of Agriculture – National Finance Center (USDA-NFC)

The National Finance Center (NFC) of the United States Department of Agriculture (USDA) has been providing cross-servicing options, primarily for payroll/personnel systems and financial management systems, to agencies for 15 years.

The NFC is capable of installing software, training, and managing the implementation process. It provides full maintenance and support of the software including modifications and help desk support. Vendors play a small role in supporting their specific software as part of the licensing agreement. The user-agencies must provide their data electronically in the code sets and file formats identified by the NFC.

The NFC offers a custom developed system, Central Accounting System (CAS). At this time, only two internal USDA agencies are using AMS' FFS, and it is uncertain when or if FFS will be offered to external agencies. Currently CAS is not Year 2000 compliant, however, it will soon be with the upcoming upgrade. CAS is scheduled for an upgrade by June 1998 to port the application to a newer database (from IDMS to DB2). The testing of the software is expected to last from June 1998 to December 1998 and complete implementation by January 1998. As each module is tested, the NFC will put it into production.

Once an agency is implemented, a representative from the agency is asked to participate in a user group. The user group reviews requests for changes and decides what modifications are needed for all of the user agencies. Many times these modifications are based on OMB, Treasury, or Congressional direction. Any requested modification is first reviewed by the user group, and if the modification is determined to be a global requirement, all of the agencies will share the cost of the modifications. For agency specific modifications, NFC can accommodate these needs, but the user agency is responsible for the cost.

The NFC provides cross-servicing functions for five agencies, the three largest ones being the Court of Veterans Appeals, the Merit Systems Protection Board, and the Federal Housing Finance Board. They operate on an IBM mainframe using IDMS, but plan to upgrade to DB2 for all administrative and payroll/personnel systems. The cost for implementation is $85,000 for an agency that requires

no modifications and approximately $150,000 for an agency that requires a few modifications. For more complex or numerous modifications and/or using a phased approach, the cost for implementation can be in the millions.

D. Additional Considerations

Based on our review of the cross-servicing providers and considering USAID's requirements for an integrated financial system, we have identified the following benefits and risks for this alternative:

1. Benefits

- The majority of the providers offer JFMIP certified product options.
- Most of the providers offer implementation support including project management, software installation, data conversion, software upgrades, training, user documentation, and on-going user support.
- Cross-servicing may provide lower licensing fees, operation costs, and upgrade costs due to the costs being distributed across multiple clients.
- Cross-servicing typically involves a short timeframe to award a contract by bypassing the formal LOI or RFP process.
- Agencies choosing cross-servicing as a solution have typically been able to implement in a short timeframe – between 6 to 12 months. It is important to note that the majority of these agencies have been relatively small and required few modifications. For agencies that use a phased approach or require many modifications, this timeframe has been longer.

2. Risks

- The majority of the packages offered by providers are currently not Year 2000 compliant. Even though all of the providers have a plan to bring their packages to compliance, the schedules vary and are dependent on provider and vendor performance
- The majority of the providers do not have clients that are similar to the composition of USAID. Typically, the clients are smaller agencies and bureaus within the provider agency. The client agencies external to the provider tend to be centralized and have fewer users than USAID. In addition, none of the user-agencies interact with foreign countries in the same manner as USAID. As such, none of the providers currently offer foreign currency support or the loan management functionality required by USAID
- Clients have to rely on the provider's schedule to upgrade the software and hardware. For example, clients must depend on the provider's ability to fix the Year 2000 problem. In

addition, an agency has to rely on the provider tasking the vendor to modify the software for agency unique requirements. It is critical for USAID to have foreign currency and loan management capabilities. USAID would have to rely on the providers tasking these modifications as priorities in their schedule

- The cost of the recurring annual fee is substantial and will recur throughout the life of the agreement with the providing agency
- Implementation may need to be delayed due to a waiting period required by some providers

The Year 2000 compliance and agency composition issues have a large impact in considering this option as a viable alternative to meeting USAID's needs. Prior to adopting this alternative, the provider would need to ensure that their package was Year 2000 compliant and that modifications to the software to incorporate foreign currency and loan management would be completed in the necessary timeframe for USAID.

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Identification of Alternatives

The IBM Team identified seven alternatives for addressing the business needs of USAID that are not currently being met by NMS. In the following sections, we will define these alternatives.

Table 10-1 lists the seven alternatives and the names by which we refer to them throughout this discussion. The table also gives a brief definition to help characterize each alternative. More detailed definitions for the alternatives are provided in the individual sections following the table. The table clearly shows the variety of alternatives available to USAID, which include various combinations of the following elements: continuing to use parts of NMS, reverting to legacy systems, switching certain functions to common off the shelf (COTS) software packages, and using cross-servicing or outsourcing arrangements to replace certain functions.

Alternative		Brief Definition
1	Full NMS Fix	Continue NMS development to provide all desired funcionality
2	Partial NMS Fix	Continue NMS development to provide minimum mission-critical subset of functionality
3	Full COTS	Replace NMS with one or more COTS packages, customizing them where needed to provide missing mission-critical funcionality
4	COTS/NMS	Replace AWACS with a COTS solution and provide the "Partial NMS Fix" solutions for A&A, Budget and Operations (Note: A&A could be replaced also with a COTS package)
5	Legacy/NMS	Replace AWACS with existing legacy systems and provide the "Partial NMS Fix" solutions for A&A, Budget and Operations
6	Cross Servicing	Use a cross-servicing agency to replace AWACS and provide the "Partial NMS Fix" solutions for A&A, Budget and Operations (A&A could be cross-serviced)
7	Outsourcing	Similar to the "Cross-Servicing" option above, but outsource to the private sector instead of cross-servicing to another government agency

Table 10-1: NMS Alternatives

A. Common Activities

Regardless of which alternative is implemented, USAID must complete a variety of activities that are common to all the alternatives. These activities consist of significant effort in four areas:

- validate system functional requirements
- undergo process redesign and organizational change
- implement IT security infrastructure
- training, testing, and worldwide rollouts

The first common activity is arguably the most critical. USAID personnel must ***validate the system functional requirements*** analysis performed by the IBM Team during this project. The goal of this activity is for USAID to develop and document a solid requirements baseline from which to proceed with the implementation of a solution. In our analysis of these requirements, we began by compiling a list of the requirements identified in the Business Area Analysis (BAA) performed by USAID in 199?. To this list, we added the items on the current "to do" lists of the various NMS development teams. Due to the serious time constraints posed by the impending Year 2000 deadlines, we feel USAID must complete the validation of these requirements as soon as possible and certainly no later than March 1, 1998.

The next common activity is that ***USAID must undergo process redesign and organizational change*** to solve some of the problems identified in our analysis. Many of these problems are not technical in nature and can only be solved by making the appropriate process and/or organizational changes. Among these changes are those that would be required if USAID decides to improve its current CMM (capability maturity model) level.

Though it falls under the category of process and organizational changes, the next common activity is listed separately to underscore its importance in the overall solution. This activity involves ***implementing a suitable technology information security infrastructure*** in accordance with the applicable laws and OMB regulations. Several of the alternative descriptions below include activities aimed at fixing or verifying the security in various system components. Those actions should only be taken after the appropriate security plans and infrastructure are put in place agency-wide.

The final common activity consists of several smaller activities that take place in each alternative at the end of implementation. These smaller activities include ***training, testing and worldwide rollout***. Training involves instructing USAID employees and contractors in the use of the various modules of the new system. It also includes the development of training materials. Testing involves verifying that the new system is Year 2000 compliant, provides the desired functionality, provides the desired level of integration across modules (software integration testing), and meets the acceptance criteria of the user community (user acceptance testing). This last item presupposes that the user acceptance criteria have been defined. Finally, worldwide rollout is the process of deploying the new

solution to USAID users throughout the world. This task generally proceeds in phases, which requires that a detailed plan be created first.

B. Alternatives Identification

In the following sections, we define each alternative in greater detail. In particular, these sections focus on the high-level activities USAID would be required to complete in order to implement a given solution. Some of these activities are common to all seven options listed above. These common activities are discussed in the next section, prior to the discussions of the specific alternatives.

1. The "Full NMS Fix" Alternative

The first alternative is the "Full NMS Fix" option. The basic premise of this alternative is that USAID will complete the NMS system, including all major applications: AWACS, A&A, BUD and OPS. The first step required is validating and documenting the business and functional requirements as described in Section IV. This option includes all requirements identified in the BAA and "to do" lists. USAID must also obtain external program management services (a prime contractor) and begin to address its information security infrastructure before proceeding with this option. The items below identify the additional high-level actions that are required to implement this alternative. Many of the other alternatives contain elements from this list and are simply referenced in the descriptions of the other alternatives that follow.

- Renovate all existing NMS application code (Visual Basic, SQL and PL/SQL) for Year 2000 compliance and verify compliance through testing
- Based on the security infrastructure changes and requirements analysis, rework the role-based security scheme in NMS to implement the proper security measures. This activity should include validating the need for and defining each role currently identified in the system. We also recommend that a single approach be used for determining a user's role assignments, instead of the two methods currently employed by NMS (data dictionary views or custom tables).
- Retain the current two-tier client-server, distributed database architecture of NMS
- Hire a new contractor with proven technology skills to perform all development work

- Modify and correct the NMS database design as follows:
  - –add or modify the structures needed to support new or corrected functionality
  - –remove obsolete or unneeded structures from the production NMS schema
  - –completely document the database structure
  - –analyze and define the specific requirements for replication
  - –consider completing and implementing the 1996 Common Tables effort
  - –consider adopting a common naming convention for database objects
- Identify the current production source code and fix it in the following ways:
  - –improve commenting to provide an acceptable level of documentation
  - –stabilize code by correcting the logic and programming errors identified earlier
  - –correct any functions that have been implemented but do not work properly
  - –add all missing functionality
  - –upgrade to Visual Basic version 5
  - –tune SQL statements for optimal performance
  - –consider moving more of the business logic to database stored procedures
  - –consider adopting a single connectivity tool (ODBC or Oracle Objects)

In addition to performing these activities, USAID should address the technical issues discussed earlier in Section V. Finally, USAID must complete the common activities listed above that occur at the end of the implementation, specifically testing, training and worldwide rollout.

2. The "Partial NMS Fix" Alternative

This alternative is nearly identical to the "Full NMS Fix" option in that it involves all of the same activities and still includes all of the NMS applications. The only difference is that this alternative includes only the minimum "mission-critical subset" of NMS functionality identified in Section IV. This minimum subset is assumed to be smaller in scope than the full system and should therefore require less time, effort and money to implement. In identifying and validating the necessary requirements for this alternative (one of the common activities described above), USAID should include only those requirements that are "essential" or "critical" to accomplishing the agency's business.

Alternatives 3 through 6 include some portion of this "Partial NMS Fix" option. Therefore, it is imperative that USAID give serious attention to the requirements definition process, particularly when it comes to determining which requirements represent critical functions. We recommend grouping the requirements by application because some alternatives include implementing only the critical functions of certain NMS applications and modules.

3. The "Full COTS" Alternative

The "Full COTS" alternative involves replacing as much NMS necessary functionality as possible with one or more COTS packages. To the extent possible, the selected COTS packages will be customized to include those necessary NMS functions that are not included in the COTS software. The activities listed below are required to implement the "Full COTS" alternative. These activities are in addition to the common activities already described above.

- Verify the Year 2000 compliance of the COTS packages selected
- Verify the ability of the selected COTS packages to implement suitable security measures as dictated by the agency's security requirements
- Verify the required USAID network and systems architecture (mainframe or client/server), recognizing that most (if not all) of the potential COTS packages are able to run on either environment (Note: The final COTS selections may require some changes to the architecture)
- Perform the analysis and actions required to identify, select, and procure the desired COTS software (Note: We recommend GSA schedule purchases whenever possible to streamline the procurement process.)
- Implement the selected COTS solutions, which includes the following actions:
  - –identify/implement process changes required by the COTS packages
  - –configure COTS packages to tailor them to USAID's specific requirements
  - –customize COTS packages as needed to any add required functionality they lack
  - –design and build any interfaces/bridges required to integrate the COTS solutions

4. The "COTS/NMS" Alternative

The "COTS/NMS" alternative consists of developing the "Partial NMS fix" solutions for A&A, BUD and OPS, and replacing AWACS with a COTS accounting package from the GSA schedule. The activities required to implement this option include most of those listed above for the "Partial NMS Fix" and "Full COTS" alternatives. Some additional analysis may be required for this alternative because the COTS accounting package chosen may well include some functions that are currently included in the NMS Budget module (i.e., budget execution functions). Any functions of the COTS solution that are duplicated in NMS should be removed from NMS.

Of particular importance in this option is the need to design and develop any interfaces or bridges that are needed to integrate NMS with the selected COTS package. We should also note that this option could include additional COTS packages to replace some of the remaining NMS functions, particularly the A&A and Budget modules.

5. The "Legacy/NMS" Alternative

The "Legacy/NMS" alternative consists of developing the "Partial NMS fix" solutions for A&A, BUD and OPS, and replacing AWACS with the agency's twelve existing mainframe-based legacy accounting systems. Re-activating the legacy systems involves the following tasks in addition to those identified for the "Partial NMS Fix" option:

- Renovate the twelve legacy systems for Year 2000 compliance and verify compliance through testing
- Verify the ability of the legacy systems to implement suitable security measures as dictated by the agency's security requirements and modify these systems (to the extent possible) to meet those requirements
- Maintain the current USAID system and network architecture, which supports both NMS and the mainframe-based legacy systems
- Reactivate the legacy accounting systems, which includes
  - –acquiring and installing terminal emulation software on workstations
  - –transferring the data from NMS (AWACS) back to the legacy systems
  - –updating legacy system documentation and procedures
  - –designing and building any required interfaces or bridges

6. The "Cross-Servicing" Alternative

This alternative is identical to the "COTS/NMS" alternative, except that USAID would use cross-servicing arrangements as presented in Section IX to supply the COTS capability instead of purchasing and implementing the COTS packages in-house. The activities required to implement this alternative are the same as those for the "COST/NMS" option, except that USAID must identify, select and establish the cross-servicing arrangement instead of purchasing COTS packages.

This option also requires careful design and preparation in the area of bridges and interfaces.

7. The "Outsourcing" Alternative

This final alternative is nearly identical to the "Cross-Servicing" option, except that it involves outsourcing certain NMS functions to the private sector rather than entering into a cross-servicing arrangement with another government agency.

XI

Business Analysis

This section of the report provides discussion of our alternatives evaluation and our determination of a selected alternative.

A. Methodology

In order to evaluate and recommend a solution, the IBM Team conducted a three-step benefit/cost assessment of the relative benefits, costs and risks associated with each alternative identified in Section X. IBM integrated the results of the analyses into a multi-attribute scoring model, as defined in the OMB Capital Programming Guide and GAO's Guide to Best Practices for IT Investments. Figure 11-1 illustrates the methodology we used in our benefits/cost assessment.

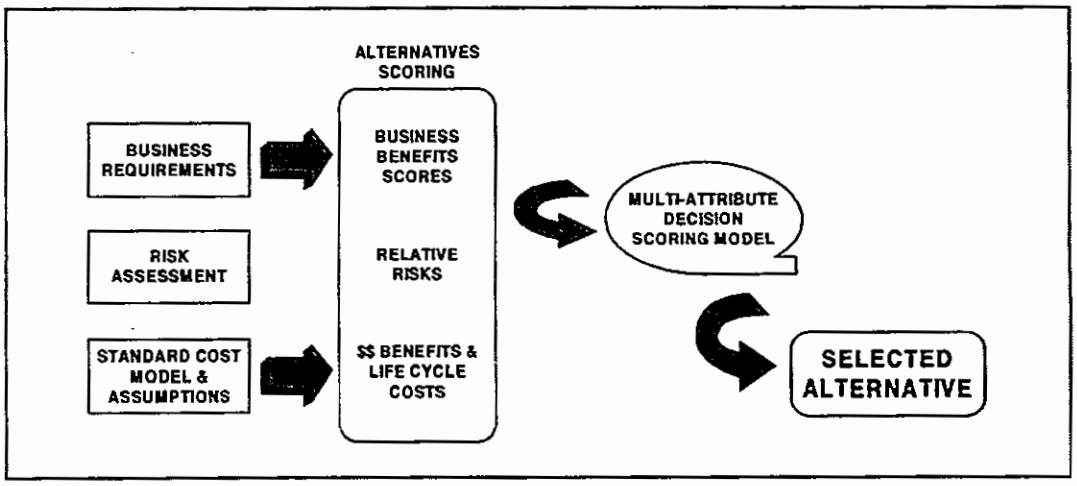

Figure 11-1: Benefits/Cost Assessment

The benefit analysis rates each alternative by assigning benefit scores indicating how well each alternative met the business needs identified in Section IV. The cost analysis presents the estimated costs of each alternative and the risk assessment identifies the risk of each alternative against a standard set of criteria.

A multi-attribute scoring model compiles the scores of each alternative with respect to cost, risk, and benefit to reach a total benefit-cost ratio for each alternative. The alternative with the highest score is recommended. The following sections provide a detailed description of the methodology used for the analysis.

B. Evaluation of Alternatives

In order to evaluate each alternative, we scored business needs against the alternative's ability to provide those needs. Business needs were derived by looking at our impact level assessment scores for each application and identifying where the largest gaps in the system functionality existed as discussed in Section IV. We assessed the organization's ability to meet the system Year 2000 deadline and overcome the security issues. Finally, we identified the percentage of all functionality that were desired and planned to be in the system and the ability to acquire that functionality by alternative.

The team scored each application's business needs on a scale between 1 and 10 with 1 representing a low confidence level and with 10 representing a high level derived from each alternative. The scores were added to provide a summary total by application. Table 11-1 shows the summary scores by application and overall score per alternative. As shown in the table, the COTS and COTS/NMS alternatives have the highest level of confidence that they can be in place by Year 2000 with all necessary functionality.

Application	Alternative					
	Full NMS Fix	Partial NMS Fix	Legacy/ NMS	Full COTS	COTS/ NMS	Cross-Servicing
AWACS	28	29	24	101	101	87
A&A	28	31	24	56	56	49
Budget	45	46	47	57	50	25
Operations	37	40	38	23	38	6
Overall Totals	138	146	133	237	245	167

Table 11-1: Alternatives Assessment Summary Table

A brief discussion of each alternative follows.

1. Full NMS Fix

Of all the alternatives, the Full NMS Fix scored the second lowest with an overall score of 138. The primary benefit to fixing all of NMS is that the data is already in the system. Also, USAID will reap the benefits of all desired functionality already in Budget and Operations. Yet, the primary driver of the

low score is that much of the functionality in the AWACS and A&A applications could not be achieved through this option. For example, the AWACS design does not plan to incorporate all the necessary functionality to comply with federal laws such as JFMIP and FMFIA. Furthermore, as currently designed, loan management is not designed into the system. Another contributing factor for this alternative's overall score came from our technical review (Section V) reveals that the system itself needs a significant amount of rewrite and design to incorporate required functionality, become Year 2000 compliant, and increase the quality of the code. It would be costly to redevelop and maintain NMS in the future. More importantly, as our Capability Maturity Model assessment shows (Section III), historically USAID has not been able to manage information systems development successfully and without severe slips in schedule. In addition, USAID does not have a security program in place for the entire Agency nor do they have an integrated approach to security throughout NMS, which leaves the system open to possible corruption.

2. Partial NMS

This alternative scored slightly higher than the Full NMS Fix primarily because it requires a minimum critical subset of the current NMS system which means that there are fewer lines of code to fix and less functionality to incorporate. By the same token, it puts the agency in the same situation as the Full NMS Fix with regards to Year 2000 compliance, security, and management structure.

3. Legacy/NMS

This option scored the lowest because it has minimal long-term benefits. One benefit is that it maintains much of the NMS functionality and provides a stop-gap approach for core financials. Moreover, the missions are currently using MACS and would not have to relearn how to use the system. Also, the legacy systems are in the process of becoming Year 2000 compliant and transactions are real time which means users do not have to wait hours for updated financial transactions. Yet, this alternative contains extreme drawbacks such as having to revitalize FACS while it is in the process of being turned off. In terms of the NMS side of this alternative, the benefits are the same as those cited in the Partial NMS solution above.

4. Full COTS

The Full COTS alternative scored the second highest because it ensures that USAID can comply with the JFMIP and FMFIA regulations and could be installed with minimal customization and still gain the required core financial system functionality. Also, since these packages are already installed in many other government agencies and bureaus, they are proven solutions designed and based on industry best practices. As detailed in Section VIII, one option on the GSA schedule has the ability to work with foreign currency. Also, the vendors state that the packages are already Year 2000 compliant, which resulted in scoring the alternative higher for Year 2000. It should be noted,

however, that the success of this alternative relies on the Agency's ability to put a security infrastructure in place, as well as being able to manage the COTS selection and implementation.

5. COTS/NMS

This alternative ranked the highest of all. The primary advantage over the COTS alternative is the fact that it can provide all the mission critical functions already in NMS while maintaining necessary functionality of A&A, Budget and Operations. Maintaining those systems benefits USAID because they help the agency conduct business in a more standard, efficient and effective fashion at the same time maximizing the current NMS.

6. Cross-Servicing

The IBM Team views the benefits of this option similarly to that of the Full COTS solution because the agencies use the same proven COTS solutions as identified in the COTS section and allow customization. Yet, this alternative was given a much lower score because of serious concerns. For example, as identified in Section IX, none of the Cross-Servicers' systems are Year 2000 compliant and USAID will have to rely on those agencies to fix them. In addition, security is a large problem because the Cross-Servicing agency is responsible for the security program, plan and implementation and there is the potential for other agencies to have access to certain data. Furthermore, the Budget Formulation module and none of the Operations module functions can be cross-serviced and therefore would not exist.

7. Outsourcing

The last alternative, Outsourcing, was not evaluated because some functions are inherently governmental and USAID specific. For those functions that are not inherently governmental, we disregarded outsourcing as a viable alternative because of the time it takes to implement and outsourcing arrangement as regulated under the OMB Circular A-76.

In accordance with ITMRA and OMB Guidance for IT systems investments, USAID considered outsourcing program delivery to the private sector or a most "most-efficient" government source. The schedule required to implement this option exceeds the time available to solve the Year 2000 century date conversion problem.

The A-76 process establishes lengthy and detailed procedures for the consideration of the proposals, which should take a total of 26 months. These procedures include:

1. Technical evaluation of all offers and cost/price evaluation for industry (4 months)
2. Best Value assessment (4 months)
3. Establish best vendor proposal and performance standards and communicate results to MEO

4. MEO resubmittal of technical/cost proposal (9 months)
5. Receive and reevaluate MEO bid (3 months)
6. Review Officer review of compliance with A-76 (3 months)
7. Allowance for Protest (3 months).

Following the award of the contract, the awardee would still need to implement their solution and transfer management of the system to the private sector. Given the timetables being considered for NMS, we assumed that implementation of the solution would take approximately 18 months. This would include time to accomplish transfer of USAID data to the contractor.

Given the extended process necessary to outsource NMS, the systems could not have been up and running in time to mitigate the impending Year 2000 problems. In fact, an outsourced alternative could not have been procured and implemented sooner than September, 2004. For this reason alone, it was impractical to consider fully outsourcing NMS.

Figure 11-2 details the steps and timelines necessary to pursue the outsourcing option. First, USAID would need to define the outsourcing requirements and establish a Most Efficient Organization (MEO) to compete the government's alternative. This process would have to begin on February 2, 1998, and would take approximately seven months. Although it would need to allow the MEO to get organized first, USAID might be able to issue the Request For Proposal (RFP) before the MEO is fully established. Still, the RFP would need to be left out for private sector and MEO consideration for approximately nine months.

WBS	Task Name	Duration
0	**USAID NMS Outsourcing Alternative**	**1735d**
1	1 Define Outsourcing Requirements	90d
2	2 Establish MEO	120d
3	3 Issue RFP	262d
4	4 Tech Review of offers	120d
5	5 Cost/Price Eval. (Industry)	120d
6	6 Best Value Assessment	120d
7	7 Est. Best Value Prop	1d
8	8 Communicate best vendor prop to MEO	1d
9	9 MEO Tech/Cost prop	270d
10	10 Receive & Eval. MEO Prop	90d
11	11 A-76 compliance review	30d
12	12 Protest	90d
13	13 Outsource Award	1d
14	14 Solution Implementation & Transfer	540d

Figure 11-2: Outsourcing Tasks/Schedule

C. Cost Analysis

This section of the report presents the cost estimates and underlying methodology and assumptions for the six feasible alternatives. The IBM Team did not develop a cost estimate for the Outsourcing alternative because it clearly could not meet critical USAID schedule needs.

These costs represent a rough-order of magnitude estimate that are likely to change as USAID gains greater understanding of the requirements and architecture required to implement the selected alternative. Table 11-2 summarizes the results of our analysis including an estimate of the USAID full-time equivalents required to adequately staff a project office and provide an effective information systems security infrastructure.

Cost Element	Full NMS Fix	Partial NMS Fix	Legacy/ NMS	COTS	COTS/ NMS	Cross Servicing
USAID Program & Security (FTEs)	14	12	18	10	12	16
Prime Contractor	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000
Service	$7,150	$7,150	$7,150	$7,150	$7,150	$7,150
Licensing	$112	$112	$0	$912	$762	$112
Design and Implementation	$32,513	$22,916	$17,236	$10,317	$11,6910	$877
Y2K Fix	$3,600	$3,400	$7,800	$1,200	$1,200	$3,500
Interagency Integration	$0	$0	$0	$0	$0	$4,000
Cross Servicing Fees	$0	$0	$0	$0	$0	$4,000
Hardware	$20,200	$20,200	$20,200	$20,200	$20,200	$20,200
Telecommunications	$800	$800	$800	$800	$800	$800
Total	$74,375	$64,578	$63,186	$50,579	$51,803	$50,639

Table 11-2: Alternative Cost Summary ($'s in 1,000's)

1. Description and Assumptions Associated with Key Cost Elements

The costs for each of the alternatives were identified within nine key categories. Two additional cost areas, inter-agency integration and cross-servicing fees, only apply to the cross-servicing alternative.

a. USAID Program Office

Program Office costs reflect the USAID staff resources required to effectively manage and implement the selected alternative. Table 11-3 presents the initial program office requirements (in FTE's) for each alternative.

FTE Category	Full NMS Fix	Partial NMS Fix	Legacy/ NMS	COTS	COTS/ NMS	Cross Servicing
Program Manager	1	1	1	1	1	1
Deputy PM/COTR	1	1	1	1	1	1
Budget/Financial Analyst	1	1	1	1	1	1
Schedule Lead./Legacy Reactivation/Cross-Servicing Negotiator	1	2	6	0	2	7
Application Leader	6	5	5	5	5	4
Y2K Leader	1	1	1	1	1	1
Architect	1	1	1	1	1	1
Total	14	12	18	10	12	16

Table 11-3: FTE's Required by Alternative

b. Prime Contractor Cost

Prime contractor costs reflect the cost of using a single contractor to partner with USAID to successfully implement the alternatives. The prime contractor is responsible for project management, systems integration and deployment, subcontractor management, and testing.

c. Service

Service costs represent the set of supporting activities required to effectively implement and utilize the selected alternative. These activities include training USAID users and security administrators on the use and protection of the system, documenting the system for users, and managing organizational change associated with the USAID-wide implementation of the selected alternative. It also includes the staffing and maintenance of a help desk that will respond to user questions and provide ongoing support.

d. Security Licensing Costs

Security licensing costs represent costs for obtaining desktop and server security products. This cost is an estimate that represents the midpoint in the range of security products available from the GSA Schedule. A precise estimate must be based on the COTS products (if selected) and the results of a formal analysis of USAID security processes and procedures.

e. Design and Development

Software costs include the cost of designing changes that need to be made to incorporate new functionality and fix current functionality problems. These costs include data base design, customizing COTS applications, configuring interfaces and code stabilization. Code stabilization includes correcting logical and functional errors in the existing code and improving its overall readability and maintainability, including the addition comments to the code to provide an adequate level of documentation.

Design and implementation includes designing security measures, project management, and design testing. It also includes the cost of cleaning up legacy and NMS data before transferring into the new solution. As applicable, the estimates also include the costs of customizing COTS applications for the mainframe. Finally, these costs include the modifications and testing required to make the existing application code Year 2000 compliant.

The following assumptions apply in determining the estimates:

- Labor rates: $100/hr * 2000 hrs./yr = $200,000 year.
- Coding rates of 500 Source Lines of Code (SLOC) per month for an experienced programmer and cleanup rates of 750 SLOC/month.

f. Year 2000 Fix

General Year 2000 software costs reflect the cost of analysis, tools, and recoding required to ensure that remaining legacy code (i.e., MACS and Payroll) is Year 2000 compliant. This cost category is separate from the estimated costs to recode existing NMS software to be Year 2000 compliant that are separately identified in the Design and Development category.

g. Hardware Costs

Hardware costs reflect costs associated with mainframe, operating system, PC, and terminal Year 2000 compliance. This category also reflects additional operations, system refreshment (to provide upgrades and improved versions) and maintenance costs associated with running NMS on the mainframe. A platform upgrade is necessary, regardless of the option selected, because of Year 2000 issues associated with the mainframe, terminals, PCs, and operating system upgrades.

h. Licensing Costs

Licensing costs represent costs for obtaining desktop and server security products as well as licensing fees associated with COTS products. This cost is an estimate that represents the midpoint in the ranges of products available. A precise estimate must be based on the COTS products (if any selected) and the results of a formal analysis of information requirements and USAID security processes and procedures.

i. Telecommunications Costs

Telecommunications costs reflect the costs associated with data transmission. The final estimate is contingent upon the implementation architecture selected.

2. Description of Cost Estimates by Alternative

This section describes the costs associated with each of the alternatives. Prime contractor, service, hardware, and telecommunications costs are the same for each of the alternatives.

a. Full NMS Fix

This is the most expensive alternative. Full NMS Fix costs are driven in large part by the costs of rewriting the AWACS application. High costs are also associated with completing the Budget, Operations, and A&A applications that require fixing existing code, improving code quality, and adding functionality.

Table 11-4 presents the complete cost estimate for the Full NMS Fix alternative.

Cost Categories	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	Total
USAID Program Office						
Est. USAID FTEs Personnel (Mgmt. & Security)	14	14	4	4	4	
Prime Contractor Cost	2000	2000	2000	2000	2000	$10,000
Project Management						
Systems Integration, Deployment, Testing						
Service						
Training (NMS & Security)						
Development	480					$480
Course Presentation	660	126	126	126	126	$1,164
Travel						$0
User Documentation	276	156	156	156	156	$900
Help Desk	200	200	200	200	200	$1,000
Process Optimization						
Bus. Trans. & Org. Alignment	2106					$2,106
Change Mgmt Labor	750	750				$1,500
Licensing Costs						
Security Software Licenses	112					$112
Design and Implementation						
AWACS	18667					$18,667
Budget	2577					$2,577
Budget Y2K Fix	400					$400
Operations	2192					$2,192
Operations Y2K Fix	400					$400
A&A	6870					$6,870
A&A Y2K	1100					$1,100
NMS	307					$307
Y2K Fix						
Legacy	1200	1200				$2,400
Tools and Analysis	600	600				$1,200
Hardware Costs						
Mainframe and PC Y2K	8500	8500				$17,000
Mainframe Procurement						$0
Mainframe O&M	1600	1600	0	0	0	$3,200
LAN Procurement						$0
LAN O&M						$0
Telecommunications Costs	$160	$160	$160	$160	$160	$800
TOTAL						$74,375

Table 11-4: Full NMS Fix Costs ($'s in 1,000's)

b. Partial NMS Fix

This alternative is the second highest cost alternative and focuses on fixing the source code to provide minimal critical functions. Table 11-5 presents the complete cost estimate for the Partial NMS Fix alternative.

Cost Categories	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	Total
USAID Program Office						
USAID Personnel (Mgmt. & Security)	12	12	4	4	4	
Prime Contractor Cost	2000	2000	2000	2000	2000	$10,000
Project Management						
Systems Integration, Deployment, Testing						
Service						
Training (NMS & Security)						
Development	480					$480
Course Presentation	660	126	126	126	126	$1,164
Travel						$0
User Documentation	276	156	156	156	156	$900
Help Desk	200	200	200	200	200	$1,000
Process Optimization						
BusTrans & Org. Alignment	2106					$2,106
Change Mgmt Labor	750	750				$1,500
Licensing Costs						
Security Software Licenses	112					$112
Design and Implementation						
AWACS	15680					$15,680
Budget	1985					$1,985
Budget Y2K Fix	308					$308
Operations	416					$416
Operations Y2K Fix	76					$76
A&A	3572					$3,572
A&A Y2K Fix	572					$572
NMS	307					$307
Y2K Fix						
Legacy	1200	1200				$2,400
Tools and Analysis	500	500				$1,000
Hardware Costs						
Mainframe and PC Y2K	8500	8500				$17,000
Mainframe Procurement						$0
Mainframe O&M	1600	1600	0	0	0	$3,200
LAN Procurement						$0
LAN O&M						
Telecommunications Costs	$160	$160	$160	$160	$160	$800
TOTAL						$64,578

Table 11-5: Partial NMS Fix Costs ($'s in 1,000's)

c. Legacy/NMS

This alternative focuses on reactivating the legacy accounting system and fixing NMS source code for minimal critical functions. Table 11-6 presents the complete cost estimate for the Legacy/NMS Fix alternative.

Cost Categories	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	Total
USAID Program Office						
USAID Personnel (Mgmt & Security)	18	18	4	4	4	
Prime Contractor Cost	2000	2000	2000	2000	2000	$10,000
Project Management						
Systems Integration, Deployment, Testing						
Service						
Training (NMS & Security)						
Development	480					$480
Course Presentation	660	126	126	126	126	$1,164
Travel						$0
User Documentation	276	156	156	156	156	$900
Help Desk	200	200	200	200	200	$1,000
Process Optimization						
BusTrans & Org. Alignment	2106					$2,106
Change Mgmt Labor	750	750				$1,500
Licensing Costs						$0
Design and Implementation						
Fix and Integrate Legacy Apps	5000	5000				$10,000
Budget	1985					$1,985
Budget Y2K Fix	308					$308
Operations	416					$416
Operations Y2K Fix	76					$76
A&A	3572					$3,572
A&A Y2K Fix	572					$572
NMS	307					$307
Y2K Fix						
Legacy	3400	3400				$6,800
General	500	500				$1,000
Hardware Costs						
Mainframe and PC Y2K	8500	8500				$17,000
Mainframe Procurement						$0
Mainframe O&M	1600	1600	0	0	0	$3,200
LAN Procurement						$0
LAN O&M						$0
Telecommunications Costs	$160	$160	$160	$160	$160	$800
TOTAL						$63,186

Table 11-6: Legacy/Partial NMS Costs ($'s in 1,000's)

d. Full COTS

This alternative focuses on identifying, electing, and procuring COTS packages and customizing them to provide required functionality for the Agency. COTS estimates, included in design and implementation costs, are based on experience implementing similar initiatives. This estimate represents the midpoint of a range of estimates, with the total depending on a thorough evaluation of COTS products. Table 11-7 presents the complete cost estimate for the Full COTS alternative.

Cost Categories	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	Total
USAID Program Office						
USAID Personnel (Mgmt. & Security)	10	10	4	4	4	
Prime Contractor Cost	2000	2000	2000	2000	2000	$10,000
Project Management						
Systems Integration, Deployment, Testing						
Service						
Training (NMS & Security)						
Development	480					$480
Course Presentation	660	126	126	126	126	$1,164
Travel						$0
User Documentation	276	156	156	156	156	$900
Help Desk	200	200	200	200	200	$1,000
Process Optimization						
BusTrans & Org. Alignment	2106					$2,106
Change Mgmt Labor	750	750				$1,500
Licensing Costs						
Security Software Licenses	112					$112
AWACS License	650					$650
Budget License	65					$65
A&A License	85					$85
Design and Implementation						
AWACS	5375					$5,375
Budget	1900					$1,900
A&A	2550					$2,550
Operations	416					$416
Operations Y2K Fix	76					$76
Legacy Y2K Fix	600	600				$1,200
Hardware Costs						
Mainframe and PC Y2K	8500	8500				$17,000
Mainframe Procurement						$0
Mainframe O&M	1600	1600	0	0	0	$3,200
LAN Procurement						$0
LAN O&M						$0
Telecommunications Costs	$160	$160	$160	$160	$160	$800
TOTAL						$50,579

Table 11-7: Full COTS Costs ($'s in 1,000's)

e. COTS/NMS

This alternative focuses on retaining and fixing some NMS functions and obtaining and customizing COTS applications for the remainder. COTS estimates represent the midpoint in a range of alternatives. Table 11-8 presents the complete cost estimate for the COTS/NMS alternative.

Cost Categories	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	Total
USAID Program Office						
USAID Personnel (Mgmt. & Security)	12	12	4	4	4	
Prime Contractor Cost	2000	2000	2000	2000	2000	$10,000
Project Management						
Systems Integration, Deployment, Testing						
Service						
Training (NMS & Security)						
Development	480					$480
Course Presentation	660	126	126	126	126	$1,164
Travel						$0
User Documentation	276	156	156	156	156	$900
Help Desk	200	200	200	200	200	$1,000
Process Optimization						
BusTrans & Org. Alignment	2106					$2,106
Change Mgmt Labor	750	750				$1,500
Licensing Costs						
AWACS Licensing Cost	650					$650
Security Software Licenses	112					$112
Design and Implementation						
AWACS	5600					$5,600
Budget Formulation & EA Coding (from NMS)	992					$992
Budget Y2K Fix	156					$156
Operations	416					$416
Operations Y2K Fix	76					$76
A&A	3572					$3,572
A&A Y2K Fix	572					$572
NMS	307					$307
Legacy Y2K Fix	600	600				$1,200
Hardware Costs						
Mainframe and PC Y2K	8500	8500				$17,000
Mainframe Procurement						$0
Mainframe O&M	1600	1600	0	0	0	$3,200
LAN Procurement						$0
LAN O&M						$0
Telecommunications Costs	$160	$160	$160	$160	$160	$800
TOTAL						$51,803

Table 11-8: COTS/NMS Costs ($'s in 1,000's)

f. Cross Servicing

This function focuses on cross-servicing to the maximum extent possible and fixing the source code to provide minimum critical functions. Table 11-9 presents the complete cost estimate for the Cross Servicing Alternative.

Cost Categories	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	Total
USAID Program Office						
USAID Personnel (Mgmt. & Security)	16	16	4	4	4	
Prime Contractor Cost	2000	2000	2000	2000	2000	$10,000
Project Management						
Systems Integration, Deployment, Testing						
Service						
Training (NMS & Security)						
Development	480					$480
Course Presentation	660	126	126	126	126	$1,164
Travel						$0
User Documentation	276	156	156	156	156	$900
Help Desk	200	200	200	200	200	$1,000
Process Optimization						
BusTrans & Org. Alignment	2106					$2,106
Change Mgmt Labor	750	750				$1,500
Licensing Costs						
Security Software Licenses	112					$112
Design and Implementation						
Operations	494					$494
Operation Y2K Fix	76					$76
NMS	307					$307
Legacy Y2K Fix						
Legacy	600	600				$1,200
Tools and Analysis	1150	1150				$2,300
Cross Servicing Fees		1000	1000	1000	1000	$4,000
AWACS						
A&A						
Interagency Integration	2000	2000				$4,000
Hardware Costs						
Mainframe and PC Y2K	8500	8500				$17,000
Mainframe Procurement						$0
Mainframe O&M	1600	1600	0	0	0	$3,200
LAN Procurement						$0
LAN O&M						$0
Telecommunications Costs	$160	$160	$160	$160	$160	$800
TOTAL						$50,639

Table 11-9: Cross-Servicing Costs ($'s in 1,000's)

D. Risk Assessment and Analysis

1. Risk Assessment

The IBM Team identified and measured the risk drivers of each of the six alternatives. The team selected the following nine criteria because they represent uncertainty regarding future events that could have a detrimental effect on meeting the program goals. These criteria and the methodology presented also comply with OMB's Capital Programming Guide.

- Schedule Longevity
- Life Cycle Cost
- Technical Feasibility
- Technical Obsolescence
- Architecture Dependencies
- Skills
- Program/Acquisition Management
- Procurement Monopolies
- Availability of Funds

The following paragraphs provide a description of each risk category.

a. Schedule Longevity

This risk category refers to the amount of time it will take to obtain funding, conduct the acquisition, and implement a solution. The amount of risk varies directly with increased time. The analysis focused on factors such as human requirements and complexity of the alternative.

b. Life Cycle Cost

This risk category examines the magnitude of risk based on the dollar size of the project. OMB and GAO best practices guides note that risk of a program varies directly with the dollar size, due to the dollars invested and the potential opportunity costs if capital investment criteria (e.g., ROI) are not met. The analysis focused on the cost analysis figures as well as the reliability of the estimates.

c. Technical Feasibility

This risk element refers to the technical difficulty and complexity of implementing each alternative. Risk varies directly with increasing complexity and technical challenge of a given alternative. For

example, developmental systems are inherently more risky compared to modifying or using a COTS alternative. The analysis focused on a variety of technological considerations including the data architecture needs and level of integration required.

d. Risk of Technical Obsolescence

This risk category refers to the timeframe within which a particular option is likely to become obsolete due to technological improvement and product life cycles. While we have assumed a five year life-cycle for cost analysis purposes, we analyzed each alternative's obsolescence beyond the five year horizon.

e. Architecture Dependencies

This risk element refers to dependencies between a new project and other projects or systems (e.g., closed architectures) that could reduce the feasibility of the alternative or result in higher costs and, longer timeline for implementation. The analysis considered a broad range of technological factors such as solution openness and portability.

f. Skills

This risk category refers to the human resource skills necessary to implement an alternative as well as the availability of those skills over the program life cycle. The analysis considered factors such as the availability of programmers, other market factors (e.g. Year 2000), the range skills required, and the size of the need over the project life cycle.

g. Program/Acquisition Management

This category refers to the internal USAID and contractor resources necessary to implement an alternative. The analysis considered factors such as the complexity of the solution, budget availability, the quality and availability of requisite software engineering and project management at USAID (e.g., CMM Level), procurement timelines, and program modularity.

h. Creating a Monopoly for Future Procurements

This risk element refers to an alternative's impact on the agency's future flexibility to consider a broad range of open and generic solutions, without being "locked in" to specific vendors or proprietary solutions. The analysis considered the alternative's dependence on an external provider for functional support, the availability of maintenance resources, the uniqueness of the products, and marketplace availability of substitutes and upgrades for the modules; for example, the selection of a software application for one module might force all other modules to be converted to that software.

i. Availability of Funds

This risk category refers to the time requirements to obtain funding and resulting impacts on meeting program objectives. The analysis focused on objective and subjective decision-making factors, such as consistency with government-wide objectives, legislation, and political considerations which might drive policy officials' funding decisions given the extensive competition for government dollars for information technology investments.

2. Risk Analysis

Once the risk drivers were identified, the risk analysis evaluated the program impacts against the alternatives. Each risk was characterized regarding the likelihood of its occurrence and the severity of potential consequences. A subjective judgment of the overall risk was rendered based on the combination of the first two items. Figure 11-3 indicates the summary of this analysis.

Risk Factors	Full NMS	Partial NMS	Legacy/NMS	COTS	COTS/NMS	Cross-Servicing
Schedule Longevity	●	●	●	◉	◉	●
Cost Magnitude	●	●	●	◉	◉	◉
Technical Skills Availability	●	●	●	○	◉	◉
Technical Feasibility	○	○	◉	◉	◉	◉
Technology Obsolescence	◉	◉	◉	○	◉	◉
Architecture Dependency	●	◉	●	◉	●	●
Program/ Acquisition Management	●	●	●	◉	◉	◉
Monopoly for Future procurements	●	●	●	◉	◉	◉
Availability of Funds	●	●	●	◉	◉	◉

● High Risk ◉ Medium Risk ○ Low Risk

Figure 11-3: Overview of Risk Analysis Scores

Based on these determinations, IBM developed an overall numeric score for each alternative by giving each high risk determination a 0.3 weighting and each medium risk score a 0.5 weighting. The higher the overall assessment, the less risky the alternative is compared to the other alternatives.

The Full COTS was determined to be the least risky alternative with a score of 0.61, and the Legacy/NMS fix deemed the riskiest alternative, risk scoring 0.11 on the risk weighting index. The COTS/NMS, Cross Servicing, Partial NMS alternatively and Full NMS alternatively scored 0.5, 0.44, 0.28, and 0.22 respectively.

a. Full NMS Alternative

The Full NMS alternative is the business-as-usual approach to fixing and completing the NMS system. The solution is relatively straightforward in terms of fixing existing programming problems and building new functionality. While the solution is technically feasible, it has already demonstrated itself to be a high-risk alternative. This alternative was the second most risky alternative, scoring 0.22 on the risk weighting index. Table 11-10 provides an overview of the risk analysis results for this alternative.

	Probability of Occurrence	Severity of Occurrence	Overall Risk Score	Justification
Schedule Longevity	High	High	High	USAID has a history of difficulty controlling schedule longevity on developmental projects. It is presumed this experience will hold true despite the assumption that the agency would bring in an experienced prime contractor. This problem has already been demonstrated in NMS.
Life Cycle Cost	High	High	High	Developmental projects have inherent cost risks. For NMS, the original funding has been exhausted and the system does not meet the agency objectives. IBM's cost analysis shows that USAID will need to expend an additional $74 million to meet the original program requirements.
Technical Feasibility	Low	Medium	Low	The alternative is a straightforward process of cleaning up code and building screens to access the database.
Risk of Technical Obsolescence	High	Medium	Medium	While the risk of technical obsolescence is high for custom developed systems, the life cycle estimate for the program is such that the organization should be able to rely on the system.
Architecture Dependencies	Medium	High	High	The existing build to suit approach suffers from many integration problems that occur as data moves between the four modules.
Skills	High	High	High	CMM analysis shows that USAID does not currently have the technical skills necessary to manage and implement this alternative. Finding the human resource skills for re-programming the code for Y2K compliance will be a challenge.
Program and Acquisition Management	High	High	High	CMM analysis shows that USAID does not currently have the program management skills necessary to implement the alternative. It is unlikely to receive additional resources from Congress to build this capacity.
Future Procurement Monopoly	Medium	Medium	Medium	Finding another contractor to manage and/or clean-up the existing code could be a problem given the quality of the existing asset. As such, AID may ultimately lose any flexibility in choosing among other vendors to help it achieve its program objectives.
Availability of Funds	High	High	High	It is unlikely that Congress and OMB will choose to fund an approach that has failed in the past.

Table 11-10: Full NMS Risk Analysis

b. Partial NMS Alternative

This alternative is a modified version of the business-as-usual approach to fixing and adding to the NMS system. The same straightforward approach is used to fix existing programming problems and build new functionality. The difference between this and the Full NMS alternative is that the focus is limited to a minimum mission-critical subset of NMS functions. Like the Full NMS alternative, the solution is technically feasible but has all the same inherent risk issues associated with developmental software projects. This alternative was the third most risky alternative scoring 0.28 on the risk weighting index. Table 11-11 provides an overview of the risk analysis results for this alternative.

	Probability of Occurrence	Severity of Occurrence	Overall Risk Score	Justification
Schedule Longevity	High	High	High	USAID has a history of difficulty controlling schedule longevity on developmental projects. This problem is only marginally mitigated by the reduced scope of work.
Life Cycle Cost	High	High	High	USAID has a history of difficulty controlling life cycle costs on developmental projects. While additional funding for this alternative is lower than for the Full NMS fix ($64 million), it is still substantially higher than the amount originally funded for the project.
Technical Feasibility	Low	Medium	Low	The alternative is a straightforward process cleaning up code and building screens to access database.
Risk of Technical Obsolescence	High	Medium	Medium	While the risk of technical obsolescence is high for custom developed systems, the life cycle estimate for the program is such that the organization should be able to rely on the system.
Architecture Dependencies	Medium	High	Medium	The existing build to suit approach suffers from many integration problems that are manifested as data moves between the four modules. Still, this alternative is less risky than the Full NMS fix given the reduced scope of work.
Skills	High	High	High	CMM analysis shows that USAID does not currently have the technical skills necessary to manage and implement this alternative. While reduced in scope, the alternative is still extremely demanding of human resource skills.
Program and Acquisition Management	High	High	High	CMM analysis shows that USAID does not currently have the program management skills necessary to implement the alternative. It is unlikely to receive additional resources from Congress to build this capacity.
Future Procurement Monopoly	Medium	Medium	Medium	Finding another contractor to manage and/or clean-up the existing code could be a problem given the quality of the existing asset. The reduced scope of work may also make the work less attractive to the existing and other contractors. As such, AID may ultimately lose any flexibility in choosing among other vendors to help it achieve its program objectives.
Availability of Funds	Medium	High	High	While the partial fix involves a reduced scope of work, it is still unlikely that Congress and OMB will choose to fund an approach that has failed in the past.

Table 11-11: Full NMS Risk Analysis

c. Legacy/NMS Alternative

The Legacy/NMS alternative is a patchwork effort to use legacy systems to address gaps in current business needs and supplement the system with working elements of NMS. This means that the alternative will have all of the inherent risks of the NMS fixes as well as the risks associated with the technological uncertainty of trying to integrate the two systems. The alternative is the most risky solution scoring 0.11 on the risk weighting index and it is unlikely, Congress and OMB would be willing to fund it. Table 11-12 provides an overviews of the risk analysis results for this alternative.

	Probability of Occurrence	Severity of Occurrence	Overall Risk Score	Justification
Schedule Longevity	High	High	High	The Legacy/NMS alternative contains the same elements of schedule longevity risk of the NMS fix alternatives and also encompasses additional risks given the uncertainty of the technical requirements.
Life Cycle Cost	High	High	High	The alternative contains the same elements of life cycle cost risk of the NMS fix alternatives and also encompasses additional risks given the cost estimation uncertainties. Despite the uncertainties, our rough order of magnitude estimate of cost is in the same range ($63 million) as the Partial NMS fix alternative.
Technical Feasibility	Medium	Medium	Medium	USAID does not have source or institutional knowledge for some legacy systems. Furthermore, there are interfaces that have to be built that represent considerable risk given the uncertainty of the requirements.
Risk of Technical Obsolescence	High	Medium	Medium	The risk of technical obsolescence is high for custom developed components from NMS. In addition, mainframe systems written in COBOL would be hard to upgrade and work with. While the legacy systems in question are already technologically obsolete, it does not mean that they cannot achieve USAID's business requirements with appropriate additional code to meet missing requirements.
Architecture Dependencies	High	High	High	The alternative will require tremendous integration between NMS and legacy systems. Again, there is uncertainty as to the potential scope of work.
Skills	High	High	High	No institutional knowledge exists for some of the legacy systems.
Program and Acquisition Management	High	High	High	CMM analysis shows that USAID does not currently have the program management skills necessary to implement the alternative. It is unlikely to receive additional resources from Congress to build this capacity.
Future Procurement Monopoly	High	High	High	Legacy systems were built on the specific USAID mainframe platform, consequently making it unlikely that any of the systems modules can be re-deployed to another platform.
Availability of Funds	High	High	High	It is unlikely, Congress and OMB will fund an expensive, technologically obsolete investment, that include developmental aspects.

Table 11-12: Legacy/NMS Risk Analysis

d. COTS Alternative

The COTS Alternative would replace the existing NMS system with commercially developed systems that have been fully tested and piloted. The approach will require some additional time and resources for data conversion and building the necessary bridges and interfaces among the packages. The agency can mitigate risks of COTS by selecting packages that can be easily integrated and require little customization. Given Congress' preference for COTS solutions, the alternative could be the easiest approach for obtaining funding. The COTS alternative is the least risky alternative, scoring .61 on the risk weighting index. Table 11-13 provides an overview of the risk analysis results for this alternative.

	Probability of Occurrence	Severity of Occurrence	Overall Risk Score	Justification
Schedule Longevity	Medium	High	Medium	COTS alternative can be acquired quickly off the GSA Schedule. USAID will need to test to verify that the system is Y2K compliant. Furthermore, USAID must dedicate time for data conversion and building bridges and interfaces.
Life Cycle Cost	Medium	Medium	Medium	Cost estimate is approximately two-thirds ($50 million) that of the Full NMS fix. Because the packages are non-developmental and have been fully tested and piloted, there is minimal risk of cost overrun. Notwithstanding, the alternative is a substantial investment above the original funding allocation.
Technical Feasibility	Medium	Medium	Medium	The COTS contains significant technical uncertainty in terms of integrating the various packages. USAID may need to build interfaces between one or more vendor systems.
Risk of Technical Obsolescence	High	Medium	Medium	Vendors will presumably upgrade their software on a regular basis to take advantage of new technological capabilities. Still, a vendor could go out of business or simply not choose to upgrade their package for financial reasons outside USAID's control.
Architecture Dependencies	Medium	High	Medium	If USAID chooses more than one COTS package, from different vendors, the agency will need to build interfaces among the modules.
Skills	Low	Medium	Low	While the vendor will provide most of technical human resource skills, the vendor may have an internal shortage of technical skills.
Program and Acquisition Management	Medium	Medium	Medium	The GSA Schedule has a number of readily available packages. USAID will mitigate risks by choosing a package with limited customization needs.
Future Procurement Monopoly	High	Medium	Medium	There is inherent risk in COTS systems because the customer is making a substantial up-front investment in a vendor proprietary system. From that point on, the customer's flexibility is limited unless it is willing to forgo the initial investment.
Availability of Funds	Medium	High	Medium	Congressional legislation and OMB guidance has encouraged agencies to use COTS packages. Still, Congress could choose not to make funds available given the past overruns.

Table 11-13: COTS Risk Analysis

e. COTS/NMS Alternative

The COTS/NMS Solution incorporates some of the positive elements of each main course of action – fixing the system or moving to COTS packages. The alternative makes maximum possible use of the initial investment. Where the current system is having the greatest problem, this solution proposes to replace the functionality with COTS. As such, the risk analysis represents a blending of previous findings for both approaches. The COTS/NMS solution was the second least risky alternative scoring 0.50 on the risk weighting index. Table 11-14 provides an overview of the risk analysis results for this alternative.

	Probability of Occurrence	Severity of Occurrence	Overall Risk Score	Justification
Schedule Longevity	Medium	High	Medium	The COTS portion of the COTS/NMS alternative can be acquired quickly off the GSA Schedule. USAID will need to test to verify that the system is Year 2000 compliant. Furthermore, USAID must dedicate time for data conversion and building bridges and interfaces. Notwithstanding, the development requirements of the alternative generate many of the same risks as with the NMS fix alternatives.
Life Cycle Cost	Medium	Medium	Medium	The cost of this alternative is slightly above that for the COTS alternative ($51 million) because it incorporates the developmental portions of the Partial NMS fixes.
Technical Feasibility	Medium	Medium	Medium	The alternative contains significant integration challenges, in terms of integrating the COTS packages with the NMS system.
Risk of Technical Obsolescence	Medium	Medium	Medium	The COTS/NMS solution is riskier than the COTS alternative because it involves incorporating part of a custom built system.
Architecture Dependencies	Medium	High	Medium	The agency will need to build interfaces between the COTS package and the NMS modules that are retained.
Skills	Medium	Medium	Medium	While the vendor will provide technical human resource skills for the COTS package, USAID will need to retain support for the NMS portion.
Program and Acquisition Management	Medium	Medium	Medium	The GSA Schedule has a number of readily available packages. USAID will mitigate risks by choosing a package with limited customization needs. The NMS portion of the work will, however, increase the risk of technical obsolescence.
Future Procurement Monopoly	High	Medium	Medium	Again, this is a mixture of risks between the COTS package and NMS. The COTS investment limits flexibility in the long-term due to the customer's investment. Finding a company to manage the existing code may be difficult as well.
Availability of Funds	Medium	High	Medium	Congressional legislation and OMB guidance has encouraged agencies to use COTS packages. Integrating working portion working portions of NMS will show that USAID did receive some value from the original investment.

Table 11-14: COTS/NMS Risk Analysis

f. Cross Servicing Alternative

The Cross Servicing Solution is technically equivalent to the COTS/NMS alternative. It incorporates some of the positive elements of each main course of actions, making maximum use possible of the initial investment. The Cross Servicing solution, however, allows the agency to outsource for the COTS functionality it needs. The Cross Servicing solution is the most risky alternative scoring 0.44 on the risk weighting index. Table 11-15 provides an overview of the risk analysis results for this alternative.

	Probability of Occurrence	Severity of Occurrence	Overall Risk Score	Justification
Schedule Longevity	Medium	High	High	While there are several agencies that will provide the service, their systems are likely not to be Y2K compliant as yet. Consequently, the agency will rely on another agency to fix its Y2K compliance problem. While cross servicing does outsource the COTS portion, USAID will still need to manage and operate the NMS portion of the system.
Life Cycle Cost	Medium	Medium	Medium	The cost of this alternative is equivalent to the COTS and COTS/NMS solutions ($50 million).
Technical Feasibility	Medium	Medium	Medium	The alternative contains significant integration challenges, in terms of integrating the COTS packages with the NMS system.
Risk of Technical Obsolescence	Medium	Medium	Medium	The cross servicing solution is riskier than the COTS alternative because it involves incorporating a custom built system and upgrading is not under the control of USAID.
Architecture Dependencies	Medium	High	High	The agency will need to build interfaces between the COTS package and the partial NMS solution.
Skills	Medium	Medium	Medium	While the cross-servicer will provide technical human resource skills for the COTS package, USAID will need to retain support for the NMS portion.
Program and Acquisition Management	Medium	High	Medium	By choosing a cross-servicer, USAID will outsource a portion of the program management responsibility. Notwithstanding, USAID will need to manage the development of customized software for the NMS portion.
Future Procurement Monopoly	High	Medium	Medium	Again, this is a mixture of risks between the COTS package and NMS. The COTS investment limits flexibility in the long-term due to the customer's investment. Finding a company to manage the existing code may be difficult as well.
Availability of Funds	Medium	High	Medium	This solution preserves a portion of NMS while at the same time using existing software that another agency already has in place. Congress and OMB may like the approach of servicing several agencies based on a single COTS investment.

Table 11-15: Cross Servicing Risk Analysis

E. Net Assessment

In order to determine which alternative is the best solution, the IBM Team factored the scores with respect to benefit, risk, and lifecycle cost. We determined the Benefit-Cost Ratio, by dividing the benefits by the normalized cost and multiplying it by the risk factor. As shown in Table 11-16, the Full COTS alternative provides will provide the most functionality at the least cost and mitigates risk significantly.

	Alternative					
	Full NMS Fix	Partial NMS Fix	Legacy/ NMS	Full COTS	COTS/ NMS	Cross-Servicing
Benefits Score	138	146	117	237	245	167
Risk Factors	.22	.28	.11	.61	.50	.44
Life Cycle ROM Costs (Millions, 5 yr. Total)	$74.4	$64.6	$63.2	$50.6	$51.8	$50.6
Normalized Cost	1.0	0.87	0.85	0.68	0.70	.068
Total Benefit-Cost Ratio	30.67	46.72	15.28	212.67	175.71	108.99

Table 11-16: Total Benefit/Cost Ratio

F. Recommended Solution

Throughout the separate parts of the Benefit-Cost Analysis, Full COTS and COTS/NMS were the two solutions, which scored favorably. For instance, the benefit scoring reveals that the COTS/NMS alternative will provide the greatest functionality. Conversely, the Risk Factor's Assessment shows that Full COTS provides the lowest risk. In terms of cost, Full COTS is the least expense solution. The benefit-cost ratio shows the Full COTS will provide the most benefits for the cost with the least risk. Therefore, to choose one solution, the IBM Team factored into the analysis the USAID management established priorities listed below:

- Ability to obtain reliable financial data in AWACS and Budget
- Ensure the integration between the Budget and Operations Modules
- Enhance the Security in the Budget Module
- Assign Emphasis Area Coding in the Operations Module
- Fulfill all functionality in the Operations Module

After computing the benefit-cost ratio, IBM concluded that COTS/NMS with a weighted benefit-cost ratio of 4.09 will best meet USAID's business needs. Table 11-17 provides a summary of the weighted benefit/cost ratios.

	Full COTS	COTS/NMS
Priority weighted scores (based on differentiating factors and USAID inputs)	1.85	5.67
Risk Scores	0.61	0.50
Normalized Life Cycle Costs	0.68	0.70
Weighted Benefit/Cost ratios	1.69	4.09

Table 11-17: Weighted Benefit/Cost Ratios

1. Implementation Plan

As part of the recommended solution, IBM has drafted a proposed transition plan between the current NMS system and the proposed solution. The plan is summarized in Figure 11-4.

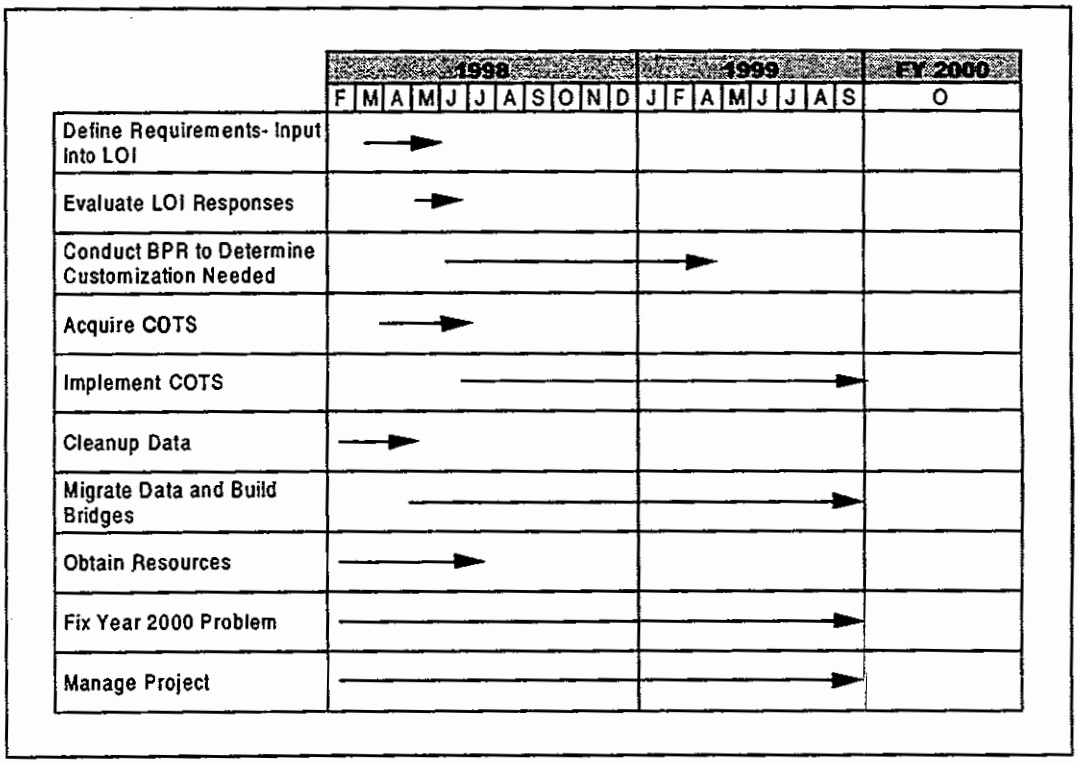

Figure 11-4: Proposed Transition Plan

The activities of the proposed transition plan occur under six main areas of activity. In the sections that follow, we present an outline of the activities by month. Figure 11-5 summarizes these activities.

	Requirements & Bus. Proc. Reengineering	COTS Acquisition & Implement.	Data Migration & Bridges	Management	Resources Training & Education	Year 2000
			1998			
Feb.	Refine IBM study to 2nd level	2/15 Proj. start Detailed plan for select/acq.	DBA creates detail data cleanup plan	Assign Req'ts. and COTS selection Mgrs.	Select Year 2000 contractor	Create Y2K Project Office. Complete stds.
Mar.	Decide min. mission-critical subset	Prelim. mtgs. with vendors. Draft LOI	Execute data cleanup plan. Input to LOI	Begin def. of BPR req'ts. Input to OMB	Y2K contractor skills on board	Input Y2K status to OMB Input to req.
Apr.	Final function content ->LOI BPR underway	Send out LOIs 4/15. Collect vendor exper. from others	Complete data cleanup	Select / hire COTS Proj.Mgr Security team in place	Y2K educ. & review at missions	Start platform upgrades, define tools req. for legacy
May	BPR continues	Vendor mtgs. & questions	Participate in V. mtgs., start map vs. req.	Begin detailed project plan	Determine project skills required	Complete all mission assess.
June	Help evaluate responses BPR complete	Receive LOI responses, eval. vs req. Decide COTS	Help evaluate responses vs. data req'ts.	Complete detailed project plan	Plan linkage of COTS spec'ts & other contr. Procure skills	Help evaluate resp. vs. Y2K req'ts. Input to OMB
July	Apply BPR req'ts list to COTS pkg. functions	Award July 1 Begin install. Def.sys design & customiz.	Define db migration/bridges <-- plan	Define config. mgt. req'ts. Project Plan approval	COTS specialists on board Def.educ. plan	Define Y2K pilot test for COTS sol'n.
Aug.	With Y2K, define req'ts. for emergency plan	Sys.des. done Detailed impl. plan sign offs Y2K pilot test	Setup / config. database	Assign / hire config. mgr.	All needed skills on board	Y2K pilot test Define emergency contingency plan
Sept.	Define MACS - COTS link req'ts.	Set up "conf. room" user eval. plan	Write conv. scripts & start testing	Mgt. review of entire plan & risks	Define, select user eval. team	Input to OMB Start legacy system testing
Oct.	Complete mission req'ts incl. non-IRM	Begin user eval. of interf. & facilities	Complete data bridge devel.		User eval. team begins	Detailed mission plan, incl. non-IRM
Nov.	Input to req. from testing	2nd pilot test - live data & users	Data bridge tests		User education plan developed	All legacy systems ready to test
Dec.		Customization coding done & unit tested		Mgt. review of entire plan & risks		Input to OMB

Figure 11-5: Transition Plan Activities

	Requirements & Bus. Proc. Reengineering	COTS acquisition & implement.	Data Migration & Bridges	Management	Resources Training & Education	Year 2000
			1999			
Jan.		Application-level testing complete			User education materials & staffing done	Manage early Y2K "events"
Feb.		Integration testing of all components				
Mar.		Integration testing completed		Mgt. review of entire plan & risks	User education begins	Input to OMB Testing completed
Apr.		Implementa-tion / cut-over begins				Implementa-tion / cut-over begins
May	User accept-ance testing (2 months)	Continue impl. & cut over	All data bridges imple- mented		Staff help desk	MACS cut- over decision (yes or no ?)
June	Final sign off on compliance w/req'ts.	Req'ts sign off Roll out to missions			Emergency contingency plan staffed	Final Y2K evaluation - legacy
July						Final Y2K evaluation - COTS sol'n.
Aug.		Full production cut-over done	All data transferred	Mgt. review of cut-over & sign off	User education complete	
Sept.		Implementa-tion / cut-over complete				Emergency contingency plan ready
Oct.	– Fiscal Year 2000 Start –					

Figure 11-5: Transition Plan Activities (cont.)

a. **February, 1998:** The components of USAID's *minimum mission-critical subset* of requirements should be defined in more detail and completed by March 1st. USAID may wish to use the work done by the IBM Team and USAID's management and users as a base for this second level of detail. Management should assign a full-time Requirements Manager to manage this and subsequent requirements work. A COTS Selection Manager should also be appointed so that the COTS acquisition process can begin by February 15th. The manager's team should create a detailed plan and timeline for the selection of the best COTS alternative.

Since much of the current data managed by NMS is incomplete and subject to inaccuracies, the Data Base Administrator should create a detailed data cleanup plan that can be completed by April. A Year 2000 Project Office, with full-time staffing should be set up and a contractor with substantial Year 2000 experience and skills should be selected to assist with all of USAID's Washington and Mission Year 2000 renovation, testing and implementation.

The current Year 2000 standards work should be completed and approved by USAID management, since it will be a key element in the requirements definition for COTS vendor selection.

b. **March, 1998:** As a result of the requirements work, USAID should decide on the *absolute minimum* set of mission-critical functions that can enable it to continue to operate through the Year 2000 transition period. Even the COTS plan has substantial schedule risk, and USAID's operation cannot afford to be crippled by Year 2000-related system failures. The Year 2000 Project Office team should input to this decision process. In addition, this team will have responsibility for creating the draft and obtaining management approval for the Year 2000 March update due to OMB. Year 2000 contractor skills should now be on board to help complete a detailed tactical plan.

   The most important management responsibility in March will likely be the submission of the new IT direction and plan to the OMB and to Congress. Approval of the new plans and budget request will of course be critical to meeting the deadlines imposed by the Year 2000 transition and other mandated Federal requirements. The COTS acquisition team should develop an initial draft of the Letter of Intent (or RFP if necessary) and begin preliminary meetings with the vendors who will be considered. Developing a "fast path" for this procurement will be another critical path element for USAID.

   USAID management should also begin definition of Business Process Reengineering (BPR) requirements and decide the goals and path to be pursued. Because of schedule constraints, the BPR process will need to go on in parallel with the Letter of Intent / vendor response process, and be completed by June. The revised requirements resulting from the BPR should be used in determining whether USAID's business processes can fit the COTS solution's capabilities or whether additional customization will be necessary. The BPR activity should be integrated into all elements of the decision process throughout the transition plan.

c. **April, 1998:** The final functional content to be used in the LOI should be decided so that the LOI can be sent to the vendors by April 15th. As the LOI response period begins, it will be helpful to USAID to contact other Federal Agencies and private industry customers who are using the COTS packages being considered, if this has not already been done. Their experience can be important input to the selection process. An experienced COTS implementation Project Manager should be hired, and improved Project Management practices and techniques should be defined and agreed. USAID should decide on the management and staffing of the full Security team and put this in place. Security considerations will be a vital input to requirements and COTS planning.

   Data cleanup should be completed as preparation for the migration and data bridge planning to be done. Hardware and software platform and version upgrades required for Year 2000 compliance should be started as base for the COTS solution and related NMS and/or legacy system Year 2000 renovation or replacement. A thorough review of mission Year 2000 requirements should be done, including non-IRM mission-critical systems along with

awareness education for Mission management. This requirements process should be integrated with the ongoing BPR work.

d. **May, 1998:** The COTS acquisition team will be meeting with vendors to clarify requirements and answer questions during the vendors' response activity. The requirements and data teams, the COTS Project Manager and the Year 2000 Project office will need to assist in this process. This should also help in preliminary mapping of vendor capabilities vs. requirements. The COTS Project Manager and team can begin drafting many of the elements of the detailed project implementation plan and the determination of the project management and technical skills that will be required. The Year 2000 team should complete the mission-wide assessment activity. Business Process Reengineering should continue, with information interchange with vendors as needed.

e. **June, 1998:** The LOI responses should be received from all participating vendors. With assistance from the requirements and data teams, the BPR activity, COTS Project Management and the Year 2000 Project Office, these responses should be evaluated against the minimum requirements set. The final decision on the COTS alternative best meeting USAID's functional, cost and schedule requirements should be made in time to make the contract award by July 1st. This schedule will support completion of the detailed Project Plan, and the required OMB June input for Year 2000 progress. The Business Process Reengineering activity should be completed and approved, resulting in a revised (minimum) requirements list.

   The use of COTS vendor planning and installation specialists should be an integral part of the decision. Resource planning can then be done for how best to coordinate and manage their efforts with other contractors doing related work at USAID, such as the Year 2000 contractor personnel. Missing skills needed to execute the installation plan should be identified and procured.

f. **July 1998:** The July 1st vendor award schedule will support the start of COTS solution implementation with a reasonable chance of meeting the Year 2000-critical deadlines. Through a reevaluation of the actual COTS package contents against the approved minimum requirement set resulting from the BPR activity, missing functional gaps can be specifically defined, and decisions made as to whether to adapt NMS or legacy system components, buy or build to best fill these gaps. In turn, this will support decisions on the specifics of the system design and architecture, and a definition of the customization that will be needed. Input to this planning will be needed from the data team, including definition of required database migration and bridges, and from the COTS vendor's specialists. The full project plan should be readied for management approval.

   To prepare for the implementation schedule which will likely require some additional implementation, Configuration Management requirements will need to be defined and appropriate procedures put in place with technical management and personnel. A user education plan can now be determined, and an initial pilot test to assure Year 2000 compliance of the vendor package using USAID data can be described.

g. **August, 1998:** Detailed system design should now be completed, and a final version of the implementation plan presented for management approval. The Year 2000 initial pilot test should be done and appropriate adjustments made to planning details if needed. The data team can begin database setup and configuration. Configuration management tools should be obtained, and staffing completed. All needed skills should be identified and be on board by September 1st. Finally, since there can be no assurance that the implementation plan will result in removing 100% of remaining Year 2000 problems, an emergency contingency plan should be defined that can react quickly when Year 2000 errors or crashes occur. This plan should also address Year 2000 "events" that may well happen in advance of the actual Fiscal Year 2000 start.

h. **September, 1998:** USAID has decided to renovate MACS as an "insurance" policy against an NMS or alternate financial management solution not being fully ready in time for the Year 2000 transition. The requirements for linking MACS and other mission-based systems to the COTS solution should be completed if this has not already been done. Since user approval of the final system implementation is an important element, we suggest a "Conference Room" approach for user evaluation of the system. This will involve selection of a panel of representative users who can test the system on a part time basis. The latest version of the system implementation should be made available in a conference room or other convenient location so that testing sessions can be made easy to schedule.

   The installation of a Year 2000 COTS solution, preparation of data conversion scripts, and completion of renovation work on necessary legacy systems can essentially support the OMB-set September, 1998 target of "ready to test for Year 2000", in our opinion. The scheduled September input to OMB can support this progress. It will be essential therefore to have a full USAID management review and approval of the entire plan in this time frame. The risk level must be fully understood.

i. **October, 1998:** All mission requirements work should now be completed, including identification of those non-IRM systems that are critical to mission operation. In addition, the "embedded chip" building and infrastructure Year 2000 risk should be fully understood and adequate plans underway to fix problems where necessary. This will support completion of the detailed Year 2000 plan for all missions as well as Washington, including awareness and contacts advice to countries where USAID has sponsored IT and other activities (e.g., manufacturing facilities) where there may be a Year 2000 exposure.

   Data bridge and interchange development should now be complete and ready for testing. The user evaluation panel or equivalent should now be in operation to provide continued usage and requirements feedback to the system implementation team.

j. **November, 1998:** The testing process of all components of the [minimum] system solution should now be under way. A second full pilot test using all system components and data bridges should be held to understand where gaps and errors are still present, and as feedback to the requirements team. Adjustments to specific requirements definitions may be appropriate as an alternative to changing system code. All legacy system Year 2000

renovation should now be ready to test. The user education plan should be completed and approved.

k. **December, 1998:** Unit testing of customization code written or acquired should now be complete, so that all system components are ready for full testing at an application level. Since quarterly input is required to the OMB on Year 2000 progress, this month should also see a full management review of progress and risks, with appropriate plan and resource adjustments being made.

l. **January, 1999:** Application level testing should now be done, so that all integration within an application (e.g., Procurement) can now be assured. User education materials and staffing should be complete and a schedule announced. Since early "Year 2000" events can be expected to occur more frequently in 1999 (e.g., using a "99" as an end of data designation instead of a real year), the Year 2000 team should be ready to manage and fix these events as they occur, with feedback to the system implementation team where necessary.

m. **February, 1999:** Integration testing of the entire system should now begin, to determine if all components work together properly and transfer data to each other as needed. The system test should include not only the COTS package and customization, but also the data bridges and interchanges with any legacy system components and with "trading partners" such as Treasury.

n. **March, 1999:** Integration testing should now be complete, meeting the OMB-set Year 2000 deadline of "ready for implementation / cut over". User education on the final system can now begin. The scheduled OMB quarterly input should trigger another management review.

o. **April, 1999:** Implementation and cut-over can now begin.

p. **May, 1999:** User acceptance testing leading to final review and compliance sign off should now be scheduled. This activity should take about two months. This leaves time for last minute changes and testing, if required. All data bridges, using clean data should now be ready. A staff help desk should be set up to support the users as they complete their education. Also, at this point, a decision can be made as to whether the MACS "insurance" plan is still needed, or whether the missions can cut over to the new system.

q. **June, 1999:** Final sign off on compliance with all requirements should now take place. Depending on the decision regarding MACS, rollout to the missions can now begin. User education continues. Final Year 2000 evaluation of all other legacy systems that were renovated or replaced should now be done. The emergency contingency plan for post FY2000-start Year 2000 failures should now be complete and staffed.

r. **July, 1999:** The final Year 2000 evaluation of the new system solution should be completed.

s. **August, 1999:** Full production cut-over can now be done, and all data transferred. User education should be complete, and a final management review of the implementation and cut over should be held.

t. **September, 1999:** Implementation and cut over should be completed with a full data conversion test and parallel operation for one month. While an emergency contingency plan should be ready if needed, the new system solution should be ready in time for the Year 2000 transition.

u. **October, 1999:** October 1, 1999 is Fiscal Year 2000 start and the target date for completion of the USAID system solution. Given successful implementation of the minimum set of requirements, additional requirement implementation may now be planned.

XII

Business Case

This section of the report provides a summary of the IBM Team NMS assessment and alternatives analysis, findings and recommendations. The material in this section provides a prototype for USAID to create a business case for funding justification. Such a business case is dependent upon key decisions that must be made by USAID management regarding alternative selection and implementation. Any final business case would require appropriate adjustment of the material in this section.

A. Introduction

The United States Agency for International Development (USAID) is requesting approval of funding to implement a solution for addressing operational gaps in the New Management System (NMS). NMS is a critical management tool for USAID because it supports the Agency's fundamental missions of providing appropriated monies to developing countries for such goals as education, population control, and child survival. NMS provides the means by which the Agency monitors and controls spending, accounts for and reports on its program dollars, plans its out year program funding, establishes its goals, and reports on results.

This proposed solution provides Year 2000 century date processing, an enhanced security infrastructure, compliance with federal financial management requirements, maintainable and stable source code, and functional capabilities needed by the USAID worldwide user communities. In addition, the solution incorporates implementation of a project management infrastructure, optimized processes, and organizational change management. The Business Case describes the business and technical needs for the NMS solution, results of the benefits-cost analysis and risk assessment for each alternative, and an implementation approach for the most cost-effective alternative. The Business Case is based on the guidance provided by the OMB Director's October 1996 Memorandum on Information Technology Funding (frequently referred to as "Raines' Rules") and the OMB Capital Programming Guide (July 1997).

Successful rollout of the NMS solution will require process analysis and redesign, as well as technical fixes, creation of a USAID integrated project team to direct and oversee the project, and change management to ensure successful rollout.

B. Background

USAID implemented an integrated portfolio of systems under the NMS development effort. The purpose of NMS was to consolidate its financial, acquisition, budget, and development management forms processing into a single integrated system and database for organizational management, Congressional, OMB and other government-mandated reporting and tracking requirements. NMS consists of four applications:

- AID Worldwide Accounting and Control System (AWACS)
- Acquisition and Assistance System (A&A)
- Budget System (BUD)
- Operations System (OPS)

The applications were initiated at different times and developed in separate environments.

NMS was implemented using a two-tier client/server architecture with ORACLE Version 7 Relational Database on UNIX-based IBM RS/6000 RISC-class servers, connected via a world-wide Very Small Aperture Terminal (VSAT) satellite Wide Area Network (WAN) to Pentium-class PC workstations. NMS runs under Windows 3.1, using a custom-developed Graphical User Interface-based (GUI) application based on Visual Basic 3.0, Structured Query Language (SQL), and Impromptu 3.0.

C. USAID Business Needs

There are significant technical, functional, and management/operational issues associated with NMS that inhibit its successful implementation and operation.

1. Technical Needs

NMS operations present severe technology issues in the areas of Year 2000 compliance, NMS design/architecture, and application code quality. Perhaps most importantly, the NMS application programs and data are not capable of processing Year 2000 related data. Specifically, there are many instances where calculations use only two digits for the year and therefore will be incorrect using dates 2000 and beyond. Date-related decisions, regarding such things as applicability of Federal regulations, will be made improperly. In addition, dates after 1999 will be stored incorrectly in the database, reporting may be incorrect, or applications and systems may fail.

NMS's database design and implementation needs to be improved so that it can support requests for information and new regulatory requirements, and provide economical operation and maintenance across the 40 worldwide mission locations. At present, NMS does not employ an

integrated, enterprise-wide data model, common tables are not shared, and data tables are too numerous and, therefore, difficult to use and maintain.

The current NMS Visual Basic code does not employ good coding standards and has many reliability and performance problems. While the industry standard is 10 percent or fewer programming errors, 28 percent of the NMS code has errors. These errors relate to program logic, performance, usability, and/or compliance with standards. The errors have resulted in reporting errors, program termination, slow performance, and costly maintenance, as well as making the applications difficult to use. The remaining 72 percent of code may also have errors not yet identified, and the code cannot be made Year 2000 compliant until after the code problems are fixed.

While USAID's network and communication structure is viable and expandable, the current NMS systems architecture does not take full advantage of these facilities.

As a result of these technical issues, NMS will be difficult and costly to maintain; it will fail at the start of Year 2000 and it will not work properly in the interim.

2. Business Functionality Needs

In each of the four NMS applications, there are gaps between system capabilities and the functionalities needed to meet federal regulations, good practices, and user requirements.

a. AWACS

Over half of the business requirements for AWACS are not fully functional. Further, this application has come under increasing scrutiny because it does not meet core financial management requirements, including the Joint Financial Management Improvement Program (JFMIP), and may have contributed to violations of the Anti-Deficiency Act. The key gaps are highlighted below:

- Classification Structure – USAID missions are managing and accounting for funds at inconsistent levels of activity and the system does not provide for an independent project structure.
- Funds Management – The system does not allow for incremental funding and poor system performance may have contributed to potential violation of the Anti-Deficiency Act.
- General Ledger – General ledger balances are not supported by subsidiary ledgers. In addition, month-end and year-end functionality has not been implemented and the year-end closing process is not functional.
- Accounts Payable – Users cannot indicate purchases to be capitalized, perform document matching, and process On-line Payment and Collection system transactions. In addition, the system does not capture receipt and acceptance data and does not meet Prompt Payment Act requirements which result in interest penalties.

- Accounts Receivable – Not all accounts receivables are recorded in AWACS and the application does not meet Debt Collection Act requirements. In addition, it lacks functionality for calculating interest and penalties due, processing pass-through collections, and establishing offsets for such things as IRS and payroll.
- Reporting – AWACS has not met any external reporting requirements, including Treasury Standard Form reports, OMB form content reports, and IRS 1099 reporting.

In addition to the above, AWACS cannot accommodate foreign currency and trust fund accounting, loans management, reimbursable orders, and JFMIP cost management.

b. A&A

In addition to shortfalls in meeting user needs, the A&A application does not incorporate functionality needed to meet recent acquisition laws and regulations. Examples of key gaps include:

- System Queries – Users do not have adequate database search capability for generating reports.
- Past Performance – Contracting Officers cannot access through NMS the agency's recorded past performance of vendors it needs to make awards.
- Accounting for Receipt of Goods – USAID does not adequately track deliverables through NMS and NMS does not provide an earned value tracking system.
- Improper Payment – Deobligation and payment approval is not entered into NMS by the same individual. In addition, there is a system lapse between the time deobligations are posted and the unliquidated balance information is updated, resulting in a window where invoices could be paid after money is deobligated.

c. Budget

The Budget application is in use worldwide and is consistent with the framework of the Operations application. There are several gaps in functionality as described below.

- Object Class Crosswalk – BUD does not provide for a crosswalk between Strategic Objective and Activity and object class code and resource category; therefore, the system does not allow users to report and allocate the Operating Expenses budget by object class and resource category. This level of reporting is required by OMB.
- Query and Reporting Functionality – Users cannot gain reliable and accurate queries and canned reports have not been developed to meet all user needs.

- Earmarks and Directives – Congressional earmarks and directives can be input into BUD; however, these earmarks do not appear on the funds allocation screens for consideration when allocating funds.
- Accurate Financial Data from AWACS – BUD uses Operating Year Budget data from AWACS when generating reports. Due to problems in the AWACS module, this data is not reliable for use in BUD.

d. Operations

The gaps in the Operations application are due to both incomplete system functionality and processes and organizational gaps that have led to incomplete data.

- Performance Data – USAID was unable to gather performance data for this years' Performance Report to Congress because there was limited use of the Operations application and completion of emphasis area coding needed to track measures and indicators.
- Generate Queries – Users cannot generate queries needed to generate reports.
- Printing – Printing is cumbersome.

The result of these business functionality gaps is that USAID has a system that is not compliant with federal laws and regulations and is not used to its potential due to lack of user functionality.

3. Management and Operational Gaps

Gaps in the areas of security and application development must be solved in order to have a successful NMS solution. With regard to security issues, USAID does not have an information technology security program or infrastructure. Specifically, NMS does not have an "owner" who is responsible for ensuring that security measures are implemented and followed, nor were security requirements incorporated into the design and implementation of NMS.

With regard to software development and project management capabilities, USAID is at a Capability Maturity Model (CMM) Level 1 which means that it does not have a process and management infrastructure necessary to support the development, acquisition, and maintenance of NMS. In addition, there is an ineffective contract management infrastructure for acquiring NMS. Further, USAID's consensus-based decision making does not provide the needed discipline for effective information technology management.

4. Organizational and Process Gaps

Technology improvements will not solve all the problems with NMS. USAID needs to address deficiencies in its organization and business processes. Organization issues include inadequate NMS project management structure, unclear and fragmented roles in each business function area and across functions, and absence of linkage between NMS and USAID strategic plans. Process issues occur because business processes were not optimized before original requirements were defined for NMS.

Table 12-1 summarizes the key organizational and process issues that have to be addressed.

Organization Issues	Process Issues
• Inadequate NMS project management structure, staffing, skills – "One-person" project management office – Inadequate competencies in system development/acquisition management • Unclear/fragmented roles, responsibilities, and accountability across functions • No enterprise-wide security management program reflecting worldwide security needs • Absence of linkages between NMS and USAID strategic plans – NMS is a critical infrastructure/enabler of agency missions, goals, and objectives – ITMRA requires that IT investments be justified by contribution to mission performance, as defined in GPRA strategic plans, and resolution of mission-critical performance gaps • Lack of communications and change management required to support technology enabled enterprise-wide performance improvement	• Process improvements have primarily automated functions, rather than reengineered processes based on performance metrics and best practices, as required by "Raines' Rules" – Funds control is performed in multiple systems - creates vulnerability to Anti-Deficiency Act violations – Invoices can be paid after funds are de-obligated – Prompt payment discounts are not being negotiated and taken. • Inconsistent levels of detail and functionality across NMS modules (e.g., inadequate functionality to provide financial control across NMS modules) • Inadequate software development processes. Major deficiencies found in: – Requirements development – Software Configuration Management – Life cycle application development • NMS has been used only as "operational" tool, rather than decision support tool, as originally "sold" and consistent how NMS would be justified under today's IT investment rules (A-11, ITMRA, OMB Capital Programming Guide)

Table 12-1: NMS Organization and Process Issues

D. Identification of Alternatives

There are seven possible solutions for addressing the gaps in technology, function, management, process, and operations. These solutions are as follows:

- Full NMS Fix – Repair the current NMS environment and incorporate all functional requirements identified in each application's Business Area Analysis and existing "to do" lists.
- Partial NMS Fix – Repair the NMS environment and modify each application to include all necessary functionalities.
- Legacy/NMS Fix – Revitalize the 12 legacy accounting systems and revert to legacy processes. For A&A, BUD, and OPS, repair the NMS environment and modify to include all necessary functionalities
- Full COTS – Replace as much NMS functionality as possible with COTS solutions, then customize to capture remaining necessary functionalities.
- COTS/NMS – Replace all AWACS with COTS solutions. Repair NMS to perform necessary functionalities not included in COTS solutions.
- Cross-servicing – Provide as many necessary functionalities as possible through cross-servicing agreements with other Federal agencies. Repair NMS to perform necessary functionalities not included in cross-servicing agreements.
- Outsourcing – Contract as many necessary functionalities as possible through external organizations. Repair NMS to perform necessary functionalities not achieved through outsourcing.

Regardless of which solution is chosen, there are important tasks that have to be performed. First, because NMS was poorly designed, it will take 30 to 60 days to refine the system requirements and specifications. Second, each alternative must incorporate the results of process redesign and organizational change. Third, USAID will need to hire an external prime contractor to manage the design and implementation of the NMS solution. Fourth, USAID will have to implement an effective security infrastructure that includes COTS security software for the system. Finally, each alternative must include training, testing, and worldwide rollout planning and implementation.

Table 12-2 summarizes the key actions required for implementing each of the seven alternative solutions.

Full NMS Fix	Partial NMS Fix	Legacy / NMS	Full COTS	COTS/ NMS	Cross- Servicing	Outsourcing
•Fix NMS code for Year 2000 •Fix NMS security •Maintain current NMS client-server architecture with distributed database •Fix database design to improve integration •Find and fix source code for all functions	•Fix NMS code for Year 2000 •Fix NMS security •Maintain current NMS client-server architecture with distributed database •Fix database design to improve integration •Find and fix source code for minimal critical functions	•Fix NMS and legacy code for Year 2000 •Fix NMS security •Maintain current NMS client-server architecture with distributed database •Reactivate legacy accounting systems •Fix NMS database design to improve integration •Find and fix NMS source code for minimal critical functions •Design and build Interfaces	•Verify COTS Year 2000 compliance •Verify ability to implement/acq uire COTS security package •Select architecture as part of COTS selection process •Identify, select, and procure COTS package(s) •Implement selected COTS solution(s)	•Fix NMS code for Year 2000 •Verify COTS package for Year 2000 compliance •Fix NMS security/verify COTS security •Maintain current NMS client-server architecture •Determine architecture of COTS in selection •dentify, select, and procure COTS package(s) •Implement selected COTS solution(s) •Fix NMS database design to improve integration •Find and fix source code for minimum critical functions	•Fix NMS code for Year 2000 •Verify cross- serviced COTS packages for Year 2000 compliance •Fix NMS security/verify security of cross-serviced COTS package •Maintain current NMS client-server architecture for NMS •Identify, select, and procure cross-servicing provider •Implement selected cross- servicing solution(s) •Fix NMS database design to improve integration •Find and fix source code for minimum critical functions	•Fix NMS code for Year 2000 •Verify service provider's systems for Year 2000 compliance •Fix NMS security/verify security of service provider •Maintain current NMS client-server architecture •Identify, select, and procure provider •Implement selected outsourcing solution(s) •Fix NMS database design to improve integration •Find and fix source code for minimum critical functions

Table 12-2: Actions for Implementing NMS Solutions

While USAID considered the possibility of outsourcing, it ruled it out as a viable solution because some functions performed by NMS are inherently governmental and USAID-specific. For those functions that are not inherently governmental, outsourcing will not be possible because the time it takes to implement an outsourcing arrangement, as regulated under OMB Circular A-76, will not satisfy the Year 2000 processing requirements. Therefore, this alternative was not included as part of the benefits-cost analysis described in the remainder of this Business Case.

E. Benefits-Cost Assessment

The selection among alternatives was performed using the benefits-cost method identified in the OMB Capital Programming Guide and GAO Best Practices Guide. These results were used to identify the solution that provided the greatest return on investment and the lowest risk to USAID.

1. Benefits Evaluation

In order to compare alternatives, each alternative was scored on the basis of its ability to meet the business needs (highlighted above under Business Functionality Needs). Table 12-3 shows the summary score by application and overall score by alternative.

Application	Alternative					
	Full NMS Fix	Partial NMS Fix	Legacy/ NMS	Full COTS	COTS/ NMS	Cross-Servicing
AWACS	28	29	24	101	101	87
A&A	28	31	24	56	56	49
Budget	45	46	47	57	50	25
Operations	37	40	38	23	38	6
Overall Totals	138	146	133	237	245	167

Table 12-3: Alternatives Assessment Summary Table

As shown in the table, the COTS and COTS/NMS alternatives have the highest level of confidence that they can be in place by Year 2000 with all necessary functionality. The COTS solution ranked high because it ensures that USAID can comply with the JFMIP and FMFIA regulations and other core financial system requirements, and could be installed with minimal customization. Also, since COTS packages are already installed in many other government agencies and bureaus, they are proven solutions designed on industry best practices. The COTS/NMS solution ranked highest because it possesses the same benefits as the COTS solution plus it provides all the mission critical functions already in NMS for A&A, BUD, and OPS.

2. Cost Assessment

After scoring each alternative's ability to meet the business needs, the implementation costs were determined. Table 12-4 summarizes the costs for implementing and maintaining each alternative, assuming a five-year lifecycle. In addition to the costs, the table presents the estimated number of USAID full-time equivalents required to adequately staff a project office and provide an effective information technology security infrastructure.

Cost Element	Full NMS Fix	Partial NMS Fix	Legacy/ NMS	COTS	COTS/ NMS	Cross Servicing
USAID Program & Security (FTEs)	14	12	18	10	12	16
Prime Contractor	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000
Service	$7,150	$7,150	$7,150	$7,150	$7,150	$7,150
Licensing	$112	$112	$0	$912	$762	$112
Design and Implementation	$32,513	$22,916	$17,236	$10,317	$11,6910	$877
Y2K Fix	$3,600	$3,400	$7,800	$1,200	$1,200	$3,500
Interagency Integration	$0	$0	$0	$0	$0	$4,000
Cross Servicing Fees	$0	$0	$0	$0	$0	$4,000
Hardware	$20,200	$20,200	$20,200	$20,200	$20,200	$20,200
Telecommunications	$800	$800	$800	$800	$800	$800
Total	$74,375	$64,578	$63,186	$50,579	$51,803	$50,639

Table 12-4: Alternative Cost Summary ($'s in 1,000's)

There is marginal cost difference between the COTS, COTS/NMS, and cross-servicing alternatives. However, the number of USAID Program Office FTE's is lowest under the COTS alternative and higher under the other two alternatives.

3. Risk Assessment

After identifying the costs associated with the alternative, nine risk drivers were evaluated and measured for each of the six alternatives. The risk drivers represent uncertainty regarding future events that could have a detrimental effect on meeting the implementation goals. The analysis of risk complies with the guidelines laid out in OMB's Capital Programming Guide.

The nine risk factors are:

- schedule longevity
- life cycle cost
- technical feasibility
- risk of technical obsolescence
- architecture dependencies
- skills
- program/acquisition management
- procurement monopolies
- availability of funds

Each risk was characterized against the likelihood of occurrence and the severity of potential consequences. The results of the risk analysis are presented in Figure 12-1.

Risk Factors	Full NMS	Partial NMS	Legacy/NMS	COTS	COTS/NMS	Cross-Servicing
Schedule Longevity	●	●	●	◉	◉	●
Cost Magnitude	●	●	●	◉	◉	◉
Technical Skills Availability	●	●	●	○	◉	◉
Technical Feasibility	○	○	◉	◉	◉	◉
Technology Obsolescence	◉	◉	◉	○	◉	◉
Architecture Dependency	●	◉	●	◉	●	●
Program/ Acquisition Management	●	●	●	◉	◉	◉
Monopoly for Future procurements	◉	●	●	◉	●	◉
Availability of Funds	●	●	●	◉	◉	◉

● High Risk ◉ Medium Risk ○ Low Risk

Figure 12-1: Overview of Risk Analysis Scores

4. Summary Assessment

As summarized on Table 12-5, the two highest-ranking alternatives are COTS and COTS/NMS. These alternatives scored significantly higher than the other alternatives in meeting USAID's business needs, provided the lowest risk exposure, and were among the three lowest lifecycle cost alternatives. When combining these factors, COTS provides the highest benefits-cost ratio at 212.67 and COTS/NMS provides the second highest ratio at 175.71.

	Alternative					
	Full NMS Fix	Partial NMS Fix	Legacy NMS	Full COTS	COTS/ NMS	Cross-Servicing
Benefits Score	138	146	117	237	245	167
Risk Factors	.22	.28	.11	.61	.50	.44
Life Cycle ROM Costs (Millions, 5 yr. Total)	$74.4	$64.6	$63.2	$50.6	$51.8	$50.6
Normalized Cost	1.0	0.87	0.85	0.68	0.70	.068
Total Benefit-Cost Ratio	30.67	46.72	15.28	212.67	175.71	108.99

Table 12-5: Total Benefit/Cost Ratio

F. Recommendation

Since COTS and COTS/NMS were the two highest rated solutions, USAID overlaid its five priority business needs to determine the best choice. COTS and COTS/NMS scored significantly higher than the other alternatives on the five business needs:

- Ability to obtain financial data from AWACS
- Budget integration with the Operations application
- Security in the Budget application
- Emphasis area coding in Operations application
- Ability to fulfill functional requirements for the Operations application

As Table 12-6 shows, the COTS/NMS solution has a benefits-cost ratio more than twice the score for the COTS solution. With a weighted benefits-cost ratio of 4.09, the COTS/NMS alternative will provide the greatest return on investment for USAID.

	Full COTS	COTS/NMS
Priority weighted scores (based on differentiating factors and USAID inputs)	1.85	5.67
Risk Scores	0.61	0.50
Normalized Life Cycle Costs	0.68	0.70
Weighted Benefit/Cost ratios	1.69	4.09

Table 12-6: Weighted Benefit/Cost Ratios

Therefore, this solution clearly addresses the business requirements for the Agency and should be pursued.

G. Compliance with Raines' Rules

The analysis and alternative selection described in this business case complies with the requirements outlined in Raines' Rules. Each rule is addressed as follows:

- A working integrated management system is necessary for USAID to efficiently and effectively perform its mission. The recommended alternative supports critical business functions consistent with Federal best practice guidelines. (Rule 1)
- The analysis considered outsourcing but rejected it because the outsourcing process cannot be completed in time to meet Year 2000 deadlines. (Rule 2) USAID will outsource project management and systems development to a CMM Level 2, or higher, contractor.
- The recommended alternative includes significant process reengineering and organizational redesign. (Rule 3)
- The recommended alternative provides the highest score in terms of return on investment and ability to meet USAID's business needs. (Rule 4)
- The recommended alternative combines COTS and non-developmental solutions with modular implementation for best integration with USAID's existing information technology environment. (Rule 5)

- The recommended alternative uses COTS solutions and a modular approach to minimize custom design risks. (Rule 6)
- The recommended alternative maintains a modular design to minimize inherent risk of large scale implementations. (Rule 7)

Full details supporting this analysis are contained in the text of the report entitled "Analysis of Alternatives with Regard to the USAID New Management System (NMS)" dated February 2, 1998.

USAID/BHR Humanitarian Assistance Common Definitions and Terms

February 11, 1998

Types of Emergencies

Complex Emergencies	Crises which are usually caused or complicated by civil breakdown /strife. Although complex emergencies can only be resolved by a political solution to the root causes of the crisis, humanitarian assistance is necessary in the interim to save lives and reduce human suffering. (OFDA).
Disaster	A disaster is a calamitous event resulting in loss of life, great human suffering and distress and larger scale material damage. (IRC)
Man-made Disasters	Humanitarian emergencies caused by humans. (OFDA)
Natural Disasters	Humanitarian emergencies which are caused by hydro-meteorological and geophysical hazards. (OFDA)

Types of Program Beneficiaries

Affected Populations	Total number of people displaced, injured, lost family member or friends, lost productive assets or livelihood, drawn into conflict, plus those people whose livelihood, incomes and well-being have been influenced by complex, natural or man-made disasters.
Beneficiaries	Persons who are receiving humanitarian assistance.
Demobilized Fighters	Former government as well as opposition group fighters who have gone through a formal disarmament and training process, and who are dismissed from military service or their future is not determined.
Disaster Victims	People whose day-to-day life patterns are disrupted by complex, natural or man-made disasters, including those who were displaced from their homestead or made homeless, were injured, lost a family member, lost productive assets, or lost their livelihood.
Ex-combatants	Former members of fighting parties/factions, involved in civil conflict or strife.
Internally Displaced People	Internally displaced persons may have been forced to flee their

homes for the same reasons as refugees, but they have not crossed an internationally recognized border (UNHCR)

Population at-risk	People increasingly affected by complex, natural or man-made disasters. They are at-risk due to the disruption or loss of their normal community and social support systems that provide the basic necessities for survival: health care, water/sanitation, food. and shelter.
Refugees	Persons recognized to be outside their country of nationality or habitual residence (henceforth "of origin"). They include: a. Persons recognized as refugees by the Host Government having ratified the 1951 United Nations Convention Relating to the Status of Refugees, and/or its 1967 Protocol; b. Persons recognized as refugees under the 1969 Organization of African Unity (OAU) Convention Governing The Specific Aspects Of Refugee Problems In Africa and those recognized in accordance with the principles enshrined in the Cartagena Declaration; c. Persons recognized by UNHCR as refuges in accordance with the Statute (otherwise referred to as "mandate" refugees); d. Those who have been granted a humanitarian (i.e., non-Convention) status in Europe, North America and Oceania: e. Persons, particularly in Europe, who have been granted temporary protection on a group basis. (UNHCR)
Resettlers	Internally displaced people, refugees, ex-combatants, and workers returning to their homestead and/or livelihoods or settle in a different area after crisis.
Returnees	Refugees, displaced people, migrant workers or other groups returning to their place of origin or country of origin.
Targeted Groups	Groups within the affected population that have been singled out to receive specific assistance.
War Affected	People directly and/or indirectly affected by civil conflict and armed resistance.

Strategic Plan & Results Framework Related Terms

Critical Assumptions	Assumptions about conditions outside of the control of NGOs and international organizations which are likely to influence achievement of a stated results and performance targets.
Impact Indicators	Measures of effects on program beneficiaries. The well-being and welfare of people are the central measures.
Input Indicators	Measures of the means by which a stated result/objective is achieved. These track the use of human and financial resources, and identify the type and amount of resources and the reasons they were provided.
Output Indicators	Measures of the outputs generated (for example, the number of search and rescue teams trained).
Performance Baseline	The value of a performance indicator prior to activity implementation. A performance baseline one element used in measuring progress toward a specific result or objective.
Performance	Progress toward achievement of a stated result/objective.
Performance Target	The specific and intended result to be achieved within an explicit time frame against which current performance is assessed.
Performance Measurement	The process that organizations follow to measure how well they are meeting their stated objectives. It involves clarifying and agreeing on organizational goals, developing performance indicators to track progress, establishing baseline data, and setting targets for future performance.
Performance Monitoring	The continuous process of collecting and recording data and analyzing and measuring progress toward achievement of a stated result/objective.
Performance Monitoring Plan	A detailed plan for managing the collection, recording, analysis and reporting of data in order to measure progress toward achievement of the results and objectives explicitly outlined in an office's results framework. A performance monitoring plan: identifies indicators to be tracked; specifies the source and method of data collection; establishes a schedule of collection for each piece of datum required; and assigns responsibility for collection to a specific office, team or individual.

Performance Indicators	Variables with a particular characteristic or dimension used for measuring progress toward achievement of a stated result. Performance indicators serve to answer "how much" or "whether" progress is made towards achieving stated results/objectives, rather than why/why not such progress is being made. Performance indicators are usually expressed in objectively measurable terms.
Process Indicators	Measures of the implementation aspects of emergency assistance activities.
Strategic Objective	The end result sought; the standard by which organizations are willing to be judged in terms of performance; the most ambitious result that program implementors are willing to be responsible for; and a result pursued through clear program strategies that trace causal linkages to intermediate results and interventions. (USAID)
Intermediate Result	A key result which must occur in order to achieve a strategic objective.

Intervention Oriented Terms

Conflict Management	Short-term interventions to contain conflict, ameliorate the symptoms of conflict, or reduce the suffering caused by conflict. The term also includes such strategies as political engineering and economic redistribution. Generally, it does not deal with the root causes of conflict or with the negotiation process between conflicting parties.
Conflict Resolution	The term conflict resolution encompasses various concepts related to conflict. All the other terms refine conflict resolution processes or actions, or make distinctions between diplomatic or non-diplomatic actions, or intervention versus non-intervention strategies. Conflict resolution is generally a nonviolent process for relationship building, collaborative problem solving, and dialogue to lay the groundwork for productive negotiation and agreement.
Demobilization	The process of converting a fighter into a civilian. A fighter is in the process of **demobilizing** when he or she has reported to an assembly area or camp, has surrendered his or her weapon and uniform, but is awaiting final discharge. Observers are usually present to ensure that weapons are in fact surrendered and stored in a secure location. Personnel in assembly areas usually register the soldiers for receipt of benefits, whether cash or in-kind.

	A fighter is **demobilized** when he or she has received discharge papers and has left the assembly area. Reporting to an assembly area is not always a component, even in a post-conflict demobilization.
Disaster Prevention	Measures taken to avert the occurrence of a hazardous event.
Disaster Preparedness	Activities directed at managing disaster response quickly and effectively in the event a disaster occurs. Disaster preparedness aims to limit the impact of a disaster by structuring the response and providing quick and effective actions after the disaster.
Disaster Response Planning	Efforts to lessen the impact of disaster before it occurs, including consideration of contingency measures.
Disaster Mitigation	Risk reduction measures implemented before, during and after a crisis or hazard to reduce and limit the impact of the crisis on people and economic assets.
Emergency Assistance	*Pre-emergency, During emergency, and Post-emergency assistance:* *Pre-emergency assistance* is the term used to indicate program activity and policy directives focused on pre-emergency, or pre-disaster assistance. Typically, these programs include: early warning systems, preventive active, preparedness, mitigation, etc. Many experts include "traditional" development activities as part of the "before" efforts focused on prevention. *During emergency assistance* is the term used to indicate program activity and policy directives focused on assistance, relief, and aid activities during the emergency or disaster. Typically, these program activities include: logistical support (medical/health, food, water/sanitation, and shelter), repatriation, and security. *Post-emergency assistance* is the term used to indicate program activity and policy directives focused on post-emergency, or post-disaster assistance. Typically, these programs include: reconstruction, rehabilitation, reconciliation, repatriation, demining, demobilization, reintegration, and preparedness.
Mediation	A process in which a third party helps others to resolve a dispute or plan a transaction but does not have the power or aspiration to impose a solution.

Monetization	Relief assistance programs where relief commodities (usually the most sought after types) are sold by local merchants to affected populations using local currencies. Merchants are able to purchase the commodities at subsidized rates from participating donor countries. Donor countries use profits from the sales to fund community improvement projects that are carried out by the local affected population. Monetization attempts increase the purchasing power of the affected population which can then begin the process of reestablishing economic cycles within the community. (OFDA)
Preventive Action	Attempts to defuse crises before they erupt into violence.
Pipeline Shortages	Situations in which there are insufficient emergency commodities and supplies at critical points in the procurement and distribution system that affect achievement of planned program requirements.
Reconciliation	The process of restoring compatibility between formerly antagonistic groups or individuals. The concept also includes the process of adjustment to changes after stressful events.
Reconstruction	Actions taken to re-establish a community after a period of rehabilitation subsequent to a disaster. Actions focus on physical structures and longer term post-disaster activities, and would include construction of permanent housing, full restoration of all services, and complete resumption of the pre-disaster state. (UNDHA, OFDA)
Rehabilitation	Assistance that addresses problems created by a disaster event which is needed to restore victims and affected communities to self-sufficiency. (OFDA)
Reintegration	The process of facilitating the transition of refugees and IDPs back into their communities of origin. In the context of ex-soldiers, it is the process of facilitating their return to civilian life.
Repatriation	The return of refugees back to their country of origin. Different types of repatriation are recognized: forced, voluntary, "spontaneous", and assisted. Some experts claim that repatriation means the return of refugees back to the *community* of origin.

Resettlement	Actions necessary for the permanent settlement of persons dislocated or otherwise affected by a disaster to an area different from their last place of habitation (UNDHA).
Transition	Rapid (or marked or dramatic) change in political, economic, social, and/or other arenas, which institutions, communities, and/or individuals have difficulty accommodating. The term embraces all kinds of transformations, such as technical, environmental, political or personal security changes. Transitions may be reflected in rapid succession or simultaneous occurrence of manifestations like tensions, confrontation and violence. Likewise, progress towards cease-fires, negotiated settlements or military intervention may indicate a transition. In BHR's context, transitions are usually a rapid change from relief operations to reconstruction and sustainable development, recognizable by simultaneous relief and development activities (OTI).

Assessment Oriented Terms

Endemic	Present continually in a community.
Epidemic	An outbreak of an infectious disease which disrupts the community and overwhelms the capacity of local health services. (WHO, 1996)
Exit Strategies	Plans for phasing out assistance.
Morbidity	The incidence or prevalence of a disease or of all diseases in a population (OFDA).
Mortality Rate	Also known as **death rate**. A ratio of deaths/ 10,000 persons/day, based on the number of deaths times 10,000 divided by the number of days times the population. (OFDA)
Needs Assessment	The determination of what assistance is needed by a region or a country following a disaster.
Pipeline Shortages	Situations in which there is insufficient food at critical points in the food procurement and distribution system that effect achievement of planned program requirements.

Re-calibration of Emergency Assistance	A continuous process of assessing beneficiary vulnerability and adjusting emergency and transitional response as appropriate.
Vulnerability	Circumstances and conditions outside our direct control that put us and our ability to function, at-risk. Vulnerability can be classified into physical, social, mental or spiritual categories
Weight-for-Height	Method of measurement to assess the nutritional status of young children by comparing the weight and height of random samples of the child population (less than 60 months) of an area at regular intervals (OFDA). See also **Z-Score**.
Z-Score	New standard measurement used during nutritional surveillance. "Z" represents the median. A Z-score represents the standard deviation above or below the median. Children with Z-scores of less than -2 are considered malnourished. Z-scores of less then -3 are considered severely malnourished (OFDA).

IBM

Analysis of Alternatives with Regard to the USAID New Management System (NMS)

Appendices to the Report to the United States Agency for International Development (USAID)

FEDSIM Project Number: 97269IDO-03

February 2, 1998

The information in this report shall not be disclosed outside the United States Agency for International Development (USAID) organization and shall not be duplicated, used, or disclosed in whole or in part for any purpose other than to assist in the development of the current IBM evaluation of USAID systems. USAID shall have the right to duplicate, use, or disclose the information to the extent provided by the contract. This restriction does not limit the right of USAID to use the information contained in the report, if it is obtained from another source, without restriction.

202

Appendix A:

NMS Evaluation Studies and Outside Reviews

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Appendix A:
NMS Evaluation Studies and Outside Reviews

Date	Source/ Author	Title	Summary Findings
December 22, 1997 (draft)	KPMG Peat Marwick	As-is Model of the Current IT Investment Review Process	USAID is not currently managing IT as an investment; need to establish strategic guidelines and link IT to Agency objectives.
December 3, 1997	Mitretek Systems	USAID NMS Independent Assessment - Findings and Recommendations	Briefing providing composite findings from earlier Mitretek reports. Provided recommendations in the areas of strategy, product development, product improvement, functionality, and integrity and performance.
November 14, 1997	Mitretek Systems	Independent Assessment of the NMS Deficiencies and Undesirable Practices	NMS software requires changes in order to improve overall software quality, to reduce maintenance costs, and to potentially improve performance.
November 6, 1997	Mitretek Systems	USAID Year 2000 Compliance Assessment and Recommended Strategy	Focused on Year 2000 compliance, yet addressed many findings in other areas such as NMS development and deployment, legacy systems, USAID management. The concluding statement that "there is a high probability of systems failure with potentially severe consequences for USAID" provides significant cause for alarm.
September 30, 1997	USAID OIG	Audit of the Status of USAID's New Management System (NMS) - Report No. A-000-97-010-P	Follow up report on the status of the five recommendations contained in the March 1997 report. Indicated that USAID had shown limited progress and had not taken action on two of those recommendations by not suspending NMS development efforts and not suspending operations of the AWACS module of NMS.
September 30, 1997	USAID OIG	1997Audit of the Internal Controls for the Operational New Management System - Report No. A-000-97-009-P	NMS does not include a system of internal controls that meets General Accounting Office (GAO) Standards for Internal Controls in the Federal Government, thereby creating a situation where full accountability of the resources made available to conduct its business cannot be assured.
September 30, 1997	USAID OIG	Audit of USAID's Compliance With Federal Computer System Security Requirements - Report No. A-000-97-008-P	USAID did not implement an effective security program that met the requirements of the Computer Security Act of 1987 or the OMB Circular A-130.
August 29, 1997	IMC Inc.	AWACS JFMIP Requirements Assessment & Compliance Report	Identified 213 core financial system requirements. Determined 125 compliant, 45 not compliant, 36 partially compliant and 7 not applicable.

Date	Source/ Author	Title	Summary Findings
July 11, 1997	USAID OIG	Audit of USAID's Efforts to Resolve the Year 2000 Problem - Report No. A-000-97-005-P	USAID may experience system problems in the Year 2000 because the Agency has not fully implemented the GAO's suggested practices. Report concluded that USAID must act aggressively to achieve Year 2000 compliance before January 1, 2000.
March 31, 1997	USAID OIG	Audit of the Worldwide Deployment of the New Management System (NMS) - Report No. A-000-97-004-P	After six months of deployment, NMS is not operating effectively because USAID has not implemented disciplined information resource management processes. The following recommendations were made as a part of the report: 1) appoint qualified CIO; 2) Assign dedicated NMS Program Manager; 3) Assign senior manager to develop and manage performance based acquisition plan; 4) Suspend NMS contractor development activities; and 5) Suspend AWACS operations
February 24, 1997	USAID OIG	Reports on USAID's Financial Statements, Internal Controls, and Compliance for Fiscal Year 1996 - Report No. 0-000-96-001-C	Could not audit USAID's financial statements because USAID did not prepare complete, reliable, timely and consistent information. USAID's financial systems do not generate the required information to generate their statements.
September 27, 1996	USAID OIG	Interim Report on the Cost of USAID's New Management System - Report No. A-000-96-002-S	Estimated actual and expected costs of NMS may exceed $96 million, but could be higher, as compared to Agency estimates of $87 million.
September 27, 1996	USAID OIG	Interim Report on the Status of USAID's New Management System - Report No. A-000-96-001-S	Status of NMS development indicated 4 of 8 NMS applications partially complete; 2 others in the analysis phase and 2 others unscheduled and unfunded. USAID remains vulnerable in financial management areas. Identified risks of premature, NMS worldwide deployment.
July 11, 1996	USAID OIG	Audit of the Controls Over the Quality of Financial Management Data - Report No. 9-000-96-005	Report summarizes OIG audits of data integrity within MACS at 33 missions. Unless corrected on a systemic, agency wide basis, serious data accuracy problems could affect reliability of NMS as it replaces MACS and other systems.
June 15, 1996	Software Engineering Institute	Software Risk Evaluation for the USAID New Management System (NMS) Project	Summarized critical risks associated with NMS development into the following areas: 1) Requirements; 2)Design; 3) Support Functions; 4) Management; 5) Human Communications; 6) Planning and Tracking; and 7) End-User Operations and Training. Total risks identified were 243, of which 76 were considered severe.
May 1993	GAO	Financial Management: Inadequate Accounting and System Project Controls at AID - GAO/AFMD-93-19	USAID could not reliably report on the use and status of all its appropriated funds. USAID did not have an AWACS steering committee. USAID systems were incomplete, error prone and inadequately documented.

Date	Source/ Author	Title	Summary Findings
February 1993	USAID	Information Systems Plan Volume I: Report to Management	USAID has not done a good job of managing its information resources. Inadequate planning, outdated technology and redundancy of processes and functions account for the current state of IT activities.

Appendix B:

Interview List

Appendix B
Interview List

			Business				Technical				
Name	Title/Position	CMM	AWACS	A&A	Bud	Ops	Net	Y2K	DB	Sec	VB
Adelota, Kola	Consultant		X								
Akalovsky, Alex	Oracle-Contractor						X				
Anstrom, Chuck	Support Development	X									
Azad, Rasool	Oracle-Contractor - Support Development	X					X		X	X	X
Baker, Murl	Project Development Officer										
Banks, Debra	Contract Specialist - Help Desk			X							
Bennett, Barbara	Legacy Project Specialist					X					
Bise, Jane	TCO Manager						X				
Blackman, Shella	Project Analyst, ANE Bureau			X	X	X				X	
Bordone, Tom	Contracting Officer			X							
Bossard, Jim	IRM Development	X									
Bowles, Bettie	Negotiator			X							
Bowman, Susan	Analyst Task Lead - Consultant		X								
Bridendolph, John	Mainframe - Legacy Systems Planning						X	X			
Brocker, Barbara	A&A Functional Lead - Procurement Analyst	X		X							
Bui, Steve	Support Development Consultant	X									
Byess, Richard	Director – Office of Results Oriented Reengineering					X					
Byllesby, Gary	AWACS Functional Lead	X									
Carpenter, Louis	Analyst		X								
Cicippio, Joseph	Financial Management Officer		X								

			Business				Technical				
Name	Title/Position	CMM	AWACS	A&A	Bud	Ops	Net	Y2K	DB	Sec	VB
Craft, John	IRM/SEC									X	
Crocker, Jim	Banyan Support Development Consultant	X					X				
Crumbly, Angelique	Help Desk - Procurement Analyst			X							
Cully, Tony	AWACS Executive Sponsor	X									
Davis, Charlotte	Program Analyst, PM, COTR			X		X				X	
Dinardo, Libby	Bureau Transition Coordinator				X	X					
Dockter, Joanne	Accountant		X								
Doherty, Sean	Routers, Consultant						X				
Dorcus, Harry	Controller, Africa Bureau			X	X	X				X	
Dowling, Terry	Support Development	X									
Eavy, Paul	IRM Technology	X								X	X
Edwards, Dan	Analyst		X								
Elgin, John	IRM/OD									X	
Escobar, Francisco	Support Development	X							X		
Febrey, Sharlene	Mainframe - Manager - Legacy Systems Planning						X	X			
Flannery, Mike	Deputy IG									X	
Fleming, Susan	Mainframe Systems Program Manager						X	X			
Floyd, Earl	System Accountant		X								
Fuksa, Mike	Security - Contractor						X			X	
Garber, Larry	Deputy Assistant Administrator					X					
Garcia, Jessica	Consultant		X								
Gibson, Mike	Banyan, SCI Consultant						X				
Goldstein, Rachel	Development - Consultant	X	X								
Gordon, Phil	TCO Consultant						X				
Gueron, Joseph	IRM Development	X								X	

			Business				Technical				
Name	Title/Position	CMM	AWACS	A&A	Bud.	Ops	Net	Y2K	DB	Sec	VB
Gunter, Sean	Operations Technical Lead - Consultant										X
Hart, Yvette	Budget Analyst				X	X					
Heneghan, Phil	Inspector General's Office	X									
Hensley, Gerald	Development Consultant	X	X						X		
Houck, James	Development - Programmer Operations	X									X
Jameson, Linny	Data Management-Mainframe						X				
Joeokell, James	Contracting Officer										
Johnson, Carrie	Configuration Control Board -Plan. And Coordinate	X		X				X	X		
Kaiser, Bruce	Support Development	X									
Kearns, Calvin	Accountant		X								
Kince, Melvin	IRM Development	X								X	
King, Joan	Financial Management Specialist		X								
Knepp, Paul	Project Analyst				X	X					
Krell, Barbara	Data Accounting Group - FM Officer	X	X								
Krishnaswamy, Rama	NMS Data Modelers								X		
Kunz, Sandy	Banyan, TCO Manager						X				
Lane, Mark	Development	X									
Larrimer, Gretchen	Acting IRM/TCO Chief	X					X			X	
Lee, Iyan	OPS Development, Activity Module					X			X		X
Lee, Suk	Bureau Transition Coordinator			X	X	X					
Lew, Mary	Financial Management Officer		X								
Lewman, Ray	Financial Management Analyst		X								
Loder, Bill	Development	X									
Lukschander, Samuel	IRM Development	X				X					
Manchester, Harry	IG/SEC									X	

			Business				Technical				
Name	Title/Position	CMM	AWACS	A&A	Bud	Ops	Net	Y2K	DB	Sec	VB
Marshall, Jennette	Support Analyst		X								
Martin, Linda	Controller, ANE Bureau			X	X	X				X	
Matejceck, Joan	Deputy CIO & Year 2000 Program Manager							X			
Matthew, Daisy	Negotiator			X							
McCormick, Michael	Support Development	X									
McDonnell, Tom	IG/SEC									X	
Milne, Alan	IG/SEC									X	
Milow, Ken	Former Team Lead Budget				X				X		X
Moore, George	Manager, Year 2000, SOAP/CCM	X						X	X		
Moreland, Janet	IRM Development and Document Operations	X									X
Mullen, Patrick	NMS Task Force, Engagement Contact	X		X				X			
Neverman, Dave	Analyst - System Planner					X					
Nolan, Beverly	Negotiator			X							
Nolley, Nathan	Support Development	X									X
Ostermeyer, David	Financial Management Officer		X								
Outterbridge, Gwendolyn	Requestor, Program Analyst, PM, COTR			X		X				X	
Owen, Darrell	Internet/Intranet Services							X		X	
Owens, Sandy	N/A		X								
Paes, Darryl	Development	X	X						X		X
Painter, James	M/B				X	X					
Parks, Susan	Program Analyst			X		X				X	
Payne, Terry	SOAP Transition, COTR - Procurement Executive	X		X							
Pereira, Oscar	Support Development Consultant	X									
Pfeffer, Howard	Inspector General's Office	X									
Plitt, Andrew	Financial Analyst		X								

			Business				Technical				
Name	Title/Position	CMM	AWACS	A&A	Bud	Ops	Net	Y2K	DB	Sec	VB
Rarick, Marcus	M/B/SB				X	X					
Richmond, Kitty	Development	X							X		
Richter, John	Budget Functional Lead	X			X	X				X	
Robertson, Denny	Bureau Transition Coordinator		X	X	X	X					
Roko, Ken	Telecommunications Specialist						X			X	
Rosetti, Ralph	Sniffer, Consultant						X				
Russell, April	Support Development	X									
Ryner, Steve	Division Chief, Central Budget Office				X	X					
Sajewski, Jerry	IRM/CIS									X	
Seakell, James	Contracting Office			X							
Shaw-Bracey, Mary	Negotiator			X							
Smith, Ronnie	Negotiator			X							
Stevenson, Marcus	A&A Executive Sponsor and Director	X		X							
Stewart, Andre	PSC										
Streufert, John	IRM Director, Engagement Ex. Sponsor	X									
Sylvia, Cristina	Negotiator			X							
Tanner, Larry	Team Lead Operations	X				X					
Tengs, Barbara	Support Development	X									
Theil, Peter	Support Budget Analyst				X	X					
Thomas, Alfreda	Negotiator			X							
Thomas, Ellen	TCO Manager						X				
Valentine, Sandra	Testing Manager, Consultant		X								
Van Vechten, Wayne	Deputy Director, IRM									X	
Vapniarek, Tom	Staff Accountant		X								
Vodraska, Anthony	NMS Program Manager, Engagement Ex. Sponsor	X									

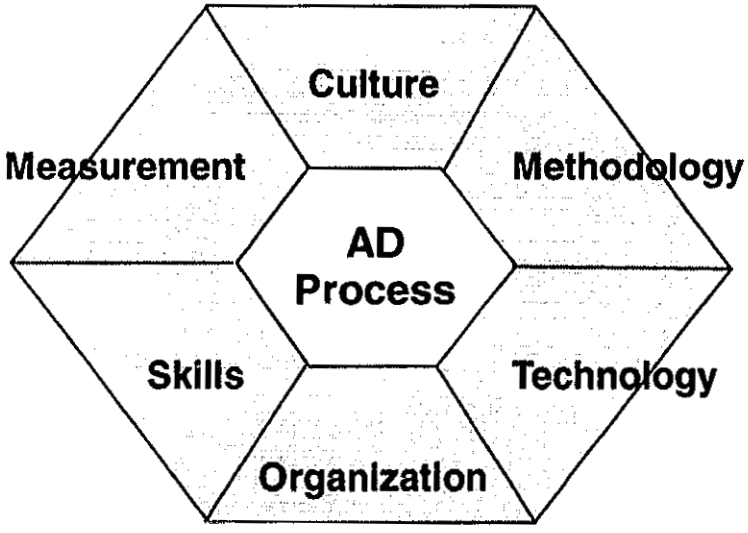
			Business				Technical				
Name	Title/Position	CMM	AWACS	A&A	Bud	Ops	Net.	Y2K	DB	Sec	VB
Walker, Sheila	Configuration Control	X									X
Walther, Mark	Contracting Officer			X							
Ward, Bob	Manager Operating Expenses, M Bureau			X	X	X					
Wells, William	Development	X							X	X	X
Whaley, Marsha	Support Development	X									
Wiley, David	Loan Management Tester		X								
Williams, Ralph	OPS co-Functional Lead	X				X					
Winters, Doyle	IBM Global Systems Year 2000 Specialist							X			
Wood, Bill	IRM Development	X					X		X	X	
Young, Frank	Director - Support Program Officer										
Yu Goldstein, Margaret	Small Purchases			X						X	
Zaldumbide, Juan	Development - Consultant	X									
Zobel, John	IRM/SEC									X	

Appendix C:

CMM Assessment Report

United States Agency for International Development

Application Development Effectiveness (ADE) Capability Maturity Model (CMM) Assessment Report



January 30, 1998

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Agenda

- Assessment Background and Approach
- Capability Maturity Model Assessment
- Conclusions
- Recommendations
- Next Steps
- Appendices

The United States Agency for International Development (USAID) engaged IBM Consulting to perform an ADE Capability Maturity Model Assessment as part of an overall NMS IV&V effort

The ADE Assessment addressed the following questions:

- What are the strengths within the organization?
- What are the major challenges facing the organization?
- What is the SEI Capability Maturity Model rating for the organization?
- What actions should be taken to provide the most value to the organization?

Dates:

- November 24, 1997 - January 30, 1998

Executive Sponsors:

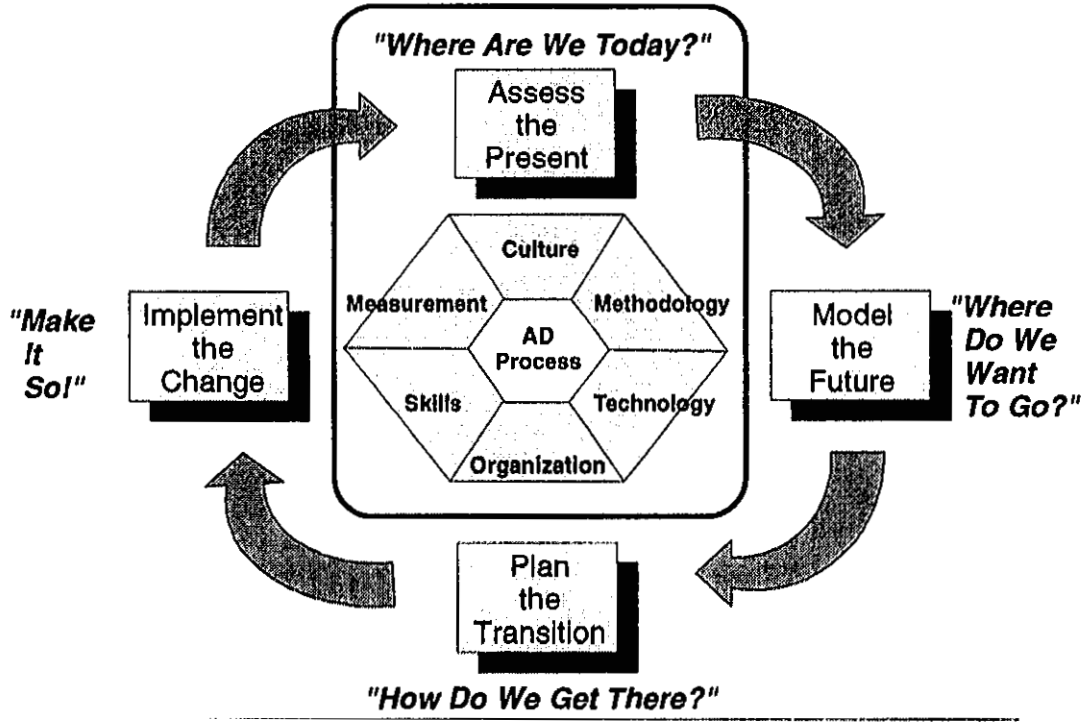
- John Streufert
- Anthony Vodraska

ADE Consultants:

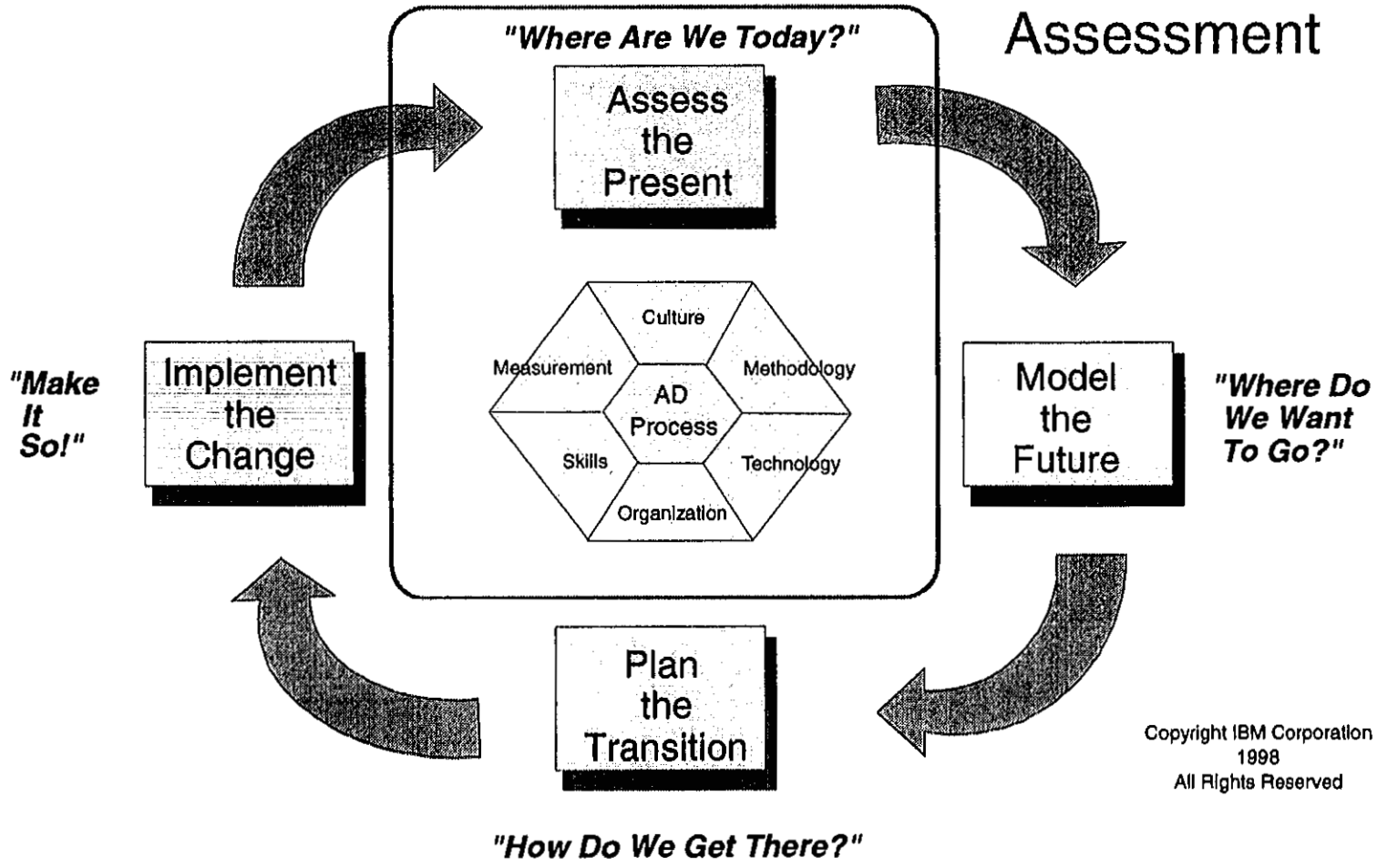
- Rob Brundage
- Jim Jones
- Terry Scott

Primary Interface:

- Patrick Mullen



The Assessment is the first phase of the Application Development Effectiveness process



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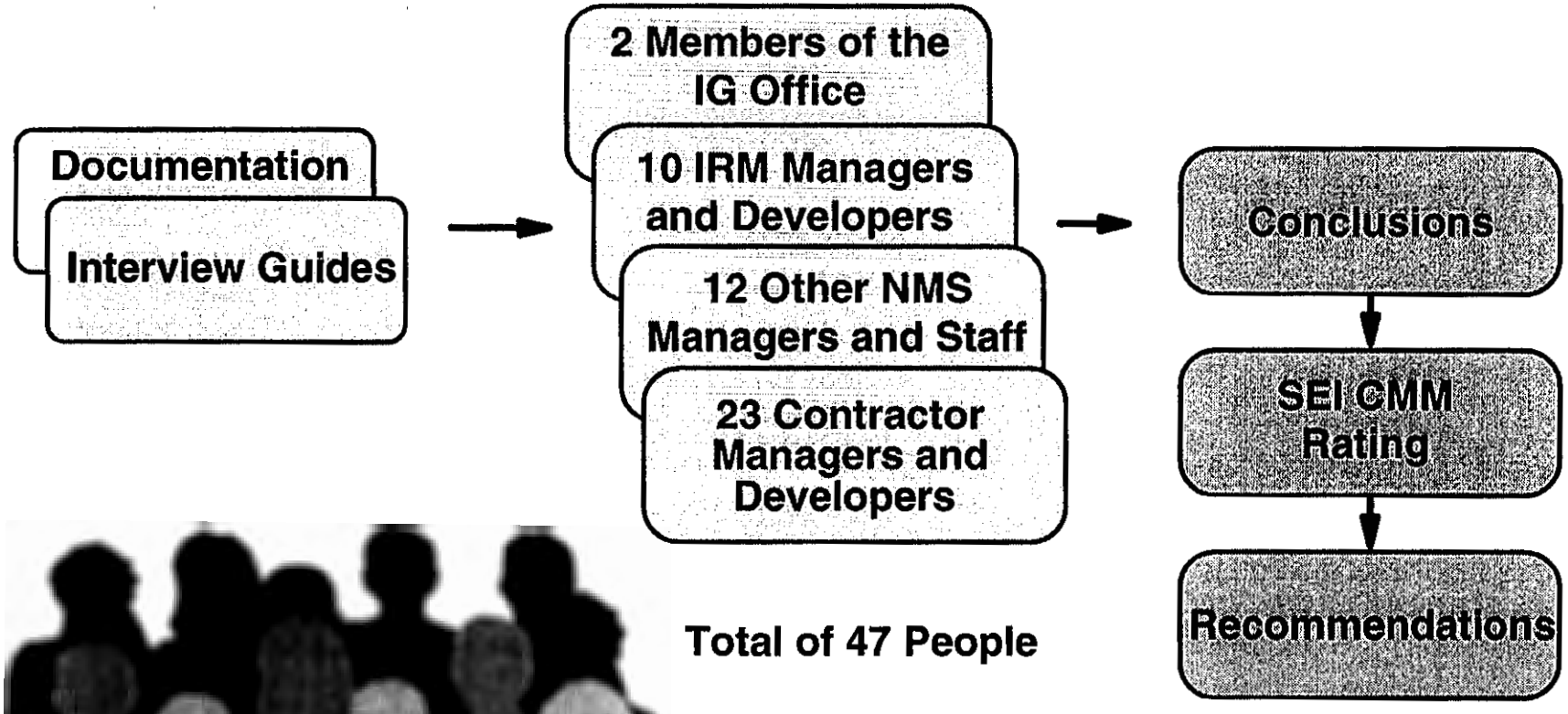
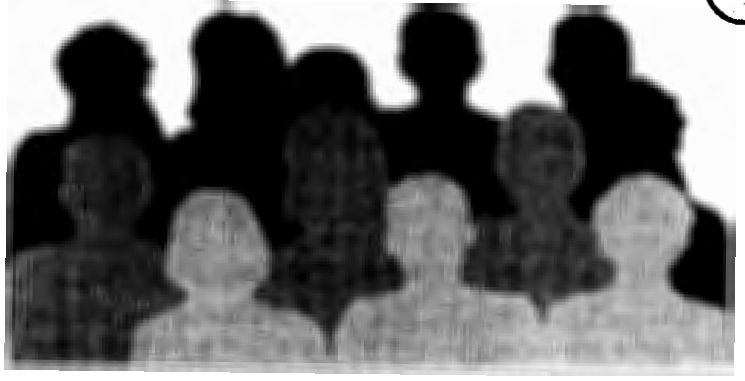
218

Data were gathered from across the USAID NMS development and user organizations, and then were used to develop the conclusions, SEI CMM rating, and recommendations





Total of 47 People

Note: the NMS development organization is considered the aggregate of contractor, task force, and IRM individuals responsible for NMS delivery

2/9

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Agenda

- Assessment Background and Approach
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- Appendices

220

The Software Engineering Institute Capability Maturity Model (CMM), an industry recognized framework, was used as the basis for the ADE Assessment

CMM level distribution of 477 US AD orgs. as of October 1997

.2% LEVEL 5 - OPTIMIZING
Focus is on continual process improvement

Data on the effectiveness of the software process is used to perform cost benefit analysis of new technologies and proposed changes

1.5% LEVEL 4 - MANAGED
Process is measured and controlled

Software processes are instrumented with defined and consistent measurements and quantitative goals for both software products and process

13.8% LEVEL 3 - DEFINED
Process is characterized and well understood

Within established product lines, cost, schedule, and functionality are under control, and software quality is tracked

22.6% LEVEL 2 - REPEATABLE
Previously mastered tasks can be repeated

The project's process is under the effective control of a project management system, following realistic plans based on performance of previous projects

61.8% LEVEL 1 - INITIAL
Process is unpredictable and poorly controlled

There are few stable software processes in evidence, and performance can be predicted only by individual rather than organizational capability - "Hero-based success"

The eighteen Key Process Areas (KPAs) within the Capability Maturity Model provided direction and focus for the Assessment

SEI Maturity Level	Key Process Areas
5 Optimizing	Technology change management Process change management Defect prevention
4 Managed	Quantitative process management Software quality management
3 Defined	Integrated software management Intergroup coordination Organization process focus Organization process definition Training program Software product engineering Peer reviews
2 Repeatable	Requirements management Software project planning Software project tracking & oversight Software subcontract management Software quality assurance Software configuration management
1 Initial	Ad hoc processes

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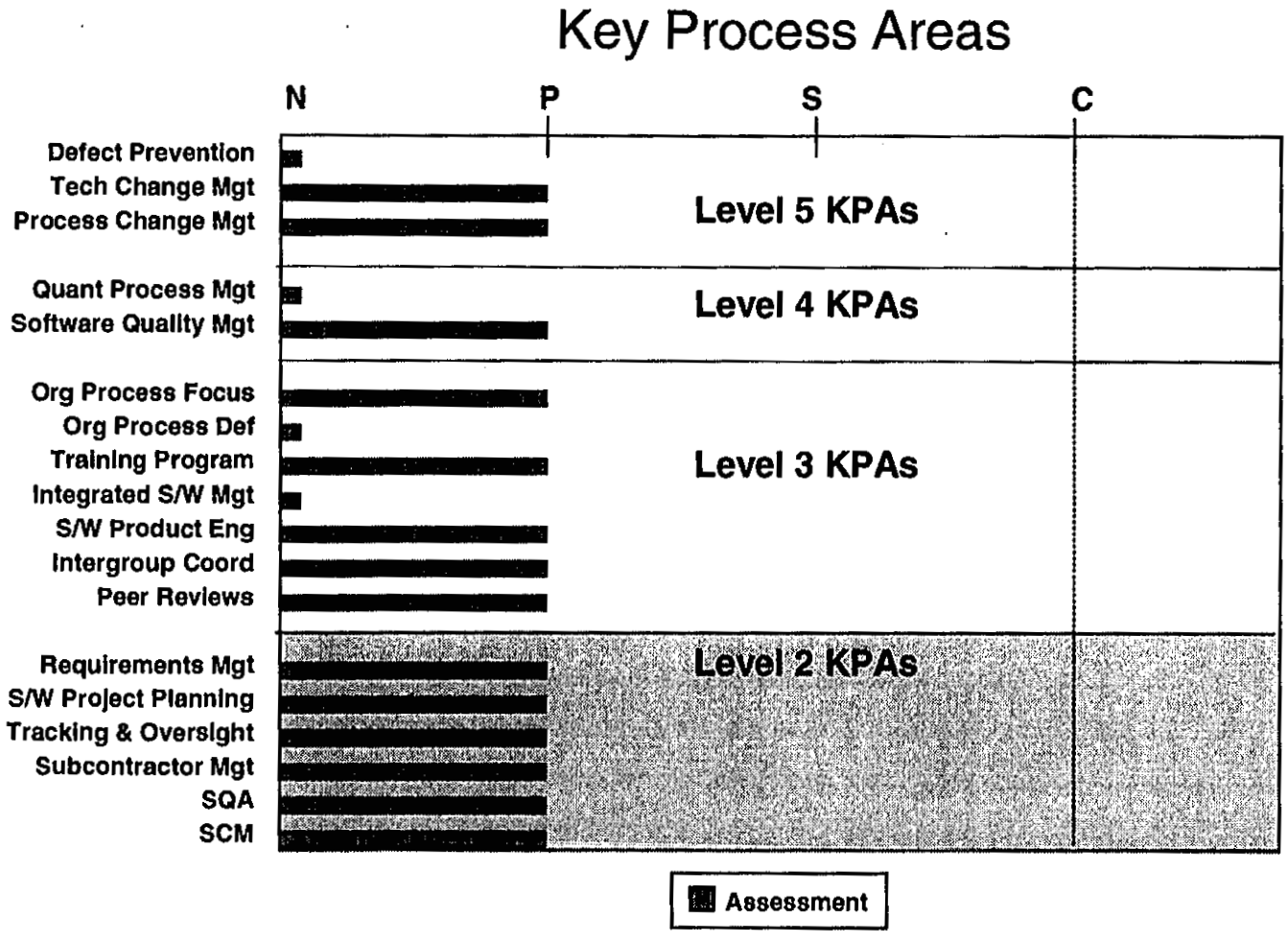
CMM compliance at any given level is specific and definitive

- To achieve a given level, there must be full compliance for all KPAs at the indicated level, as well as full compliance for all KPAs at all lower levels

- Compliance means that
  - processes exist, are documented, and are followed
  - process key practices are demonstrable and process goals are achieved
  - processes are institutionalized, i.e., everyone follows them all the time

The overall assessment rating of the USAID NMS development organization is Level 1 (Initial), as a result of noncompliance with Level 2 KPAs



N - Not Done
P - Partial
S - Satisfactory
C - Full Compliance

Each Key Process Area has been assessed based on SEI evaluation criteria, as well as observations of organizational strengths and weaknesses

- The detailed assessment of the six KPAs for Level 2 appears on the following pages *
- The rating scale used is as follows:
  - N - Not Done
  - P - Partial
  - S - Satisfactory
  - C - Full Compliance

Overall Rating

SEI definition of KPA

Level 2 KPA: Requirements Management

Description: The purpose of Requirements Management is to establish a common understanding between the customer and the project team of the customer's requirements that will be addressed by the project team.

Evaluation: PARTIAL

KPA Evaluation Criteria	N	P	S	C
System requirements are controlled to establish a baseline for project and management use				
Software plans, products, and activities are kept consistent with system requirements				
Projects follow written organization policy for managing requirements				
Measurements are made and used to determine the status of activities for managing requirements				

Observed Strengths	Observed Weaknesses

* Level three through five appear in Appendix A

225

Requirements Management - Level 2 KPA

Description: The purpose of Requirements Management is to establish a common understanding between the customer and the project team of the customer's requirements that will be addressed by the project team

Evaluation: PARTIAL

KPA Evaluation Criteria	N	P	S	C
System requirements are controlled to establish a baseline for project and management use		●		
Software plans, products, and activities are kept consistent with system requirements	●			
Projects follow written organization policy for managing requirements	●			
Measurements are made and used to determine the status of activities for managing requirements	●			

Observed Strengths

- ✓ Functional Leads assigned responsibility for requirements definition
- ✓ Work requests are entered into various backlog systems and are periodically prioritized

Observed Weaknesses

- ✓ No clear or shared understanding of what should be in a requirements document
- ✓ Requirements lack testability
- ✓ Accountability for quality of requirements varies by area
- ✓ No change control for requirements

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N - Not Done
P - Partial
S - Satisfactory
C - Full Compliance

2-26

Software Project Planning - Level 2 KPA

Description: The purpose of Software Project Planning is to establish reasonable plans for performing and managing the project

Evaluation: PARTIAL

KPA Evaluation Criteria	N	P	S	C
Software estimates are documented for use in planning/tracking the project	●			
Software project activities and commitments are planned and documented	●			
Affected groups/individuals agree to their project-related commitments	●			
A project manager is designated & responsible for negotiating commitments and developing the project's software development plan		●		
The project follows a written organizational policy for project planning	●			
Measurements are made and used to determine planning activity status	●			

Observed Strengths

- ✓ Recent appointment of an NMS Program Manager
- ✓ COTRs are assigned to subcontract efforts

Observed Weaknesses

- ✓ Few disciplines associated with project planning
- ✓ No standards for estimating
- ✓ Commitments made before project plans are in place
- ✓ Cross-project planning is ineffective

N - Not Done
P - Partial
S - Satisfactory
C - Full Compliance

Software Project Tracking and Oversight - Level 2 KPA

Description: The purpose of Software Project Tracking and Oversight is to provide adequate visibility into actual progress so that management can take effective actions when the project's performance deviates significantly from plans

Evaluation: PARTIAL

KPA Evaluation Criteria	N	P	S	C
Actual results and performance are tracked against the software plans	●			
Corrective actions are taken/managed when results deviate significantly	●			
Changes to commitments are agreed to by affected groups/individuals	●			
A project manager is designated to be responsible for the activities/results		●		
The project follows a written organizational policy for project management	●			
Measurements are made and used to determine the status of software tracking and oversight	●			

Observed Strengths	Observed Weaknesses
✓COTRs are assigned to subcontract efforts	✓All facets of project tracking need attention: - Project size, effort, cost, schedule, etc. - Plans, revisions, and change impacts - Intergroup commitments - Tools and methods to support tracking - Project management disciplines

N - Not Done
P - Partial
S - Satisfactory
C - Full Compliance

Software [Sub]contract Management - Level 2 KPA

Description: The purpose of Software Subcontract Management is to select qualified software subcontractors and manage them effectively

Evaluation: PARTIAL

KPA Evaluation Criteria	N	P	S	C
The project selects qualified software subcontractors		●		
The project and subcontractors agree to their commitments to each other		●		
The project and subcontractors maintain ongoing communications		●		
The project tracks actual results and performance against commitments		●		
A written organizational policy for managing subcontracts is followed		●		
A subcontract manager is designated and responsible for the subcontract		●		
Measurements are made and used to determine subcontract activity status	●			

Observed Strengths	Observed Weaknesses
✓ SOAP has been proposed as an organization standard ✓ COTR is designated contract interface ✓ Collocation of contractor personnel	✓ No organizational policy ✓ Current contracts are level of effort vs. performance based

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N - Not Done
P - Partial
S - Satisfactory
C - Full Compliance

Software Quality Assurance - Level 2 KPA

Description: The purpose of Software Quality Assurance (SQA) is to provide management with the appropriate visibility into the processes being used and the products being built by the project

Evaluation: PARTIAL

KPA Evaluation Criteria	N	P	S	C
Software quality assurance activities are planned		●		
Adherence of products and activities to applicable standards, procedures, and requirements is verified objectively	●			
Affected groups/individuals are informed of SQA activities and results		●		
Issues that cannot be resolved in the project are addressed by senior mgt.		●		
The project follows a written organizational policy for implementing SQA	●			
Measurements are made and used to determine cost/status of SQA activity	●			

Observed Strengths	Observed Weaknesses
✓ Existence of QA Testing Group	✓ No SQA function ✓ SQA project activities are not being performed ✓ Y2K standards ignored

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N - Not Done
P - Partial
S - Satisfactory
C - Full Compliance

230

Software Configuration Management - Level 2 KPA

Description: The purpose of Software Configuration Management (SCM) is to establish and maintain the integrity of products throughout the project's life cycle

Evaluation: PARTIAL

KPA Evaluation Criteria	N	P	S	C
Software configuration management activities are planned		●		
Selected software work products are identified, controlled, and available		●		
Changes to identified software work products are controlled		●		
Affected groups/individuals are informed of the status/content of baselines		●		
The project follows a written organizational policy for implementing SCM		●		
Measurements are made and used to determine status of SCM activities	●			

Observed Strengths

- ✓ A designated configuration group is responsible for migration of source and executables from test to QA to production
- ✓ CCC Harvest is used as a library control tool

Observed Weaknesses

- ✓ Not all production objects are under configuration control, e.g., data base, documentation
- ✓ Version control remains a manual process in many areas
- ✓ Instances of inconsistency between source and executables and missing source code

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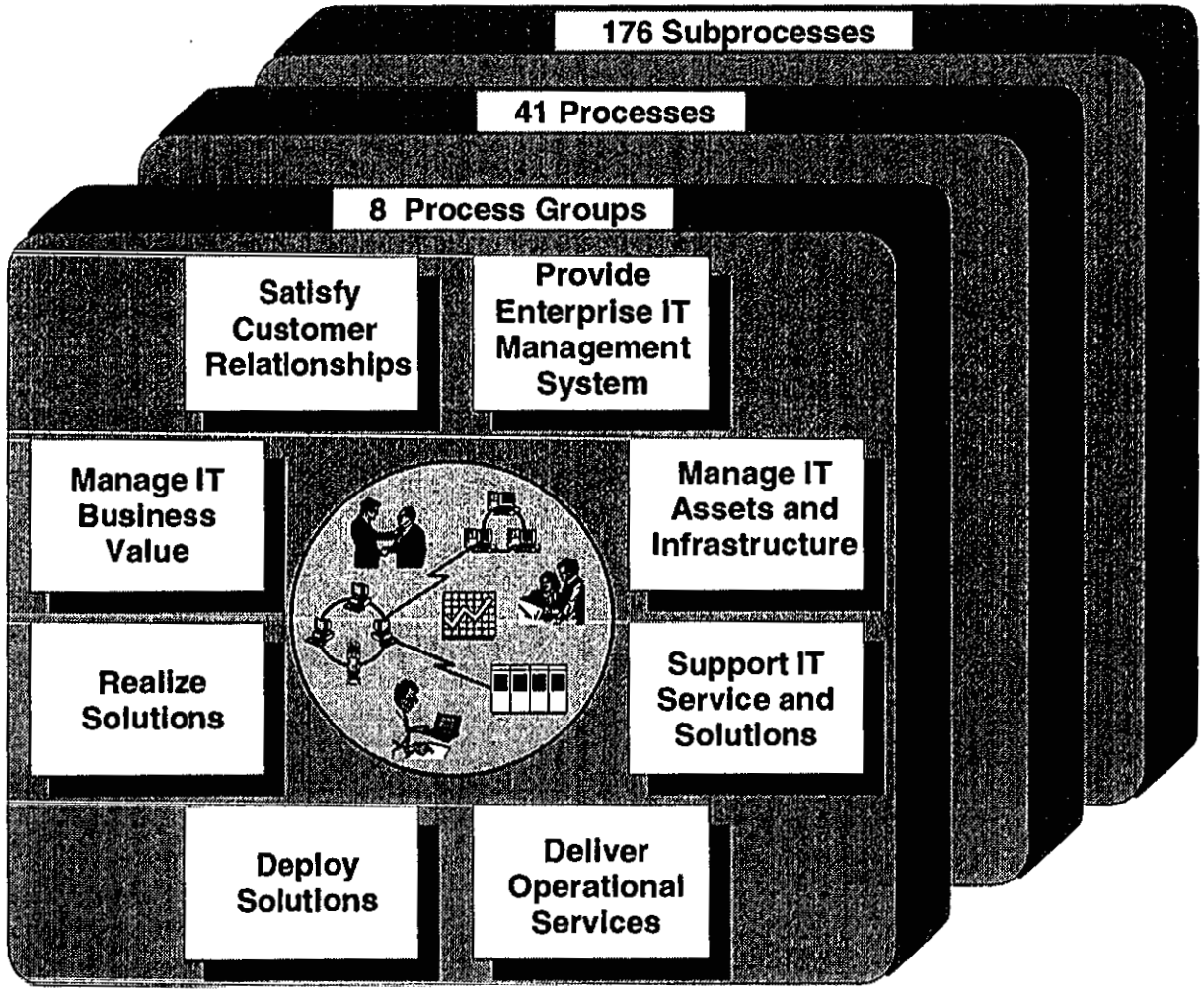
N - Not Done
P - Partial
S - Satisfactory
C - Full Compliance

231

Another tool used during the ADE Study is the IBM Information Technology Process Model (ITPM), consisting of 8 major IT process groups



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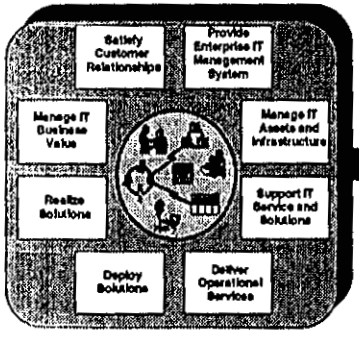
The ITPM consists of 41 processes that further define IT responsibilities



176 Subprocesses

41 Processes

Satisfy Customer Relationships
- Understand Customer Requirements
- Market IT Offerings
- Administer Service Levels
- Provide IT Operational Support to Customers
- Manage Customer Satisfaction

Manage IT Business Value
- Establish IT Value
- Conduct Research
- Develop IT Strategy
- Justify Offerings & Infrastructure
- Define IT Architecture
- Develop / Track IT Plan

Realize Solutions
- Understand Solution Requirements
- Design Solutions
- Construct and Integrate Solutions
- Test Solutions
- Gain Customer Acceptance and Certification

Deploy Solutions
- Define Change Management Practices
- Administer Change
- Plan Deployment
- Implement Change

Provide IT Management System
- Establish IT Management System Framework
- Plan IT Management System
- Evaluate IT Management System

Manage Assets and Infrastructure
- Manage IT Finance
- Procure Services and Components
- Price Offerings and Administer Customer Contracts
- Manage IT Inventory and Assets
- Manage Security
- Manage Human Resources
- Manage Skills Portfolio

Support Services & Solutions
- Maintain Configuration Information
- Manage Availability
- Manage Facilities Supporting IT
- Manage Backup and Recovery
- Manage IT Continuity
- Manage Performance and Capacity
- Manage Problems

Deliver Services
- Enable Service Delivery Requirements
- Match Resources to Commitments
- Perform Services
- Sustain Service Delivery Capability

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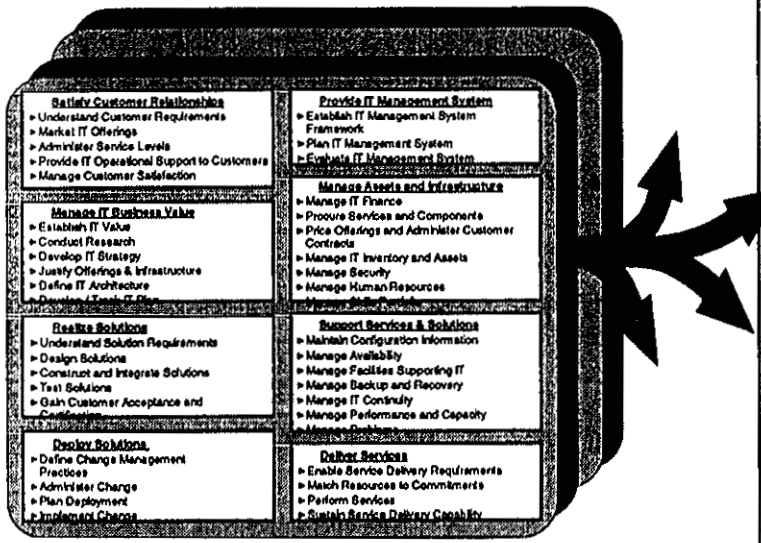
233

Application Development (AD) processes comprise 18 of the 41 processes in the ITPM and provide a detailed view into the development organization



- ✓ Understand Customer Requirements
- ✓ Administer AD Service Levels
- ✓ Manage Customer Satisfaction
- ✓ Establish AD Management System Framework
- ✓ Plan AD Management System
- ✓ Develop AD Strategy
- ✓ Justify AD Offerings & Projects
- ✓ Create & Manage AD Plan
- ✓ Define & Manage AD Projects
- ✓ Understand Solution Requirements
- ✓ Design Solutions
- ✓ Construct & Integrate Solutions
- ✓ Test Solutions
- ✓ Assure Quality and Gain User Acceptance of Solutions
- ✓ Procure Services & Components
- ✓ Manage AD Assets (SCM)
- ✓ Manage Human Resources
- ✓ Manage Skills Profile

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234

The 18 application development processes from the ITPM were used as an additional confirmation of the results of the CMM analysis

	1		2		3			4		5
Process / Attainment	Not Done	Ad Hoc	Conven-tional	Outlined	Supported	Engineered	Adopted	Measured	Analyzed	Optimizing
Understand Customer Requirements		●								
Administer AD Service Levels		●								
Manage Customer Satisfaction		●								
Establish AD Mgt. System Framework		●								
Plan AD Management System		●								
Develop AD Strategy		●								
Justify AD Offerings and Projects		●								
Create and Manage AD Plan			●							
Define and Manage AD Projects		●								
Understand Solution Requirements		●								
Design Solutions		●								
Construct and Integrate Solutions		●								
Test Solutions		●								
Assure Quality and Gain User Acceptance		●								
Procure Services and Components				●						
Manage AD Inventory and Assets (SCM)		●								
Manage Human Resources								●		
Manage Skills Profile				●						

Not Done: Not performed
Ad Hoc: Sometimes performed
Conventional: Commonly understood
Outlined: Outputs & steps named and defined
Supported: Methods, tools, and support staff
Engineered: Extensively documented
Adopted: Accepted as part of the culture
Measured: Metrics defined and collected
Analyzed: Measurements used to evaluate ADE
Optimizing: Continually improving w/ measures

Source: The IBM Information Technology Process Model - Version 1.0

Agenda

- Assessment Background and Approach
- Capability Maturity Model Assessment
- **Conclusions**
- Recommendations
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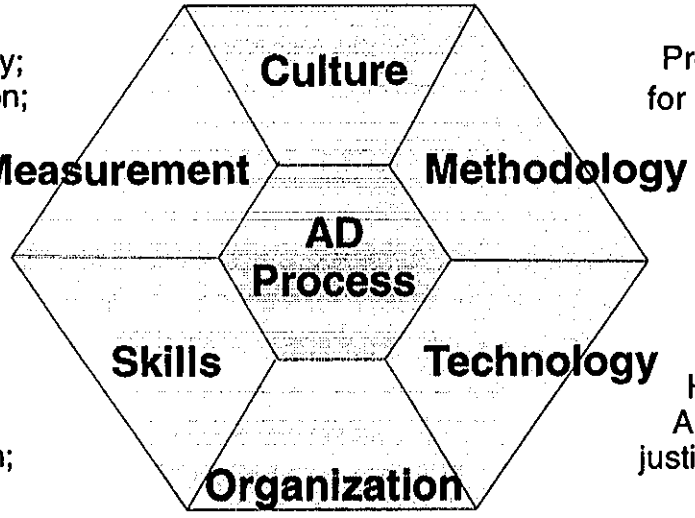
In addition to the CMM rating, ADE conclusions and recommendations were developed

Mission, Goals; Planning; Leadership; Communications; Expectations; Accountability; Physical environment

Schedule; Costs; Productivity; Quality; Customer satisfaction; Staff morale



Processes (methods, techniques) for project mgmt, development, and quality; Process adherence

Skill planning and acquisition; Process, technical, and management training/education; Experience

Hardware/Software strategies; Architectures; Tools; Evaluation, justification, and introduction process

Roles; Responsibilities; Resources; Support Services; Organizational structure; Relationships (customer, I/T)

The ADE Assessment identified positive factors within the USAID NMS development organization that can be leveraged to enhance application development effectiveness

Leadership

- The NMS executive team recognizes that major problems exist and that there is a need for change
- Recent appointment of key individuals (IRM Director, NMS Program Manager) is a positive step
- Suspension of new NMS module development activities and initiation of the current assessment will help establish a firm development direction

People Assets

- The USAID organization is composed of dedicated, loyal, and conscientious people who are motivated by a passion for the Agency's mission and who have a desire to produce quality results

Teamwork

- Contractor communication has improved with consolidation into a single facility
- USAID staff and contractors are beginning to function as a collaborative team
- Users are actively engaged in the NMS development and deployment effort

Beginnings of Future Discipline

- A Change Control Board (CCB) and QA testing group have been introduced
- There is an intent to move to performance-based contracts
- The proposed SOAP process promises the beginning of a disciplined structure for software ordering and acquisition

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138

The NMS leadership fails to provide consistent direction, leading to uncertainty, which impacts both morale and productivity

- There are no published NMS organizational vision, mission, and goals to provide direction for development
- The leadership has not provided the required understanding of NMS purpose or a definition of what constitutes its completion
- Management does not function as a team (e.g., user and IRM have been in contention, there is an adversarial relationship between NMS and the Office of the IG)
- Roles and responsibilities are not well defined and some employees are unsure of their reporting relationship
- Job performance expectations are unclear
- People are not held accountable for their results
- There is not an effective decision making process to address issues and conflicts
- There is a stated "intent" to implement various initiatives, but there are few substantive plans as vehicles for establishing commitments, coordinating efforts, and communicating progress
- Quality is often compromised for schedule

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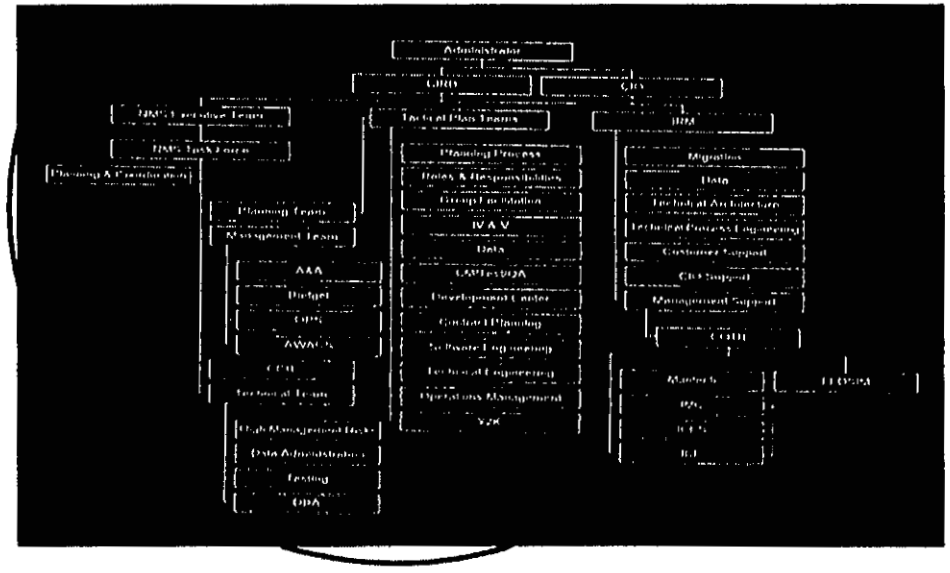
The current NMS organization is fragmented and complex, discouraging accountability and inhibiting productivity

- There are a number of strong, autonomous user organizations which continue to act independently (i.e., lead contractor development efforts).
- IRM, the key technical organization, is viewed as not in the NMS mainstream
- There is a lack of a single NMS development organization with clearly defined roles, responsibilities, and authorities
- Distributed responsibilities have produced fragmented efforts and eroded accountability

- The management structure is viewed as unstable and gives the appearance that there is no one in charge
- Individuals have divided loyalties and are unsure of priorities
- An NMS program manager has been recently appointed, but he has limited full time staff, and is viewed as a facilitator
- There is a stated intent to consolidate the NMS task force into IRM, but the target organization is not clear and there is no published timetable



248

Two aspects of the USAID culture, informality of communications and management by committee and consensus, inhibit timely, effective decision making and productivity for software engineering

- Vertical communication is poor and the development staff views that they "exist in an information vacuum"
- Information tends to be disseminated mainly through informal channels, e.g., private individual communications, incidental comments in meetings, and e-mail
- Management by committee and consensus delays decisions, and reduces their content to the lowest common denominator of agreement
- The staff views that they are in "perpetual wait mode"
- Meetings are viewed as time consuming and ineffective because they rarely result in concrete decisions or with action plans and ownership established

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241

The lack of a well defined project management process inhibits consistent delivery of applications on time and within budget

- There is no project management process (work breakdown structure, estimating, scheduling, tracking, issue management, risk analysis and mitigation). What work is identified is of insufficient granularity to serve as the basis for meaningful estimates, identification of dependencies, and change impact analysis
- Lack of formal project plans inhibits effective communication
- Related work efforts proceed independently of each other, with poor identification and management of dependencies
- Because efforts are not based on a life cycle model, resulting plans are often incomplete and responsibilities are unclear
- Commitments are made in the absence of complete supporting plans
- Management does not approve development plans or review project status on a periodic basis
- Lack of task completion criteria and disciplined tracking of task completeness prevent reporting of accurate project status
- Needed project management skills do not exist in the organization

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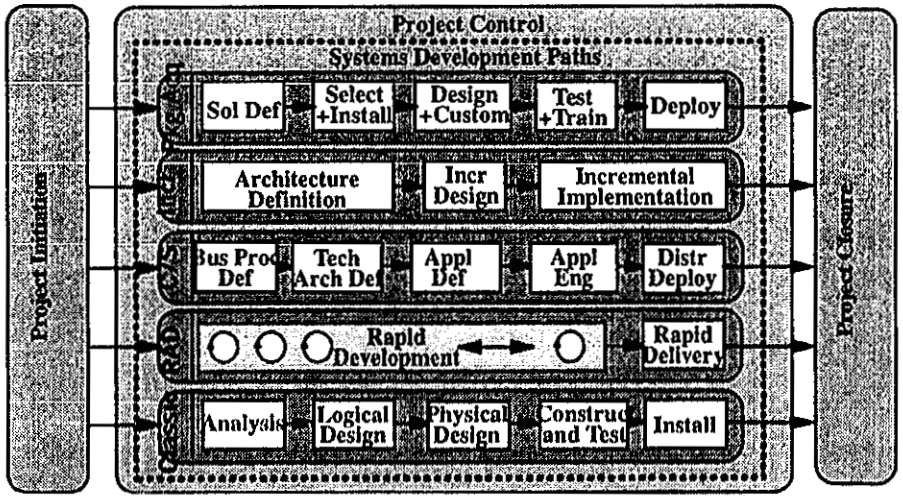
The lack of a life cycle methodology prevents consistent development and maintenance of quality applications in a timely and efficient manner

- There is a set of IRM "System Development Procedures", but they are not followed rigorously or consistently
- An effort to implement an Information Engineering life cycle methodology was begun, but not completed
- Without a life cycle methodology there is not a clear definition of roles and responsibilities

- Current process differences across individual NMS and contractor groups inhibit effective sharing of resources, cross-area project coordination, and are a source of frustration to NMS developers and customers
- Lack of formal documentation inhibits transfer of institutional knowledge



The lack of an effective requirements management process inhibits the timely identification of business needs

- Requirements definition is done inconsistently and informally. There are no guidelines for what constitutes complete definition, and resulting requirements are not testable
- Requirements are developed on an individual area basis (AWACS, A&A, Budget, OPS) and cross-area dependencies are often not well addressed
- Detailed "requirements" are often created by contractors during specification development
- The inability to define timely complete requirements precludes development of accurate estimates, invites continuous scope change and rework, and leads to continuous redevelopment
- There is often a lack of knowledge about how systems integrate and interface
- There is not an effective process for defining the subsystem requirements of USAID Missions leading to delivery of solutions which do not meet their needs
- Functional Leads lack necessary requirements analysis and definition skills

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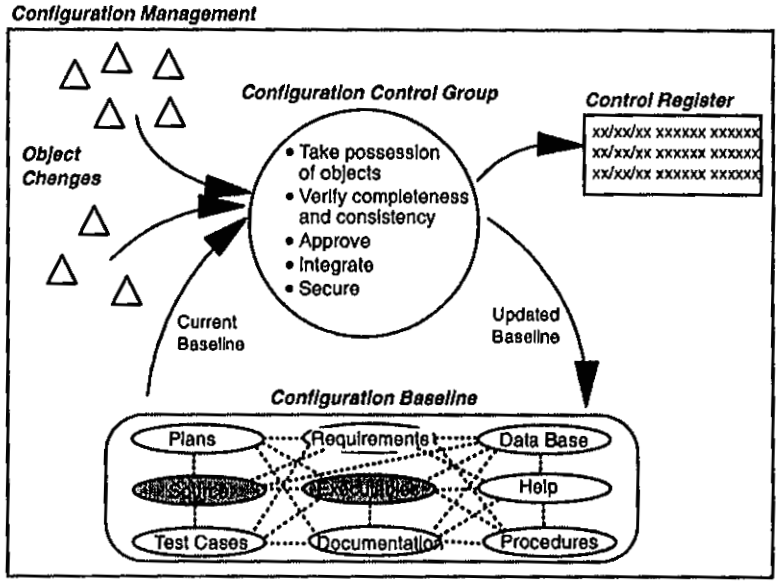
24

Lack of a comprehensive and rigorous Software Configuration Management process in a high-volume change environment introduces production and control problems and places software assets at risk

- There is no baseline for production objects
- Software source and executables have recently been placed under configuration management, but there is no plan for addressing other objects (e.g., data model changes, test scripts, Impromptu reports/queries) under CM, or to provide coordination with ongoing hardware and network changes
- There are known instances of missing production source, and mismatches between production source and executables
- Over the past year, a new release of NMS has been produced every 4.4 days
- A Change Control Board (CCB) has been put in place, but approvals for production changes are determined by vote vs. objective criteria
- The CCB may approve known problems, partially tested, and untested function for production in an effort to prevent holdup of other tested high priority function or "showstoppers"
- CCB decisions are recorded after the fact by e-mail and an assumption is made to their correctness unless specific objection is registered

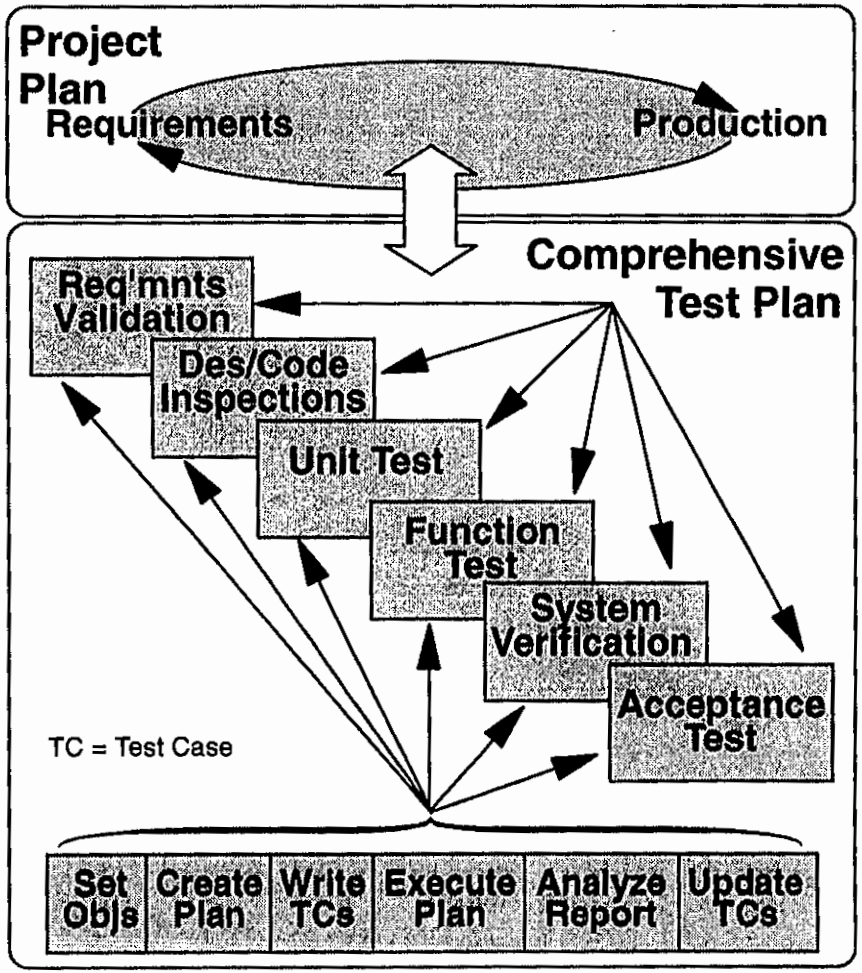


Importance

- Large applications contain many thousands of interdependent objects
- Objects have change levels, effective dates, and are developed/maintained by different people
- Concurrent updates to interdependent objects are required to prevent error
- You cannot change what you cannot locate
- Redevelopment of missing objects is time consuming and expensive
- Security

Testing lacks appropriate rigor, consistency, and focus, resulting in errors, rework, and reduced customer satisfaction

- The view of testing as a cross-life cycle activity is not prevalent within the organization
- Reviews, inspections, and walkthroughs (forms of static testing) are rarely done
- The degree to which test plans, test scripts, and test cases are employed varies widely
- Integration and QA testing efforts are performed by contractors. Formal exit criteria do not exist. Test reports are no longer prepared
- Functional Leads may participate in test and informally "approve" results
- Little regression testing is done
- Schedule pressures often leave insufficient time for effective testing



The current contracting approach inhibits achievement of consistent quality and productivity

- USAID, functioning as the NMS prime-contractor, has no consistent subcontract management process and has used level of effort (LOE) contracts to acquire needed staff
- Current LOE contracts, not having defined deliverables and acceptance criteria, are not consistent with the requirements of the NMS organization
- Separate NMS organizations (e.g., IRM, FM) are responsible for managing various portions of individual contracts
- There is no consistent contractor management or oversight process
- The proposed SOAP process has not been fully deployed across NMS
- Users directing contractor work do not have sufficient technical skills to effectively manage development efforts
- IRM retains the contractor budgets but does not direct the work

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247

The lack of a measurements program in the NMS application development environment is inhibiting fact-based decision making, direction setting, and communication

- Measurements are not being used as the basis for decision making
- Measurements are not effectively serving as a management communication vehicle
- A baseline for process improvement does not exist
- Process areas needing attention cannot be readily identified
- The progress of process improvement efforts cannot be evaluated
- Problem management is not serving as a defect prevention vehicle

Achieving significant process improvement will require enhancement of both IRM and user skills

- Turnover in the organization, e.g., reassignment of foreign service staff, resignation of contractors, reassignment of USAID staff, and periodic political reappointments contribute to loss of institutional system knowledge

- There is a need for improved technical, process development, contract management skills, and knowledge of NMS and its interfaces with legacy systems

- Few members of the NMS development staff or customer community have worked in a process-driven environment

Agenda

- Assessment Background and Approach
- Capability Maturity Model Assessment
- Conclusions
- Recommendations
- Next Steps
- Appendices

250

Establish an effective and sustaining leadership environment to provide the foundation for continuing application development process improvement

- Conduct a facilitated AD strategy and planning session to identify NMS vision, mission, goals, objectives, and strategies, and team building for the future

- Cultivate improved vertical communications by disseminating key information and initiating programs which encourage the sharing of views and information (round tables, skip-level interviews, periodic opinion surveys, etc.)

- Institute an NMS policy that governs how application development commitments to customers are made and measured

Simplify and streamline the NMS development organization structure to focus management attention, clarify reporting chains, eliminate divided loyalties, and strengthen accountability

- Charter a single organization, reporting directly to the USAID CIO, responsible for technical delivery of all NMS new functionality, maintenance, and technical support, including the management and technical oversight of all contractors (NMS delivery organization)
- Provide the necessary funding, dedicated staffing, and technical and administrative infrastructure support for the organization
- Designate an individual with appropriate responsibility and authority to head the organization
- Charter a single organization, within the user community, responsible for NMS ownership, function prioritization, requirements development, and system acceptance (NMS owner organization)
- Retain an executive steering committee responsible for providing overall NMS direction consistent with Agency strategic plans
- Disband the NMS Task Force, transferring current responsibilities to the NMS owner and NMS delivery organizations

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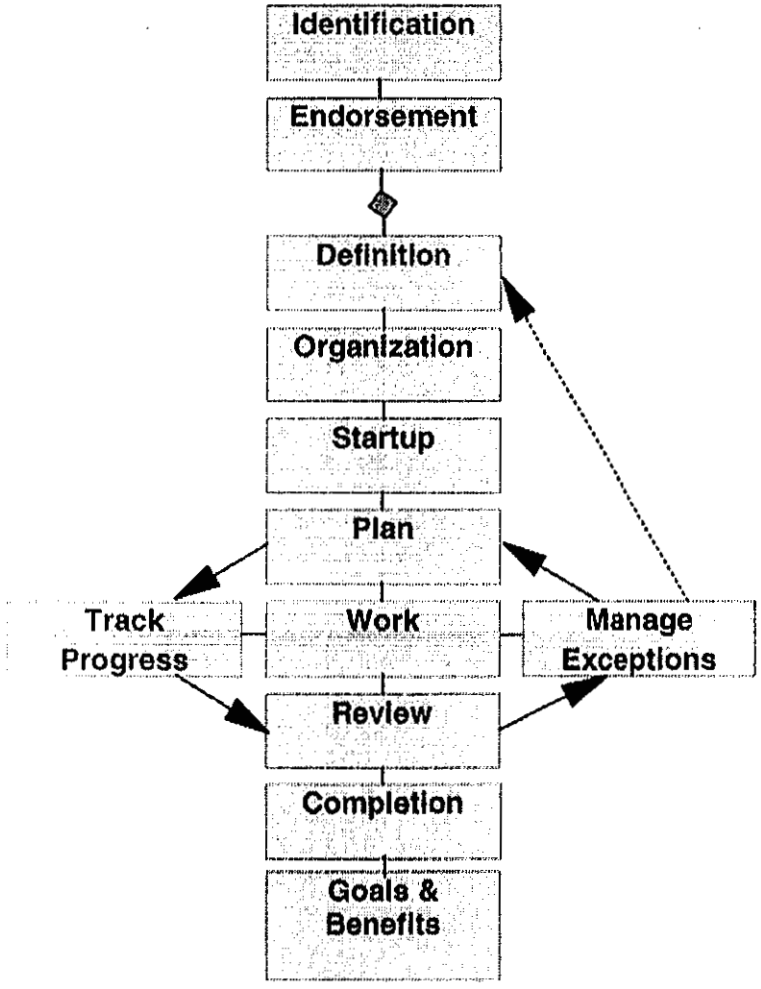
252

Implement a project management process that will increase development predictability and lower project risk, contributing to improved customer satisfaction



- Implement a common project management process using industry standard techniques as a base and supplement with selected USAID techniques
- Define project management principles, objectives, and standards to provide an anchor point for the implementation
- Establish a project office to provide administrative support, coordinate status reporting, and consolidate measurements
- Create project manager positions and job descriptions
- Provide appropriate training for project managers
- Select and implement a standard supporting project management tool
- Ensure that formal project management responsibility is established for each and every work effort

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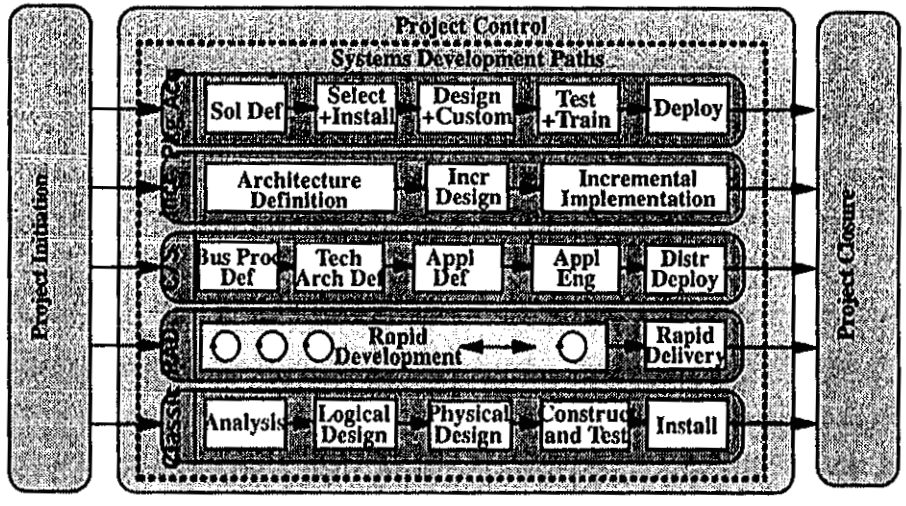
Retain contractors as the vehicle for continued NMS development and maintenance, and implement an effective subcontract management process

- Identify and select a single NMS prime contractor and initiate a strategy to cultivate a long-term relationship with this organization
- Initiate performance based contracts with measurable deliverables, acceptance criteria, performance penalties and incentives, and appropriate oversight
- Require that all contractors commit to engage in programs of continuous improvement and to achieve acceptable CMM levels on acceptable timetables
- Acquire and/or develop the necessary skills for the technical management of performance based contracts

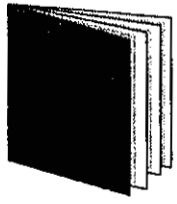
Establish a life cycle methodology as the foundation for implementing repeatable processes and for the development, acquisition, and maintenance of quality applications

- Identify, evaluate, select, and acquire an appropriate life cycle methodology for USAID
- Evaluate, select, customize, and pilot appropriate paths
- Develop guidelines for path use
- Develop a methodology roll-out plan including just-in-time education
- Define, communicate and commit the NMS development and user roles and responsibilities within the application development process



Develop and implement a consistent NMS requirements process which yields timely, complete requirements for needed functionality and which can serve as a testable base for performance-based contracts

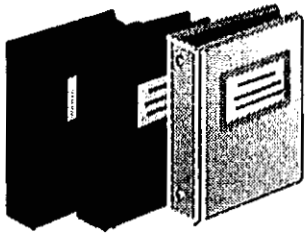
- Develop a consistent NMS process and deploy it across all user areas
- Supplement existing staff with experienced requirements analysts
- Provide necessary education and mentoring of staff on requirements analysis and definition
- Develop and document requirements at a testable level of detail and begin using them as the basis of acceptance testing in performance based contracts
- Don't begin a development effort without a defined requirement



Process

Staff

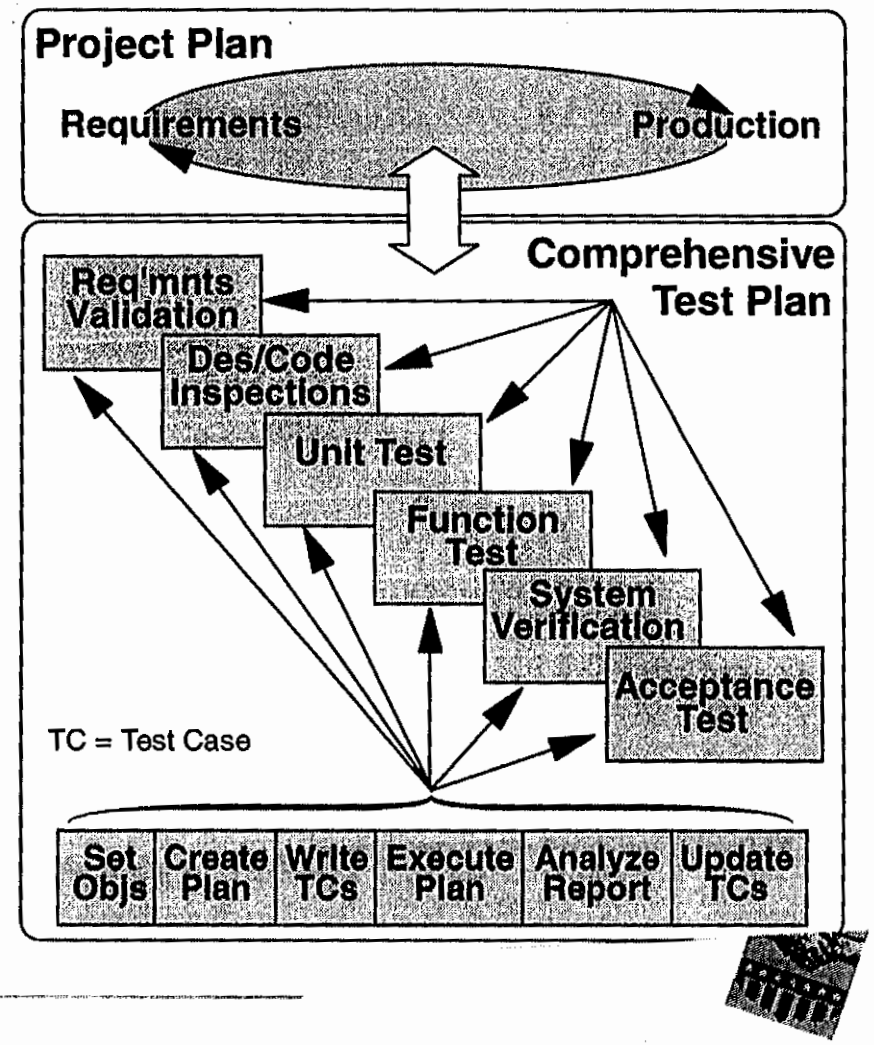
Education/
Mentoring



Testable Requirements

Establish a process for full life cycle testing including plans, activities, and organizational standards

- Define and reach agreement on all phases of testing
- Define organizational structure and responsibilities for testing
- Define the entry and exit criteria for all phases of testing
- Determine the infrastructure requirements: education, skills, organizational implications, support, tools, ownership
- Define and document the implementation strategy and considerations
- Adopt industry standard test terminology
- Coordinate with life cycle methodology implementation



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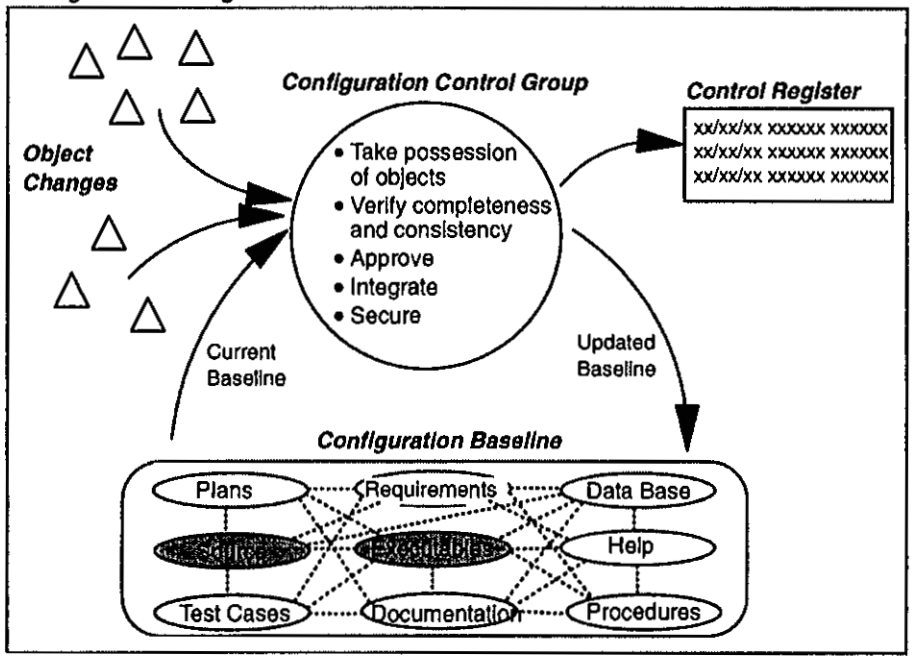
257

Strengthen Configuration Management as a tool to improve production system stability and quality

- Add a technical Configuration Management focus to the Change Control Board (CCB)
- Complete implementation of the current plan to establish consistency of production source and executables
- Develop and implement a plan to bring all production level objects under rigorous Configuration Management
- Increase the release period from weekly to monthly/quarterly in order to reduce the change impact to the field, increase system quality, and increase development productivity
- Develop, implement, and adhere to formalized, objective criteria for determining what is approved by the CCB
- Implement additional discipline in CCB meetings and require formal approvals for decisions

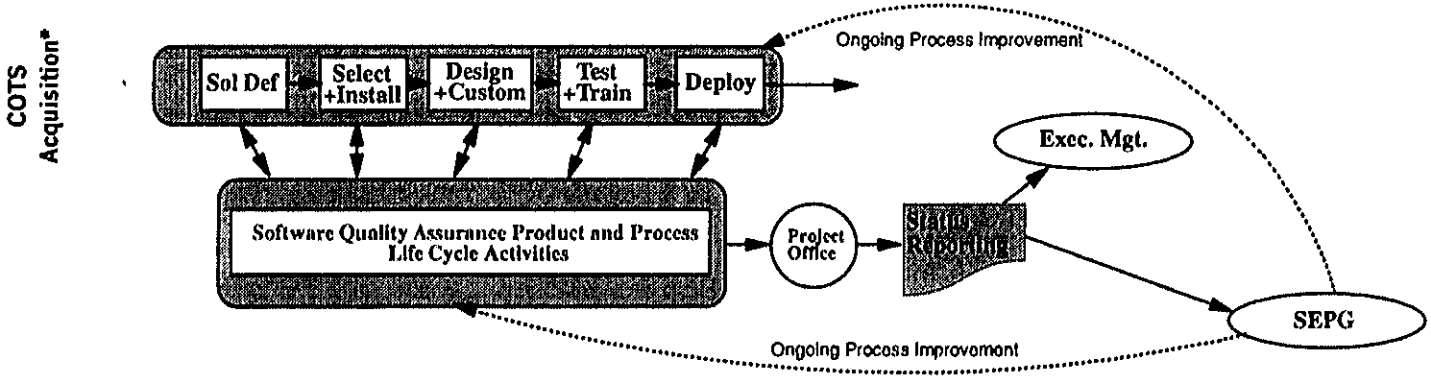


Importance

- Large applications contain many thousands of interdependent objects
- Objects have change levels, effective dates, and are developed/maintained by different people
- Concurrent updates to interdependent objects are required to prevent error
- You cannot change what you cannot locate
- Redevelopment of missing objects is time consuming and expensive
- Security

Leverage Software Quality Assurance (SQA) concepts to achieve effective process implementation and deliver high quality products

- Charter an SQA organization responsible for providing full life cycle quality assurance activities across products and processes
- Develop and communicate to the full staff a quality policy and associated SQA charter, roles, responsibilities, goals, and plans
- Through participation in the full life cycle of projects, integrate the SQA efforts into the development and acquisition process
- Establish periodic review and reporting of SQA activities to project teams, project managers, and management
- Address compliance issues through a documented escalation procedure
- Measure, evaluate, and improve the SQA process via normal Software Engineering Process Group activities

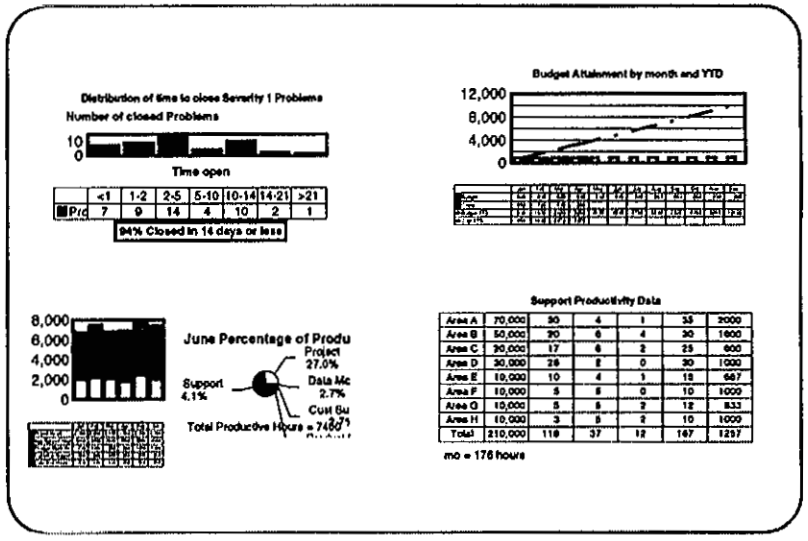


* Example of one type of path

Define a set of application development and acquisition measurements to facilitate fact-based understanding, decision making, and action

PLANNING MODEL

Measurement Dashboard



AD Measurement Categories

Category	Areas Addressed
Productivity	Pertains to the rate of software delivery and the ability to support installed software
Quality	Pertains to the technical quality of software, how well business needs are met, and the effectiveness of the software process
Commitment	Pertains to the organization's ability to meet schedule and cost commitments
Cost	Pertains to the cost of software delivery and support
Responsiveness	Pertains to the timeliness of software delivery and support
Satisfaction	Pertains to the organization's ability to achieve satisfaction from various stakeholder groups (customers, employees...)

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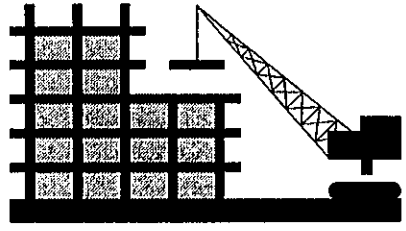
260

Establish a clear charter for key infrastructure support functions within the NMS development organization



INFRASTRUCTURE FUNCTIONS

Project Office

- Project status reporting
- Measurement data collection
- Project manager administrative support
- Project management tool support and mentoring

Quality Assurance

- Quality process ownership
- Process enforcement
- Cross-functional peer reviews
- Process measurements

Software Engineering Process Group (SEPG)

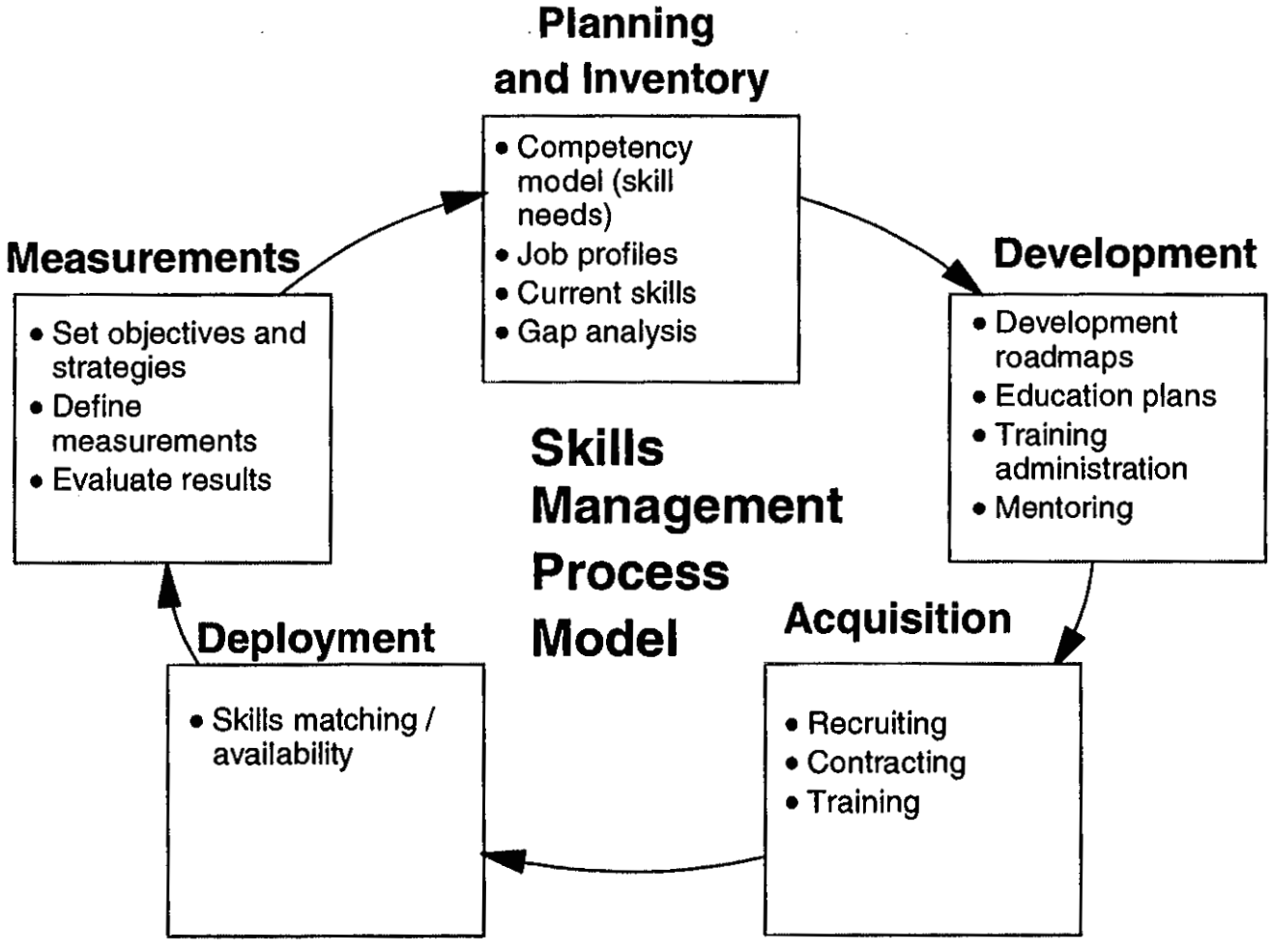
- Process implementation and ownership
- Methodology implementation
- Process/methods education and training
- Process consultation and mentoring

Acquisition and Technology Support

- Technology plan
- Development and delivery platform architecture
- Package selection and support
- Coordination of technical and administrative competency centers (requirements, testing, acceptance, etc.)

261

Develop and implement a skills management strategy that will prepare NMS development personnel for the future technology-driven and process-driven environment



262

Agenda

- Assessment Background and Approach
- Capability Maturity Model Assessment
- Conclusions
- Recommendations
- Next Steps
- Appendices

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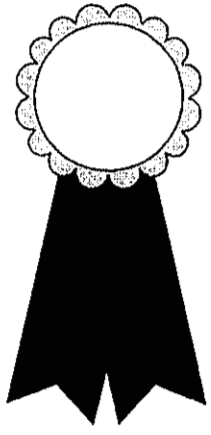
263

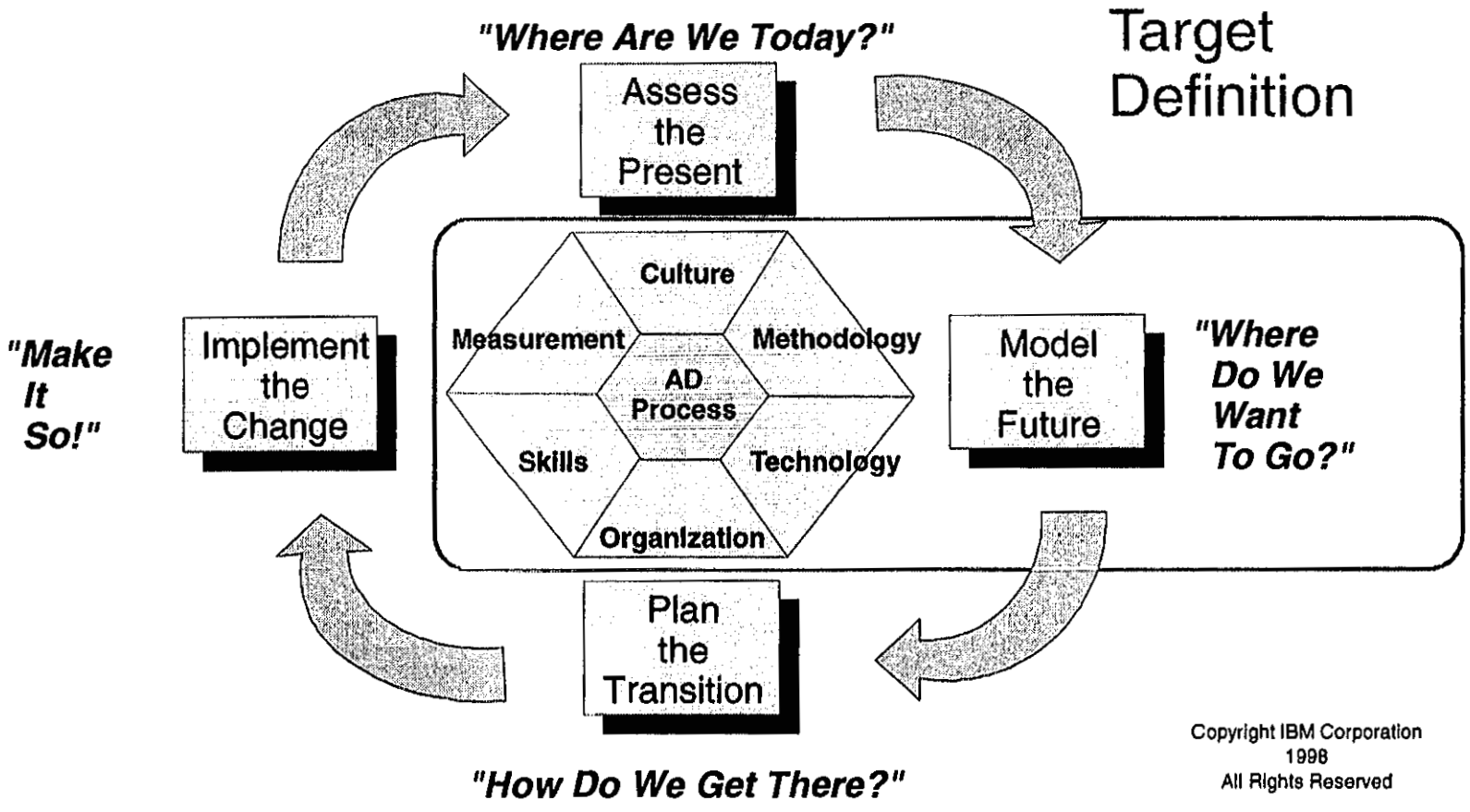
Organizations that have invested in process improvements over an extended period have realized dramatic results

- For organizations that have invested in software process improvement for 3 or more years:
  - ROI is about 7:1
  - Average gain in productivity is 37% per year
  - 18% gain each year in proportion of defects found in pretest
  - 19% average reduction in time to market
  - 45% average reduction in field error reports per year
- In addition to these quantified gains, intangible benefits have also been reported:
  - Improved employee morale
  - Fewer overtime hours
  - More stable work environment
  - Lower turnover of staff
  - Improved communication
  - Improved quality as reported by customers



Source: "The Capability Maturity Model Guidelines for Improving the Software Process", 1995

Our recommendations lead to the next phase of the ADE process improvement cycle - Target Definition



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245

Agenda

- Assessment Background and Approach
- Capability Maturity Model Assessment
- Conclusions
- Recommendations
- Next Steps
- Appendices

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Appendix A

KPA 3 through 5 Assessments

Organization Process Focus - Level 3 KPA

Description: The purpose of the Organization Process Focus is to establish the organizational responsibility for software process activities that improve the organization's overall software process capability

Evaluation: PARTIAL

KPA Evaluation Criteria	N	P	S	C
Process development and improvement activities are coordinated	●			
Strengths and weaknesses of software processes are regularly assessed		●		
Process development and improvement activities are planned at org level	●			
Written policy exists for coordinating process development / improvement	●			
Senior mgt. sponsors process development and improvement		●		
Senior mgt. oversees process development and improvement	●			
Measurements are used to determine status of process activities	●			

Observed Strengths	Observed Weaknesses
✓ Recognition of need for action	✓ No organizational infrastructure support for process improvement

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N - Not Done
P - Partial
S - Satisfactory
C - Full Compliance

268

Organizational Process Definition - Level 3 KPA

Description: The purpose of Organizational Process Definition is to develop and maintain a usable set of processes that improve performance across projects, and provide a basis for cumulative, long-term benefits to the organization

Evaluation: NOT DONE

KPA Evaluation Criteria	N	P	S	C
A standard organization software process is developed and maintained	●			
Information related to the use, by projects, of the organization's standard software process is collected, reviewed and made available	●			
The organization follows a written policy for developing and maintaining a standard software process	●			
Measurements are made and used to determine status of the organization's standard software process definition activities	●			

Observed Strengths	Observed Weaknesses

N - Not Done
P - Partial
S - Satisfactory
C - Full Compliance

269

Training Program - Level 3 KPA

Description: The purpose of the Training Program is to develop the skills and knowledge of individuals so they can perform their roles effectively and efficiently. A Training Program involves an organizational function that identifies the training needed by the organization, projects, and individuals, and then develops or procures training to address the identified needs

Evaluation: PARTIAL

KPA Evaluation Criteria	N	P	S	C
Training activities are planned		●		
Training for performing software managerial and technical roles is provided		●		
Individuals in the organization receive the training they need		●		
The organization follows a written policy for meeting its training needs	●			
Measurements are made and used to gauge the status of the training pgm.	●			
Measurements are made and used to gauge the quality of the training pgm.	●			

Observed Strengths	Observed Weaknesses
	✓ Lack of in-depth knowledge inhibits training in systems and interfaces ✓ No program for ongoing skills enhancement

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N - Not Done
P - Partial
S - Satisfactory
C - Full Compliance

23

Integrated Software Management - Level 3 KPA

Description: The purpose of Integrated Software Management is to integrate development and management activities into a coherent, defined software process that is tailored from the organization's standard software process

Evaluation: NOT DONE

KPA Evaluation Criteria	N	P	S	C
The project's defined process is a tailored version of the organization's standard software process	●			
The project is planned/managed according to its defined software process	●			
The project follows a written organizational policy requiring planning and management using the organization's standard process	●			
Measurements are made and used to determine effectiveness of the integrated software management activities	●			

Observed Strengths	Observed Weaknesses
	✓ Managers/staff have little understanding of methodology/process or the benefits ✓ With high date-driven pressure and without management support and encouragement, most groups have not attempted to introduce process disciplines

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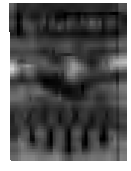
N - Not Done
P - Partial
S - Satisfactory
C - Full Compliance



271

Software Product Engineering - Level 3 KPA

Description: The purpose of Software Product Engineering is to consistently perform a well-defined development process that integrates all activities required to produce correct, consistent products, effectively and efficiently

Evaluation: PARTIAL

KPA Evaluation Criteria	N	P	S	C
Development tasks are defined, integrated and consistently performed		●		
Software work products are kept consistent with each other		●		
The project follows a written organizational policy for development		●		
Measurements are made and used to determine the functionality and quality of software products	●			
Measurements are made and used to determine the status of development activities	●			

Observed Strengths	Observed Weaknesses
	✓ With high date-driven pressure and without management support and encouragement, most groups have not attempted to introduce process disciplines

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N - Not Done
P - Partial
S - Satisfactory
C - Full Compliance

272

Intergroup Coordination - Level 3 KPA

Description: The purpose of Intergroup Coordination is to establish a means for project teams and development groups to participate actively with other teams and groups so that the project is better able to satisfy customer needs effectively and efficiently

Evaluation: PARTIAL

KPA Evaluation Criteria	N	P	S	C
Customer requirements are agreed to by all affected groups		●		
Commitments between project teams / groups are agreed to by all affected parties		●		
Intergroup issues are identified, tracked, and resolved		●		
Written policy exists for establishing cross-organizational teams	●			
Measurements are used to determine the status of process activities	●			

Observed Strengths	Observed Weaknesses
	✓ Current channels of communication for end user requirements are not effective

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N - Not Done
P - Partial
S - Satisfactory
C - Full Compliance

223

Peer Reviews - Level 3 KPA

Description: The purpose of Peer Reviews is to remove defects from the software work products early and efficiently. An important corollary effect is to develop a better understanding of the software work products and of defects that might be prevented

Evaluation: PARTIAL

KPA Evaluation Criteria	N	P	S	C
Peer review activities are planned		●		
Defects in the software work products are identified and removed		●		
The project follows a written organizational policy for performing peer reviews	●			
Measurements are made and used to determine the status of peer review activities	●			

Observed Strengths	Observed Weaknesses

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N - Not Done
P - Partial
S - Satisfactory
C - Full Compliance

274

Quantitative Process Management - Level 4 KPA

Description: The purpose of Quantitative Process Management is to control the process performance of the organization quantitatively. Software process performance represents the actual results achieved from following a software process

Evaluation: NOT DONE

KPA Evaluation Criteria	N	P	S	C
The quantitative process management activities are planned	●			
The performance of the software process is controlled quantitatively	●			
The process capability of the organization's standard software process is known in quantitative terms	●			
The organization follows a written policy for measuring and controlling the software process, as well as analyzing process capability	●			
Measurements are made and used to determine the status of the activities for quantitative process management	●			

Observed Strengths	Observed Weaknesses
	✓ Measurement data are not used to make decisions or improve process

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N - Not Done
P - Partial
S - Satisfactory
C - Full Compliance

225

Software Quality Management - Level 4 KPA

Description: The purpose of Software Quality Management is to develop a quantitative understanding of the quality of software products and achieve specific quality goals

Evaluation: PARTIAL

KPA Evaluation Criteria	N	P	S	C
Software quality management activities are planned		●		
Measurable goals for software product quality and their priorities are defined	●			
Actual progress toward achieving quality goals is quantified and managed	●			
The organization follows a written policy for managing software quality	●			
Measurements are made and used to determine the status of the software quality management activities	●			

Observed Strengths	Observed Weaknesses
	✓ Quality data are not used to make decisions or improve products

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N - Not Done
P - Partial
S - Satisfactory
C - Full Compliance

Defect Prevention - Level 5 KPA

Description: The purpose of Defect Prevention is to identify the causes of defects and prevent them from recurring

Evaluation: NOT DONE

KPA Evaluation Criteria	N	P	S	C
Defect prevention activities are planned	●			
Common causes of defects are sought out and identified	●			
Common causes of defects are prioritized and systematically eliminated	●			
The organization follows a written policy for defect prevention activities	●			
The project follows a written organizational policy for defect prevention	●			
Measurements are made and used to determine the status of the defect prevention activities	●			

Observed Strengths	Observed Weaknesses
	✓ Multiple approaches to problem management ✓ Problem management is not exploited for defect prevention potential

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N - Not Done
P - Partial
S - Satisfactory
C - Full Compliance

277

Technology Change Management - Level 5 KPA

Description: The purpose of Technology Change Management is to identify new technologies (i.e., tools, methods, and processes) and to implement them in the organization in an orderly manner

Evaluation: PARTIAL

KPA Evaluation Criteria	N	P	S	C
Incorporation of technology changes is planned		●		
New technologies are evaluated for effect on quality and productivity		●		
Appropriate new technologies are implemented across the organization		●		
The organization follows a written policy for improving technology capability	●			
Senior management sponsors and oversees technology change mgmnt.	●			
Measurements are made and used to determine the status of the organization's activities for technology change management	●			

Observed Strengths	Observed Weaknesses

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N - Not Done
P - Partial
S - Satisfactory
C - Full Compliance

278

Process Change Management - Level 5 KPA

Description: The purpose of Process Change Management is to continually improve the software processes used in the organization with the intent of improving software quality, increasing productivity, and decreasing the cycle time for product development

Evaluation: PARTIAL

KPA Evaluation Criteria	N	P	S	C
Continuous process improvement is planned	●			
Participation in process improvement activities is organization-wide	●			
The organization's standard process and the project's defined process are improved continuously	●			
A written policy for implementing process improvements is followed	●			
Senior management sponsors activities for process improvement		●		
Measurements are made & used to determine process improvement status	●			

Observed Strengths	Observed Weaknesses

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N - Not Done
P - Partial
S - Satisfactory
C - Full Compliance

279

Appendix B

ITPM Process Definitions

280

ITPM AD Process Framework Definitions

AD Process	Definitions
Understand Customer Requirements (Market Research)	Market analysis and evaluation of customer requests for additional and/or new solutions/products
Administer AD Service Levels (Problem Turnaround by Severity)	Negotiations for service level agreements and response criteria for problems by severity level
Manage Customer Satisfaction	Determination of customer satisfaction with AD function, products and processes
Establish AD Management System Framework(Methodology/Measurements)	Determine the framework for managing the AD function. Includes definition of roles and responsibilities and communication of overall management system and approaches. Measurements as means of communicating areas of focus and evaluating performance again
Plan AD Management System (Project Management and Oversight Policies)	Selection of project management techniques and definition of policies for senior management oversight and involvement in projects
Develop AD Strategy (AD Effectiveness Goals)	Defining and documenting the major goals of the AD organization and how they will contribute to the enterprise's business strategy
Justify AD Offerings and Projects (Market/Portfolio Analysis)	Validation of current offerings and justification of new project activities
Create & Manage AD Plan (Product Plan)	Define overall AD product plan and schedule - basis for making resource allocation decisions reflecting priorities
Define & Manage AD Projects	Project management process
Understand Solution Requirements	Confirmation and agreement on requirements for the AD solution, enhancement, or maintenance request
Design Solutions	Translation of requirements into system solution designs, traceability to requirements, and solidification of commitments
Construct and Integrate Solutions	Build systems solutions to meet system solution design specifications and integrate into deliverable units
Test Solutions	Verification and validation that the solution being delivered meets the requirements and conforms to the specifications
Assure Quality and Gain User Acceptance of Solutions	Verification of final solution by the user community and ongoing monitoring of the process to assure quality
Procure Services and Components	Acquisition of outside resources, software, or hardware
Manage AD Inventory and Assets (SCM)	Library and software configuration management to maintain an accurate software inventory and control change
Manage Human Resources	Underlying personnel management systems for the AD organization
Manage Skills Profile	Analysis of skills adequacy and gaps as required to fulfill the AD plan

281

Appendix D:
NMS Program and Process Documentation

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Appendix D:
NMS Program and Process Documentation

Date	Title/Subject	Author/Source
11/28/97	A&A (Administration) Entity Relationship Diagram	Mantech
11/28/97	A&A (Formation) Entity Relationship Diagram	Mantech
11/28/97	A&A (Planning) Entity Relationship Diagram	Mantech
11/28/97	A&A (Support) Entity Relationship Diagram	Mantech
11/28/97	A&A SP (Request) Entity Relationship Diagram	Mantech
11/28/97	A&A SP (RFQ) Entity Relationship Diagram	Mantech
11/28/97	A&A SP (Award) Entity Relationship Diagram	Mantech
11/28/97	Budget ERD (Physical) Entity Relationship Diagram	Mantech
11/28/97	OPS ERD (Physical) Entity Relationship Diagram	Mantech
11/14/97	Independent Assessment of the NMS Deficiencies and Undesirable Practices	Mitretek Systems
11/13/97	FY98 Distribution to Strategic Objectives	
11/97	USAID NMS Independent Assessment - Findings and Recommendations	Mitretek Systems
10/30/97	NMS Program Structure (Draft)	
10/22/97	NMS Stop Work Memo	Unknown
10/1/97	New Management System (NMS) Functionality, Version 4	
10/97	USAID Year 2000 Compliance Assessment and Recommended Strategy	Mitretek Systems
9/30/97	Audit of the Status of USAID's New Management System (NMS) - Report No. A-000-97-010-P	USAID OIG
9/30/97	Audit of the Internal Controls for the Operational New Management System - Report No. A-000-97-009-P	USAID OIG
9/30/97	Audit of USAID's Compliance With Federal Computer System Security Requirements - Report No. A-000-97-008-P	USAID OIG
9/16/97	NMS Phone List (SBU) - (Draft)	
9/9/97	The Federal Financial Management Improvement Act of 1996 - OMB Implementation Guidance for CFOs and IGs	
8/29/97	AWACS JFMIP Requirements Assessment & Compliance Report (note: separately bound)	IMC Inc.
8/29/97	A&A Business Area Development Group Listing	Mantech
8/29/97	AWACS Business Area Development Group Listing	Mantech
8/29/97	Budget Business Area Development Group Listing	Mantech
8/29/97	Operations Business Area Development Group Listing	Mantech
8/29/97	NMS Applications Development Group Listing	Mantech

Date	Title/Subject	Author/Source
8/29/97	Configuration Management/Quality Assurance Development Group Listing	Mantech
7/24/97	Software Order Administration Process Manual	Unknown
7/11/97	Audit of USAID's Efforts to Resolve the Year 2000 Problem - Report No. A-000-97-005-P	USAID OIG
7/97	AWACS General Ledger Operations Guide - Accounts Receivable - Volume 3A (note: separately bound)	IMC Inc.
5/97	AWACS General Ledger Operations Guide - Accounts Payable - Volume 2 (note: separately bound)	IMC Inc.
4/28/97	Draft Summary of NMS Questionnaires	
4/14/97	Memorandum – Fiscal Year 1999 Bureau Budget Guidance	USAID
3/31/97	Audit of the Worldwide Deployment of the New Management System (NMS) - Report No. A-000-97-004-P	USAID OIG
3/97	AWACS General Ledger Operations Guide - Funds Management - Volume 1 (note: separately bound)	IMC Inc.
2/24/97	Reports on USAID's Financial Statements, Internal Controls, and Compliance for Fiscal Year 1996 - Report No. 0-000-96-001-C	USAID OIG
01/13/97	Procedures for Testing NMS	USAID
1997	Capital Programming Guide, Version 1.0	OMB
1997	Presidential Directive on Electronic Commerce	White House
12/2/96-12/9/96	NMS Response Time Investigation	USAID
9/27/96	Interim Report on the Cost of USAID's New Management System - Report No. A-000-96-002-S	USAID OIG
9/27/96	Interim Report on the Status of USAID's New Management System - Report No. A-000-96-001-S	USAID OIG
7/11/96	Audit of the Controls Over the Quality of Financial Management Data - Report No. 9-000-96-005	USAID OIG
3/26/96	NMS Common Tables Handbook - Release 1.0 (Draft)	Common Tables Working Group
2/8/96	OMB Circular A-130, Appendix III, "Security of Federal Automated Information Systems"	OMB
10/25/95	Budget System Design Document (Draft)	USAID
10/16/95	Foreign Affairs Manual Volume 12 Chapter 500 "Information Security"	
10/95	Final Report to the Business Area Analysis Team for operations re-engineering	USAID development team
6/15/95	Software Risk Evaluation for the USAID New Management System (NMS) Project	Software Eng. Inst., Carnegie Mellon
3/17/95	Audit of the Integration of USAID's Information Systems - Report No. 9-000-95-010	USAID OIG
1995	Guide to Best Practices for Past Performance	OFPP
10/24/94	Response to "Request for Waiver" written September 27, 1994	Katherine W. Wood
8/94	Business Area Analysis: Budget and Fund Allocation, Volume I: Report to Management	USAID

Date	Title/Subject	Author/Source
7/94	Business Area Analysis: Budget and Fund Allocation, Volume II: Technical Appendices	USAID
1994	Guide to Best Practices for Contract Administration	OFPP
10/1/93	USAID Organization Chart	Unknown
6/1/93	Request for Waiver	Donald Charney
5/93	Financial Management: Inadequate Accounting and System Project Controls at AID - GAO/AFMD-93-19 (note: separately bound)	GAO
2/93	USAID Information Systems Plan Volume I: Report to Management	
1993	Government Performance and Results Act (GPRA)	US Congress
9/92	Information Resources Management: Initial Steps Taken But More Improvements Needed in AID's IRM Program - GAO/IMTEC-92-64	GAO
8/90	OMB Bulletin 90-08 "Guidelines for Preparation of Security Plans for Federal Computer Systems that Contain Sensitive Information"	OMB
7/26/89	Continued Viability of the Financial and Accounting Control System (FACS)	USAID OIG
1987	Public Law 100-235, the "Computer Security Act of 1987"	
* * *	FEDSIM Project No.: 97269IDO-03 Statement of Work	
* * *	Draft FEDSIM Independent Verification and Validation of NMS development (NMS IV&V) Project Element Plan	
* * *	Telephone Listings	USAID Tel Dir
* * *	NMS Program Organization Chart	
* * *	NMS Points of Contact	
* * *	Bureau Transition Coordinators	
* * *	Bibliography of AWACS Files going to the RRB Building	
* * *	Federal Acquisition Regulations (FAR)	FAR Board
* * *	USAID Acquisition Regulations	USAID
* * *	Information Technology Handbook, Chapter 10, "Information Technology Security"	Department of Commerce
* * *	"Guidelines for Conducting Information Technology Security Verification Reviews of Sensitive and Classified Systems"	Department of Commerce
* * *	Federal Acquisitions Regulations	GSA
* * *	A&A Business Area Analysis	USAID
* * *	NMS Documentation Change Report	
* * *	Congressional Presentation Summary Tables FY1997 (note: separately bound)	USAID
* * *	Congressional Presentation Statistical Annex FY 1997 Final Version (note: separately bound)	USAID

Appendix E:

NMS Application Gap Analysis Matrices

Appendix E-1:
AWACS – Core Financial System Management

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
ACCOUNTING CLASSIFICATION STRUCTURE MANAGEMENT The accounting classification structure management process shall provide a consistent basis for:							
1	Consolidating government-wide financial information.	J	A/P		2	2	AWACS supports the requirements for recording and classifying transactions in accordance with the United States Standard General Ledger. However, AWACS does not provide several elements required by JFMIP for government-wide reporting (i.e., Organization, Program, and Project).
2	Integrating planning, budgeting, and accounting.	J	A/P		2	2	The primary NMS classification element, Activity, is maintained in budget and used by AWACS.
3	Capturing data at the lowest level of detail-at the point of data entry-throughout the agency in a manner that ensures that when data is rolled up the level that is standardized; it is consistent at the standardized level.	J	A/P		2	2	Missions are managing and accounting at inconsistent levels of activity.
4	Comparing and combining similar programs across agencies and calculating overall program results. Provide a project structure that is independent of the other classification structures to allow multiple organizations, programs, and funding sources to be associated with a project.	J	A/P		2	0	AWACS does not support an independent project element in the classification structure.

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
5	Provide for an accounting and reporting structure for a diversity of USAID unique programs and activities under the general heading of project assistance and non-project assistance, as well as traditional administrative expense type functions. Include: operating expense/project assistance/non-project assistance; bilateral assistance/non-bilateral assistance; and loan/grant financing		FM		2	0	Lack of an independent project structure in AWACS limits the agency ability to track and record USAID unique project information.
COST MANAGEMENT Cost Recognition To support the Cost Recognition process, the Core financial system shall:							
6	Use the accrual basis of accounting when recognizing costs. The cost of goods and services used, consumed, given away, lost or destroyed must be recognized within the period of time the event occurred, regardless of when ordered, received, or paid for. Similarly, revenues must be recognized when earned.	J			2	0	AWACS does not currently support recording of periodic accruals such as payroll, contract accruals, etc. Expenses are accrued only at the time an invoice is approved, not when goods are received/accepted.
7	Reduce asset balances such as inventories and prepaid expenses as they are used and expensed.	J			2	0	AWACS does not support the ability to capitalize purchases
8	Use the agency's accounting classification structure to identify information such as fund, program, organization, project, and object class to support the cost accumulation and distribution processes.	J			2	0	AWACS does not support Cost Accumulation and Distribution
Cost Accumulation To support the Cost Accumulation process, the Core financial system shall:							

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
9	Provide support for fees, royalties, rents, and other charges imposed by the agency for services and things of value it provides. Sufficient information must be accumulated to support CFO recommendations made during biennial reviews on revising the charges to reflect costs incurred by the agency in providing those services and things of value.	J			2	0	AWACS does not support Cost Accumulation and Distribution
10	Provide for a variety of information to support the decision making process, the management of the agency, and external reporting. This will include: Cost reports to be utilized in the analysis of programmatic activities; Supporting schedules and operating statements in support of financial statement preparation and audit; Meaningful cost information needed to support performance measures; Ability to provide cost information directly to other systems in the Agency requiring this data. Ability to receive cost information directly from the managerial cost accounting system for reporting and analysis. Cost information for comparison to other program data to determine compliance with planned budgeted activities and effective utilization of available budgetary resources; Support of the billing process by providing cost information to the receivable function for producing bills.	J			2	0	AWACS does not support Cost Accumulation and Distribution
Cost Distribution To support the Cost Distribution process, the Core financial system shall:							

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REQ	BAA	AID			
11	Provide for identifying costs based on the accounting classification structure, including the ability to: Identify and record direct costs incurred, including input on costs from feeder systems such as inventory, travel, payroll, etc.; Allocate indirect costs to interim and final cost objectives using a method consistent with agency cost accounting standards. The preferred method for assigning indirect costs is one that best provides for a causal/beneficial relationship between the costs being distributed and the cost objective receiving the cost. Indirect cost allocation may be based on total cost incurred, direct labor hours used, square footage, metered usage, or any other reasonable basis; Allow for multilevel allocation and reallocation; Support variance analysis, adjustment of rates, and disposition of variance by performing periodic allocations to adjust cost based on estimated rates to the actual costs incurred for the period.	J			2	0	AWACS does not support Cost Accumulation and Distribution
12	Provide the capability to distribute costs to cost objects regardless of how they have originally been posted to the system (e.g., for financial statement presentation).	J			2	0	AWACS does not support Cost Accumulation and Distribution
REPORTING Access to Information To support Access to Information, the Core financial system shall:							
13	Allow for the information contained in the system to be queried to present specific detailed data as requested.	J			2	0	AWACS does not support ad-hoc querying

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REQ	BAA	AID			
14	Provide for the production of formatted reports by personnel accessing the system. The system must allow for the reformatting of reports to present different sorts of the information, the presentation of only specific information in the format selected, the summarization of data and the modification of report formats to tailor the reports to the specific requirements of the user.	J			2	0	Users can not format or reformat reports in AWACS
15	Provide for easy access to historical files for comparative, analytical and trend information.	J			2	0	Archiving capabilities have not been implemented in AWACS
Financial Reporting To support the Financial Reporting process, the Core financial system shall:							
16	Use financial data that can be traced directly to SGL accounts to produce reports providing financial information, whether used internally or externally.	J			2	0	Government-wide standard reports are not being produced by AWACS
17	Maintain accounting data to permit reporting in accordance with accounting standards recommended by the Federal Accounting Standards Advisory Board (FASAB) and issued by the Director of OMB, and reporting requirements issued by the Director of OMB and the Secretary of the Treasury. Examples of these reporting requirements include: Treasury Standard Form (SF) reports Other Treasury Reports (e.g., TFM 2108, FACTS) OMB Form and Content Reports	J			2	0	Government-wide standard reports are not being produced by AWACS
18	Produce, distribute, and provide access to formatted reports defined by agency management for the specific requirements of the agency.	J			2	0	AWACS does not fully support USAID's management reporting requirements

Appendix E-2:
AWACS – Funds Management

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	GAA	AID			
Funds Allocation To support the Funds Allocation process, the Core financial system shall:							
1	Provide the capability to record the funding and related budget execution documents including all stages of funds control (i.e. appropriated, apportioned, allotted, and budget allowance). Also record modifications.	J	FM AP		2	2	Not fully satisfied. Funding and budget execution documents for loans have not been implemented. Reimbursable funds control at the higher level has not been implemented.
2	Distribute, track, control, and report funds authorized at various funding levels, based on the SGL and accounting classification structure.	J	FM AP		2	3	Not fully satisfied. Distributes, tracks and controls funds at all levels. Reporting is limited.
3	Record the expiration and cancellation of appropriation authority in accordance with OMB Circular A-34 and the SGL.	J	FM FM AP		2	4	Satisfied.
4	Provide for transferring the management of funds from one AID organization or location to another without a major reallocation and deallotment/reallotment of funds.		AP		1	3	Satisfied. Note: Functionality does exist in AWACS, but due to partial implementation is not fully utilized.
5	Provide the ability to account for budgetary resources at a lower level in the accounting classification structure than they are budgeted and controlled.	J			1	4	Satisfied.
6	An integrated process that will ensure the agency does not obligate or disburse funds in excess of those appropriated and/or authorized.		FM		2	1	Not fully satisfied. AWACS FM performs funds control, but a violation of the Anti-deficiency Act may have occurred.
Funds Control To Support Foreign Assistance Act (FAA)							

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
7	Provide for a multi-level accounting and reporting structure that recognizes foreign economic assistance master accounts maintained for the Executive Office of the President and AID accounts maintained for allocations received from the Exec Office of the President per Section 661 of the FAA.		FM		2	0	Not satisfied.
8	Provide a capability to track, account for, and report on a multitude of legislative ceilings and earmarking of funds as exemplified by Titles II and V of the Foreign Operations, Export Financing, and Related Programs Appropriations Act of 1991 and by Sec 302 of the FAA.		FM		2	0	Not satisfied.

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
9	Provide for an accounting and control structure with the capability for any appropriation or account available for providing foreign economic assistance to function as a carrier account that may be charged in any fiscal year, within the limit of available funds, to finance expenses for which funds are available in other appropriations or accounts form for providing foreign economic assistance. It must assure that: Expenses initially charged to a carrier account under authority of Section 632(g) of the FAA are finally charged to the applicable appropriations or accounts at the end of the fiscal year with proper credit to the appropriations or accounts initially utilized for the financing purpose. Transfer final charges to applicable appropriations or accounts at the end of the fiscal year may be waived in the case of expense (other that those provided for under Section 6.37(a) incurred in furnishing assistance by AID, where it is determined that the accounting costs or identifying the applicable appropriation or account to which such expense should be charged would be disportionate to the advantage to be gained.		FM		2	0	Not satisfied.
10	Provide for an accounting and reporting structure with flexibility that permits obligations of funds provided for in bilateral project agreements for the service of personnel employed by other agencies of the US government as well as personnel not employed by the US Government but not employees of AID. (Section 625(f) of the FAA)		FM		2	0	Not satisfied.

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
11	Provide for an accounting, control, and reporting structure that supports financing and banking arrangements authorized by Section 632(e) and 635(g)(1) of the FAA.		FM		2	0	Not satisfied. Letters of credit functionality has not been designed into AWACS. Letter Of Credit Support System.
12	Provide for a flexible accounting and reporting capability in order that funds appropriated with time limitations on their availability for obligation may remain available until expended if they are initially obligated before the expiration of their respective periods of availability. Section 517 of the Foreign Operations, Export Financing, and Related Programs Appropriation Act, 1991)		FM		2	0	Satisfied.
Funds Control To support funds availability editing activity, the Core financial system shall:							
13	Provide for notification of funds avail. prior to the issuance of a commitment, obligation, or expenditure.	J	FM AP		2	4	Satisfied.
14	Record the impact of transactions on funds available.	J			2	4	Satisfied.
15	Provide the capabilities and controls for authorized users to override funds availability edits.	J	FM AP		1	0	Not satisfied.
16	Adjust available funds balances as reimbursable orders are accepted. In the case of reimbursable orders from the public, an advance must also be received before additional funding authority is recorded.	J			1	0	Not satisfied. AWACS Fund Management does not include functionality to fund reimbursable agreements.
17	Check available funds for commitments and obligations incurred in support of reimbursable agreements.	J			1	0	Not fully satisfied. Commitments and obligations are not distinguished as direct or reimbursable. AID does not believe it follows the correct accounting for reimbursables.
Commitments To support the Commitment activity, the Core financial system shall:							

295

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
18	Provide the capability to enter commitment documents into the Core financial system on-line and from multiple locations, as well as through an interface with other systems.	J			2	4	Satisfied. Commitments are made in AWACS and A&A.
19	Provide for modifications to commitment documents, including ones that change the dollar amount or the accounting classification structure cited. Invoke funds availability editing for the changed amounts.	J			2	4	Satisfied.
20	Close commitment documents under the following circumstances: (1) by the system upon issuance of an obligating document, (2) by the user with appropriate authorization, and (3) as part of the year-end closing.	J	FM		2	4	Satisfied.
Obligations To support Obligation activity, the Core financial system shall:							
21	Record obligations based on obligating documents and liquidate the related commitments, either partially or fully at the user's request.	J	FM		2	4	Satisfied.
22	Record obligations for which there is no related commitment.	J			0	0	Not satisfied. A commitment is required before an obligation.
23	Allow obligation documents to be entered into the Core Financial system on-line and from multiple locations, ae well as through an interface with other systems.	J			2	4	Satisfied. Obligations are entered in AWACS and A&A.
24	Allow multiple commitments to be combined into one obligating document and one commitment document to be split between multiple obligating documents.	J	FM		1	0	Not fully satisfied. Allows one commitment to be split between multiple obligating documents, but does not allow multiple commitments to be combined into one obligating document.
25	Provide on-line accese to all obligations by selection criteria, e.g., document number.	J			2	1	Not fully satisfied. Query by obligation number only.

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
26	Close obligating documents either (1) by the system automatically, upon complete performance/delivery or (2) by the user, with appropriate authorization.	J	FM AP		2	4	Satisfied. Obligations are not automatically closed, but can be closed manually. Note: no obligation aging report exist. See Reporting.
Analysis To support the Analysis activity, the Core financial system shall:							
27	Track the use of funds against operating or financial plans.	J	FM AP		2	4	Satisfied. Funds are tracked against OYB.
28	Report plan to actual at the level of the operating plans.	J			2	4	Satisfied.
29	Summarize, compare, and report the operating plans to the appropriate level of funds control.	J			2	4	Satisfied.

Appendix E-3:
AWACS – General Ledger

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
Account Definition To support the Account Definition activity, the Core financial system shall:							
1	Use a chart of accounts consistent with the structure provided in the U.S. Government Standard General Ledger (SGL).	J	GL		2	4	Satisfied.
2	Provide subsidiary ledger support for SGL accounts. This support, whether provided by subsidiary accounts or additional data elements, may be as detailed as the agency deems appropriate for asset protection, management information, and fund accounting.	J	GL		2	1	Not satisfied. G/L balances do not agree with subsidiary ledger detail because not all historical data has been migrated and data integrity has been compromised by programming bugs.
3	Support an account structure for multiple appropriations or funds and multiple fiscal years within the appropriations, including single-year, multi-year, and no-year appropriations. Other classification structure elements should be used to break out account balances as deemed appropriate by the agency for reporting or control purposes.	J	GL		2	4	Satisfied.
4	Support an account structure for multiple appropriations or funds and multiple fiscal years within the appropriations to account and report on funds subject to the Foreign Assistance Act.		GL		2	0	Not satisfied. See funds management.
Transaction Definitions To support the Transaction definition activity, the Core financial system shall:							

298

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
5	Use standardized transactions identified by reference codes to control transaction editing, posting to the appropriate general ledger accounts, and updating of other information maintained in the system, such as document balances and available funding.	J			2	4	Satisfied.
6	Provide the capability for a person with proper authority to establish or modify standardized transactions, including system-generated transactions.	J			2	4	Satisfied.
7	Provide the capability for generating all of the appropriate debit and credit entries (at least four pairs) to the general ledger from a single line of information with a transaction reference code. Should include budgetary and proprietary accounts.	J	GL		2	4	Satisfied.
8	Process system-generated transactions, such as automated accruals, closing entries, cost allocation transactions, recurring payments, and transactions that generate other transactions in those cases where a single transaction is not sufficient, using transaction definitions that may be easily maintained by a knowledgeable and authorized person.	J			2	0	Not satisfied. Accruals, cost allocation, and recurring payment functionality does not exist. Accruals are currently in testing. Closing entries have been automated for funds management, but have not been developed for closing of nominal or budgetary accounts.
Transaction Control In addition to recording transactions originally entered into the Core financial system, the Core financial system must be able to:							
9	Process transactions originating in other systems, recording and keeping track of such transactions and related information, in order to provide the basis for central financial control.	J	GL		2	4	Satisfied.
Audit Trails To support this activity, the Core financial system shall:							

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
10	Provide audit trails to identify changes to system parameters and trace transactions from source documents, original input, other systems, system-generated transactions, and internal allocation transactions through the system. Provide transaction details to support account balances.	J	GL		2	4	Satisfied.
Transaction Processing To support this activity, the core financial system shall:							
11	Provide the capability to post to the current and prior months concurrently until month-end closing and to maintain and report balances separately for the current and prior months. For example, a user could post transactions in early December for events that apply to November. At the same time, transactions for events occurring in December should be posted to affect December balances; these transactions would be reflected in December reports but not the November reports. Barring unusual circumstances, this overlap should be of limited duration (a few days) at the beginning of each month.	J			2	2	Satisfied. Note: AID is currently not closing individual accounting months.
12	At year-end, provide for the capability to post to the current year by month, as well as to the prior year, regardless of when year-end closing occurs. For example, a user should be able to post to the previous fiscal year, while also posting transactions to the new year.	J			2	4	Satisfied.
13	Provide control over the processing and reprocessing of all erroneous transactions through the use of error file(s) and/or suspense accounts. Erroneous transactions must be maintained and tracked until either corrected, posted or deleted at the request of an authorized user.	J			2	4	Satisfied.

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
14	Provide standard record format(s) for interface of transactions from other systems to the Core financial system, and subject all transactions from interfacing systems to the Core financial systems edits, validations, and error correction procedures.	J			1	0	Not satisfied. Functionality does exist to interface with other NMS modules, but not other systems.
15	Support simultaneous data entry/access by multiple users in a variety of modes.	J			2	4	Satisfied.
Archiving and Purging To support the archiving and purging process, the Core financial system shall:							
16	Archive transactions and related information needed for audit trails and as needed to limit data maintained to that appropriately needed for analysis and control. Retain system records in accordance with federal regulations established by the National Archives and Records Administration (NARA), GAO and others.	J			2	0	Not satisfied. Archiving methodology has not been implemented.
GENERAL LEDGER MANAGEMENT Accruals, Closing and Consolidation To support the Accruals, Closing and Consolidation process, the Core financial system shall:							
17	Provide for month-end and year-end closing and rollover of the General Ledger account balances under the control of an authorized system administrator. Selectively generate required transactions as needed by the year-end closing procedures.	J	GL		2	0	Not fully satisfied. AWACS G/L does not automatically generating fiscal year-end closing entries for nominal accounts.
18	Provide the capability for multiple preliminary year-end closings before final year-end closing, while maintaining the capability to post current period data.	J			2	4	Satisfied.
19	Allow for accruals of contracts or other items that cross fiscal years.	J	GL		1	0	Not satisfied.

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
General Ledger Analysis and Reconciliation To support the General Ledger Analysis and Reconciliation process, the Core financial system shall:							
20	Report a comparison between the amounts in the other components of the Core financial system and the related control accounts in the General Ledger and annotates on the report those accounts that are out of balance.	J			2	0	Not satisfied.

Appendix E-4:
AWACS – Accounts Payable

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REQ	BAA	AID			
Payee Information Maintenance: To support the Payee Information Maintenance process, the Core financial system shall:							
1	Maintain payee information that includes data to support obligation, accounts payable, and disbursement processes. Include the capability to search for payee information and generate a listing of payees.	J	A/P		2	1	Not fully satisfied. Search capabilities are limited and reports are not available. **Note:** A table containing vendor information for vendors awarded contracts is maintained by AWACS A/P. A vendor table is also maintained by A&A. The A&A vendor table contains vendors award contracts and those vendors who have bid on AID solicitations. Modifications to vendor information contained in the A&A module are written to the AWACS A/P table, but modification made to the AWACS A/P table is not written to the A&A vendor table.
2	Support payments made to third parties that act as an agent for the payee.	J	A/P		2	4	Satisfied. AWACS A/P maintains vendor payee information that allows AID to capture payment to vendor agents (third party).
3	Maintain information needed to support IRS 1099 reporting.	J	A/P		2	0	Not satisfied. 1099 functionality is not currently included in AWACS.
Payment Warehousing To support the Payment Warehousing process, the Core financial system shall:							

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
4	Warehouse and schedule payments in accordance with applicable regulations, for example, OMB Circular A-125, the Cash Management Improvement Act, and travel regulations.	J	A/P		2	4	Satisfied. AWACS A/P included warehousing functionality. OMB A0125 (PPA) due date is calculated based upon criteria entered (acceptance date, invoice receipt date, commodity type purchased). Payments are scheduled based upon ALC, payment method type, due data, and payment schedule type). Did not test for compliance with the Cash Management Improvement Act or travel regulations.
5	Record an accrued liability upon receipt and acceptance of goods and services and properly identify them as capital asset, expense, prepaid expense, or construction.	J	A/P FM		2	0	Not satisfied. Accrual is established when the invoice is received, not when goods are accepted. Acceptance date is recorded in AWACS manually when registering the vendor invoice. Also, all items are expensed. If the item expensed should be a capital or prepaid asset, the expense is reversed and manually posted appropriately.
6	Be capable of splitting an invoice into multiple payments on the appropriate due dates when items on the invoice have different due dates.	J			1	4	Satisfied.
7	Record discount terms, and determine whether taking the discount is economically justified as defined in the Treasury Financial Manual, Volume I, section 6-8040.	J			2	0	Not satisfied. AWACS A/P does no support taking discounts. A/P does not have the functionality to determine the economic benefit and automated schedule payment according to discount terms if determined to be favorable.
8	Record receipt, inspection, and approval of goods or services. Data is required to ensure Prompt Payment Act compliance.		FM AP		2	0	Not fully satisfied. Inspection of goods not recorded. Acceptance date is recorded manually.

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
9	Update the funds control and budget execution balances to reflect changes in the status of undelivered orders and expended appropriations as well as changes in amounts. Amounts may be different because of changes in prices or other authorized charges. Partially liquidate commitments in the case of partially ordered requisitions	J	A/P FM		2	4	Satisfied. Funds control is updated when administrative approval is recorded in AWACS A/P.
10	Establish accounts payable and make payments on behalf of another agency citing the other agency's funding information.	J	FM		1	0	Not satisfied.
11	Allow changes to payment schedules by authorized staff prior to submission to the disbursing office.	J	A/P		2	2	Satisfied. Note: Changes can only be made before certification.
12	Handle credit memoranda for returned goods or other adjustments. The capability must allow applying a credit memorandum to a payment due to the vendor issuing the credit or, if there are pending orders, to a future payment; or, if there are no outstanding payments to the vendor and no pending orders, establish an accounts receivable.		A/P FM		2	3	Not fully satisfied. Vendor credits are entered during registration of an invoice and netted against scheduled payments. An account receivable is not automatically established.
13	Schedule payments of advances, prepaid expenses, loans, grants, etc., with the appropriate accounting entries for each.	J			2	2	Not fully satisfied. Loan and letter of credit payments can not be scheduled.
Payment Execution To support the Payment Execution process, the Core financial system shall:							
14	Identify and select payments to be disbursed in a particular payment cycle based on their due dates. Provide the capability for review and certification by an authorized certifying officer.	J			2	4	Satisfied.

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
15	Compute amounts to be disbursed to include discounts, withholdings, interest, or penalties in accordance with applicable regulations. Generate the appropriate transactions to reflect the above deductions and additions.	J			2	0	Not fully satisfied. Functionality does not exist for determining whether the discount terms are favorable, take the discount if the favorable, or track discounts taken/lost. Interest and penalties are calculated.
16	Collect informations on discounts taken, discount lost, and interest penalties to comply with applicable Prompt Payment Act reporting requirements.	J	A/P		2	0	Not fully satisfied. Functionality does not exist for determining whether the discount terms are favorable, take the discount if the favorable, or track discounts taken/lost. Not reporting of interest, penalties and discounts taken/loss is provided.
17	Provide for various forms of payment to be used, i.e., check, or electronic transfer of funds, (e.g., ACH, wire).	J			2	4	Satisfied. EFT or Check for automated payments.
18	Consolidate multiple payments to a single payee, up to the prescribed limitation in order for the disbursing office to produce one check and itemize all payments covered by the one check. Allow for separate checks to a payee in specific instances where needed.	J	A/P		1	4	Satisfied.
19	Allow a payment to be removed from the automated scheduling stream and to be scheduled as a manual payment or held for later payment.	J	A/P		2	2	Satisfied. A payment can only be removed from a payment schedule before certification.
20	Process transactions resulting from payments made using other systems, such as payroll. Record disbursements, assets, expenses, obligations, or other accounts as appropriate, but do not schedule a payment to be made by the Core financial system, since the payment has already been made by the other system.	J			2	4	Satisfied. Option exists to prepare a no pay voucher.

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
21	Record disbursements made through OPAC by another agency against the agency's funds.	J			1	1	Not satisfied. OPAC disbursements are entered manually. Automated OPAC functionality is under development and in the testing phase.
22	Record payments made by another entity, such as a finance center, on behalf of the agency using agency funds.	J			1	4	Satisfied. No pay voucher functionality.
23	Define, track, and report tolerances used for quantity variances between receiving reports and the obligating documents. Goods or services should be rejected if this tolerance is exceeded unless an override is made by authorized personnel.		A/P		2	0	Not satisfied.
24	Match obligating document, receiving report, and invoice.		A/P		2	0	Not satisfied.
25	Provide notification where a receiving report or acceptance is missing for an invoice, or where goods or services have been received and accepted, but an invoice has not been received.		A/P		2	0	Not satisfied.
26	Process purchase returns, including rejection of part of a shipment. The appropriate resulting transactions should be generated.		A/P		2	0	Not satisfied.
Payment Confirmation and Follow-up To support the Confirmation and Follow-up process, the Core financial system shall:							
27	Provide for the comparison of the agency's payment schedule and disbursing office's accomplished payment schedule.	J	A/P		2	4	Satisfied.
28	Update the agency's records when payment information is received from the disbursing office to include: the paid schedule number, check numbers, and date and amount of payment.	J	A/P		2	4	Satisfied.

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
29	Maintain payment history of every payment by the Core financial system authorizing document number, payment schedule number, payment date, invoice number, vendor number, appropriation charged.	J	A/P		2	4	Satisfied.
30	Provide on-line access to vendor and payment information.	J	A/P		2	0	Not satisfied. Functionality was available in legacy system environment and is planned for NMS.

Appendix E-5:
AWACS – Accounts Receivable

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
Receivable Establishment To support the Receivable Establishment process, the Core financial system shall:							
1	Record the establishment of accounts receivable along with the corresponding revenues, expenditure reductions, or other appropriate offsets.	J			2	2	Not fully satisfied. System does not support expenditure reduction and not all AIID Headquarters offices are entering accounts receivable.
2	Support the establishment and tracking of accounts receivable to be paid under installment plans, including plans for which payments have been rescheduled.	J			2	0	Not satisfied. Functional does exist in the loan module that is under development.
3	Print bills using different methods to accommodate the generation of standard forms such as SF-1080's or SF-1081's, and turnaround documents to be used as a remittance advice.	J			2	4	Satisfied. AWACS A/R has the functionality to generate bills in the following forms: AID 7-129, SF-1081, and SF-1080. Also a notice of payment can be generated.
4	Prepare and transmit billing data to the On-line Payment and Collection (OPAC) system operated by the Treasury Financial Management Service to obtain funds from other federal agencies in accordance with interagency agreemente. Provide supporting data for OPAC transactions to agencies billed which can be used by them to verify the OPAC charges.	J			1	1	Not satisfied. OPAC receipts are entered into AWACS A/R manually. An automated interface is under development.
5	Record adjustments to bills and post to customer accounts.	J			2	4	Satisfied.

309

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
6	Print statements as well as bills.	J	AR		2	0	Not satisfied. The capability to generate customer statements is under consideration.
Receivable Management To support the Receivable Management process, the Core financial system shall:							
7	Maintain detailed information by account (e.g., individual, employee, private sector organization, state or local government, or other federal agency) sufficient to provide audit trails and to support billing and research activities.	J	AR		2	4	Satisfied.
8	Maintain accounts for reimbursable orders and identify government and non-government accounts.	J	AR		1	2	Satisfied. Note: Reimbursable functionality does not exist at the upper level. See funds management.
9	Update each account when billing documents are generated and collections are received.	J	AR		2	4	Satisfied.
10	Maintain individual accounts receivable and references to appropriate supporting documentation.				2	4	Satisfied.
11	Provide on-line query capability to receivable and account information.				2	1	Partially satisfied. Outstanding accounts receivable only. Query of satisfied accounts receivable is in the testing phase.
12	Provide information, on a summary basis and on individual accounts receivable, on the age of accounts receivable to allow for management and prioritization of collection activities.	J	AR		2	0	Not satisfied. Aging of accounts receivable is under development.
13	Provide for the calculation and assessment of interest, administrative charges, and penalty charges on overdue accounts receivable. Allow for the waiver of these charges with appropriate authority.	J	AR		2	0	Not satisfied. Functionality is currently in the testing stage.
14	Maintain data for accounts receivable referred to other federal agencies and/or outside organizations for collections.	J	AR		2	2	Functionality exists, but it is not being used.

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
15	Record the write-off of delinquent or uncollectible accounts receivable and maintain data to monitor closed accounts.	J	AR		2	2	Functionality exists, but it is not being used.
16	Produce dunning (collection) letters for overdue accounts receivable, in accordance with Treasury requirements and existing legislation.	J	AR		1	3	Satisfied.
Collections To support the Collections process, the Core financial system shall:							
17	Record complete and partial receipts according to the Debt Collection Act of 1982 and other applicable regulations.	J	AR		2	4	Satisfied.
18	Record revenues, expenditure reductions, or other appropriate offsets associated with collections for which no receivable was previously established.	J	AR		2	4	Satisfied.
19	Provide information to allow for offset of funds due to delinquent indebtedness through appropriate means, such as administrative offset, federal employee salary offset, and income tax refund offset.	J	AR		1	0	Not satisfied.

Appendix E-6:
A&A

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AIB			
Planning							
1	Describe acquisition requirement	15.402 ,7.105	/		2	4	Fully functional
2	Describe estimated value of acquisition	15.802	/		2	3	Estimated value maybe difficult to validate at this point in the Planning process.
3	Describe dates required	15.402 -g(1)	/		2	2	Entering the date required at this juncture is of dubious value. Kick-off meeting and WBS have not been developed. A Requester is entering this data without sufficient information for their date to be well grounded.
4	Select category of resource		/		1	2	Database search is not indexed. This results in a more time consuming process than necessary. Roles for inputing this field is unclear with users.
5	Select desired type of acquisition	Parts 7,13, 14	/		1	4	Fully functional
6	Select desired type of solicitation	15.402 -g(3), (8), -h 15.405	/		1	4	Fully functional
7	Suggest vendor type (if limited competition)	15.407 -c(2)	/		0	4	Fully functional.
8	View status of acquisition (once assigned to CO)		/		2	4	Fully functional
9	Confirm ability to support acquisition		/		0	0	Functionality does not exist.

312

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	SAA	AID			
10	Give recommendations regarding development of SOW	15.406	/		0	2	Request can be staffed. However, functionality is better achieved in practice via e-mail or the phone. Consequently, users do not use this functionality.
11	Assign responsibility for acquisition to Contracting staff	1.603	/		2	4	Fully functional
12	Determine vendor type		/		1	4	Fully functional
13	Review acquisition descriptions, solicitation types, and vendor types selected for acquisition	16.101 , 102	/		1	4	Fully functional
14	Record concurrence to acquisition strategy/vendor type		/		2	4	Fully functional.
15	Track & monitor vendor usage		/		1	4	Fully functional, but is not critical.
16	Use template to create SOW based on types of award	53.2	/		0	0	Users either do not believe functionality exists or do not use it.
17	Record technical and funding approvals	32	/		2	4	This is performed in A&A and used in AWACS has the un-liquidated balance line
Award Formation							
18	Record/Track award status	14.408 -1	/		2	4	Fully functional
19	Create, approve, track CBD notices	5.101	/		1	4	Fully functional
20	Review/record responsibility evaluation of vendors		/		1	0	Cannot use the system to determine if a contractor has a good financial and ethical track record.
21	Check mailing lists and responses against Debarred or Suspended bidders list	9.406	/		1	0	Based on the vendor list in A&A, there is no program that can be run to tell user if any of the vendor are debarred.

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
22	Record cost and technical evaluation of each response	15.804	/		0	3	Cost and Technical scores are recorded and calculates a total response score. However, it does not show any justification for the ultimate decision and is consequently misleading. If someone needs to see the justification for award, they need to see the entire response evaluation file.
23	Record BAFO, REQUESTS, memorandums of negotiation, and legislative notifications	15.611 15.610	/		1	3	Often, users do not know this functionality exist and do not use it. They do not seem to miss it.
24	Use electronic signature to transmit record of orders to vendors		/		2	0	NMS data cannot be sent directly to vendors. Developing such functionality is required under the 1997 DOD Authorization Act.
25	Review/concur with all CBD notices	5.101	/		1	4	Fully functional but objectives can be better achieved through e-mail, or direct interaction.
26	Determine status of acquisitions		/		2	4	Basic information is accessible. More data should be accessible to users through better database search capability.
27	Review indirect cost rates during evaluation	15.805	/		1	2	Functionality exists but is not enabled due to security issues.
28	Establish competitive range	15.609	/		1	4	Fully functional
29	Transmit deobligations to FM		/		2	4	Fully functional.
30	Develop proposals using USAID-provided software	14-202.8	/		0	0	This functionality was never provided
31	Track/perform schedule AWARD amendments, planned and ad hoc actions	14.408	/		1	2	Not utilized to the extent necessary.
32	Prepare a solicitation	14.2		/	2	2	Uses a dialog box to write solicitation. Users complain that dialog responses are not always properly reflected. There is a lot of effort to overwrite the prepared solicitation with cutting of pasting for other solicitations.

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	SAA	AID			
33	Create a list of vendors receiving solicitation			/	2	3	Functionality exists. Automated solicitation mailing list from CBD responses can be printed but all users may not be aware of this capability
34	Capture information regarding procurement actions which include opportunity for small, minority-owned or disadvantaged business	19		/	2	4	Fully functional
35	Commit funds			/	2	4	Fully functional
36	Decommit funds			/	2	4	Fully functional.
37	Record pre-award protest	33		/	1	3	Not being used consistently by the users. They may not perceive the need to enter data.
38	Rank vendors based on proposals	15.506 -5		/	0	2	Agency would not have automated access to past performance data. Can use past performance information submitted with proposal.
39	Electronically route a request document to others in the agency for review and approval			/	2	1	While there is a staffing alert indicator, some users do not go into the system often enough for this to be sufficient
40	Obligate funds			/	2	4	Fully functional
41	Award a contract	13.106 -2(c)		/	2	4	Fully functional
42	Print reports			/	2	1	Standard print out does not necessarily provide all necessary information needed by the users. User would like access to a more robust tool such as Impromptu to print out specific information.

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
43	Perform database searches			/	2	1	Database searches can and are performed. Fails to provide data that some users would like to have. Impromptu system is the main tool for more detailed searches, but few users have access to it or are trained to use it. Further, the data infrastructure is not prepared to permit widespread use of Impromptu even if it were provided.
Small Purchase							
44	Create Modification Requests	1.602		/	2	4	Fully functional
45	Receive requests for small purchases from AID/W offices or USAID Mission via system		/		1	1	No functionality exists for the Missions. This would be useful for them.
46	Set Up Delivery Schedule	13.301		/	2	4	Fully functional
47	Incorporate Statement of Work	13.106 -1 (a)		/	2	4	Fully functional
48	Commit/Sub-Commit Funds			/	2	4	Fully functional
49	Decommit Funds			/	2	4	Fully functional
50	Set Up Shipping And Billing Locations For Goods and Services	13.301		/	2	4	Fully functional
51	Electronically Route a Request For Review or Approval	14.202 -8		/	2	4	Fully functional
52	Print a Purchase Order			/	2	1	Standard print out does not necessarily provide all necessary information needed by the users. Print out seems to resort line items (e.g. Line 10 would appear first but line 100 would appear before line 20.)
53	Prepare a Request for Quotes	13.106 -2(a)		/	2	1	Users need better training to access the information they need to use this functionality.
54	Record Quotes	13.106 -2(b)		/	2	4	Fully functional

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
55	Make an Award	13.106 -2(c)		/	2	4	Fully functional
56	Prepare a Negotiator's Memorandum	13.106 -2(d)		/	1	2	Not enough space to record the basis for award in most circumstances. Print out does not reflect all entry in the field.
57	Obligate Funds			/	2	4	Fully functional
58	Perform Database Searches			/	2	1	Fails to provide data that some users would like to have. Impromptu system is the main tool for more detailed searches, but few users have access to it or are trained to use it. Further, the data infrastructure is not prepared to permit widespread use of Impromptu even if it were provided. Employees find it faster to look data up in hard files.
Award Administration							
59	Track invoices	32.905	/		2	4	Functionality exists in AWACS
60	Track deliverables	11.403	/		2	2	Functionality is not sufficiently used and impacts the agency's earned value-tracking capability.
61	Track/implement amendment creation	1.602-1, -2, -3	/		1	2	Some users are not using either because they do not know functionality exists or are not trained to use it.
62	Collect information on AWARD closeout		/		1	1	Functionality exists but is not enabled.
63	Perform AWARD closeout	4.802-2	/		1	0	Functionality does not exist

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
64	Record Receipt/Acceptance/Rejection	11.403		/	2	1	The COTR record of receipt/acceptance/rejection is recorded in A&A. At one point this was connected to the payment process in AWACS whereby a payment could not be made w/o receipt and acceptance of deliverables by the COTR. AWACs requested that this feature be disconnected until issues could be resolved on the AWACS side regarding the connection Consequently, FM cannot get approval through the system. Instead, there is an off-line process (phone calls, e-mails, etc...) to get the COTR sign-off. This has ramifications with regard to the Prompt Payment Act.
65	Record Post Award Protests	33		/	1	4	Fully functional
66	Record Correspondence Actions Between USAID and Vendors With Regard to an Award			/	1	4	Fully functional
67	Make Administrative Modifications to an Award	1.602-1,-2,-3		/	2	4	Fully functional
68	Deobligate Funding			/	2	3	Entries by Program Managers in A&A are visible in AWACS in 24 hours or less. While Program managers obligate, COTR's approve, therefore leaving a small window whereby the agency could pay invoices after money is de-obligated.
69	Perform Searches to Extract Data			/	2	1	Fails to provide data that some users would like to have. Impromptu system is the main tool for more detailed searches, but few users have access to it or are trained to use it. Further, the data infrastructure is not prepared to permit widespread use of Impromptu even if it were provided.
Support							
70	Track up-to-date audit status	15.802	/		1	0	Functionality does not exist.

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
71	Automate records of vendor's accounting systems	15.805 -5	/		0	0	Functionality does not exist.
72	Access and track past performance	42.15	/		2	0	Functionality does not exist. Integration with NMS is not automated. Existing Past Performance Data Base is a word perfect file that will fail when AID starts to collect most vendor past performance data
73	Evaluate workload analysis/staffing requirements	15.805	/		1	0	Functionality does not exist
74	Access current records on vendor's accounting systems	15.806 -3	/		0	0	Functionality does not exist
75	Access current records on vendor's negotiated indirect cost rate agreements	15.809	/		1	1	Functionality does exist but not enabled due to security issues.
76	Add Vendors	15.407 -c(2)		/	2	4	Fully functional
77	Maintain Vendor Profiles, Capability and Performance Records	4.703 4.705		/	2	1	It does not provide an automated view of past performance. It does maintain vendor profiles.
78	Reassign Workload	1.602		/	2	4	Fully functional
79	Add and Edit Shipping Addresses	47.303		/	2	4	Fully functional
80	Perform Vendor Queries			/	2	1	Reports can be generated, however, NMS fails to provide data that some users would like to have. Impromptu system is the main tool for more detailed searches, but few users have access to it or are trained to use it. Further, the data infrastructure is not prepared to permit widespread use of Impromptu even if it were provided.

319

Appendix E-7: Budget

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
Budget Formulation							
1	Plan for the funding requirements in future years – program budget		X		2	4	Fully functional. The bureaus have not fully used this application yet; it will be used for the development of the FY 2000 budget. The bureaus/missions will need training and policy guidance for using the system.
2	Plan for the funding requirement in future years – operating expenses (OE) budget		X		2	2	Gap in P and T. The OE budget can be budgeted to the SO and Activity level; however, AID also needs to budget to the object and sub-object class level and cannot through NMS. The bureaus/missions will need training and policy guidance for using the system.
3	Aggregate request amounts for the Agency's OMB and Congressional Presentation (CP) – program budget		X		2	4	Fully functional.
4	Aggregate request amounts for the Agency's OMB and CP – OE budget		X		2	2	Gap in P and T. Can aggregate the OE budget to the SO and Activity level; however, AID needs to aggregate the budget to the object and sub-object class level and cannot through NMS.
5	Submit budgets to the next level		X		2	4	Fully functional. Users can submit budgets from the activity to the SO to the mission to the Bureau to the Central Budget Office.

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
6	Distribute OYB – program budget		X		2	4	Fully functional. AID uses this tool to develop proposed OYB operating plan (Annex) and for distributing approved OYB. Policies and procedures are needed to address allotment process through system.
7	Distribute OYB – OE budget		X		2	2	Gap in P and T. Can distribute the OYB by SO and Activity but cannot distribute by object class and sub-object class in NMS. Policies and procedures are needed to address allotment process through system.
8	Link OYB allowances to AWACS		X		2	4	Fully functional.
9	Distribute target amounts for Congressional earmarks and directives (Indirect Emphasis Areas)		X		2	2	Gap in P and T. Indirect Emphasis Area funding is established in "Emphasis Area" module of BUD and can be seen through queries. However, the OYB distribution does not identify the earmarks/directives.
10	Monitor OMB and CP budgets			X	2	2	Gap in P and T. Can monitor status of budget cycle through query functionality. Training is needed on query functions.
11	Generate various funding scenarios in a given future year		X	X	1	0	This functionality was originally envisioned in the BAA but has never been implemented. Users believe is would be useful to have.
12	Link to OYB actuals in AWACS		X	X	2	2	Gap in P and T. In order to formulate budgets and to generate queries, this sub-system needs to link to actual obligations and expenditures from AWACS. BUD is able to download and display OYB actuals; however, the AWACS data is unreliable.
13	Develop narrative justifications for budget		X		0	0	This functionality was originally identified in the BAA; however, users would rather use other means to develop and transmit narrative justifications.

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
14	Generate "what if" scenarios		X		0	0	This functionality was originally identified in the BAA and partial functionality exists. However, users would rather use separate spreadsheets (data can be downloaded to spreadsheets).
Budget Guidance							
15	Provide narrative instruction for distributing funds and creating future budgets		X		1	1	Guidance is available but none of the users surveyed have used the module. In addition, the system can accommodate tables that are part of the guidance. The Central Budget Office has suggested that the functionality be expanded to include a messaging system.
Funds							
16	Create Funds and Fund Accounts		X		2	4	Fully functional.
17	Edit information on existing funds		X		2	4	Fully functional.
18	View information on the funds		X		2	4	Fully functional.
19	Delete the Fund or Fund Account when it is no longer needed		X		2	4	Fully functional. There are controls over when funds can be deleted.
20	Enter funding levels at specific budget milestones		X		2	4	Fully functional. This allows for tracking dollars through the budget process (e.g., OMB, CP).
21	Input of pre-appropriation amounts for a future budget year		X		2	4	Fully functional.
Emphasis Area This functionality is limited to the Central Budget Office. It defines the link between Agency goals and objectives and bureau/mission SOs and activities.							
22	Create Direct Emphasis Area categories		X		2	4	Fully functional.
23	Create Indirect Emphasis Area categories		X		2	4	Fully functional.
24	Edit information on Emphasis Area categories		X		2	4	Fully functional.
25	Link Emphasis Area coding to OPS Activity application		X		2	4	Fully functional. Links data into the OPS sub-system.
Budget Query							

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
26	Build a customized search of the NMS database		X		2	2	Gap in P and T. There are many query functions in place; however, additional features have been identified and there is a lack of understanding of how to use the feature. Some queries do not return accurate results.
27	Graph query results		X		0	2	Gap in P and T. There are graph functionalities; however, few use this feature and some elements do not work properly. Functionality is not needed here because the results can be transferred to Lotus.
28	Save query results as Lotus 1-2-3 worksheets		X	X	2	3	Gap in P. The users can save query results; however, there is a lack of understanding on how to use the query feature.
29	Save query parameters		X		2	2	Gap in P and T. The users can save queries; however, there is a lack of understanding on how to use the query feature and it does not work all the time.
Object Class Only one individual in Central Budget Office has this role.							
30	Establish new Resource Categories		X		2	0	Resource Categories (i.e., sub-object class) cannot be added beyond the original hard-coded categories.
31	Modify Resource Categories		X		2	0	Resource categories cannot be modified.
32	Provide indexed access to Resource Categories below the Object Class level		X	X	2	0	The user has to search through the list of 400 resource categories.
Reporting Region							
33	Group countries together for reporting purposes		X		1	2	Gap in P and T. The user can establish a reporting region but the link to running a query on that region is not working. In query, the user can only select one country. This functionality could be included as part of the query function.
Other							

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
34	Provide canned reports			X	2	1	There are 2 or 3 budget-specific reports linking the agency's budget to its goals but the users need more reports. There needs to be user involvement in defining needs.
35	Connectivity between missions and DC		X	X	2	3	Gap in T. This feature is needed so the agency can share information and respond quickly to changes during budget development and execution. However, the technology sometimes hinders this communication.

Appendix E-8: Operations

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
Results Tracking							
1	**ADD AND EDIT A STRATEGIC OBJECTIVE AND RELATE IT TO THE AGENCY'S 5 GOALS**		X		2	4	
2	Create Results Framework		X		2	4	
3	Link to agency's 6 goals		X		2	4	
4	Track measures, goals and indicators		X		2	2	Gap in Organization and Process. Although, this function works it is not being widely used.
Activity							
5	Define activities under an operating unit objective		X		2	4	
6	Define the geographic area that will benefit as a result of this activity		X		2	4	
7	Assign Emphasis Area Coding to each activity by fiscal year and fund account		X		2	2	Gap in Organization and Process. Although, this function works in the module and Budget mandates to perform this task many people are not assigning the codes and people in Washington are doing that assigning for the mission staff.
Participation							
8	Define a customer, stakeholder or implementor group.		X		0*	2	Gap in Organization and Process. People are not using this function because it does not have to be automated or could be done by other means

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REG	BAA	AID			
9	Record an engagement plan for each customer.		X		0*	2	Same as above
10	Generate a customer service plan		X		0*	2	Same as above
Team							
11	Coordinate objective team membership, responsibilities and goals. Keep a team journal		X		0*	2	Same as above
12	Team Access, which allows people from other Bureaus to look at their data.			X	2	0	Gap in Technology. This feature does not exist.
13	Prepare a Results Package		X		0*	2	Gap in Organization and Process. The concept of doing this has not been filtered throughout the entire organization.
14	Input Lessons Learned		X		0*	2	Same as above
15	Plan a Budget (Budget Planning Module)		X		0*	2	People are using spreadsheets to perform budget planning and would like to continue to use those sheets because they do not want to be on-line to perform what if scenarios. Many do not know it is there or how it works.
16	Conduct Results Planning (this module allows a person to create a draft plan and then upload it to the Results Tracking Module)			X	0*	2	People are putting their results directly into Results Tracking without creating drafts.
17	Generate reports		X		2	4	Ops has 5 reports, one of which is the Performance Data Table that is used in the R4 process
18	Query functions			X	2	0	There are no query functions in NMS.
19	Schedule			X	0*	0	Gap in Organization, Process, and Technology. Is a function that was planned but is currently done using manual processes enabled by project planning software tools. Also, this function does not need to be on-line and shared around the globe.
20	Print screens			X	2	0	Gap in Technology. Users have to take snap shots of the screen and get out of

1	2	3			4	5	6
Code ID	Functionality	Source			Impact (0-2)	Score (0-4)	Findings
		REQ	BAA	AID			
21	Linkage to Budget		X		2	4	
22	Linkage to AWACS		X		2	4	
23	Linkage to A&A		X		2	4	
24	Operations PC is a local version of the software that would give the missions without NMS the capability to use OPS			X	1	0	Gap in Technology. This function has been programmed but the upload/download procedures have not been written. It is nice to have because it supports
25	Generate Performance Data for GPRA report		X		2	2	Gap in Organization and Process. The system is able to collect the performance data by activity but the system is not the only source for GPRA and never will be.
26	Need reliable AWACs data			X	2	0	Gap in Technology and Organization. People do not feel that AWACs data is reliable and therefore any funding detail that is generated is bad.

Appendix F:

Enterprise Security Management Mechanisms

Appendix F

Enterprise Security Management Mechanisms

a. Security Service Mechanisms

If we establish the basic attributes of security that we are striving to achieve, then security mechanisms are the actual methods and techniques that we devise to accomplish them. In general, the simpler the mechanism, the greater the possibility that that mechanism might be defeated and the service rendered ineffectual. Thus, as a security policy evolves, it must necessarily establish minimum standards of security mechanism strength. It is frequently the case that when users are seeking "more security" for their network, they are in effect asking for stronger security mechanisms to support the security services they have. In other words, the service may be perfectly correct for the organization's security policy; it just isn't implemented with mechanisms that are strong enough to thwart the threats being mounted against it.

Some mechanisms are very familiar, but perhaps have been used to support other network services besides security. A common example is packet filtering. Simple packet filtering has been used to tune performance or to confine certain classes of traffic within an organization's interwork, or as a troubleshooting technique. Recently, more elaborate filtering techniques have been developed as part of a firewall access control strategy or to automatically route traffic over more protected paths.

The list of mechanisms that can be used in supporting security services is long, but how they are used in the different product areas can differ. For instance, a password mechanism is universally used for authentication. Other mechanisms, such as encryption can be used to support virtually all services.

b. Authentication Mechanisms

Authentication is an essential service. Most commercial organizations, consciously or not, operate under identity-based security policies. Network privileges and access is authorized based on the identity of the user. Securely and reliably configuring a user's identity is, therefore, fundamental.

One note of caution. It is sometimes easy to confuse who or what is being authenticated. In some cases it is a live individual. It also might be a computer or program that is representing that individual. This will be referred to as *user authentication.* In other instances the entity being identified is strictly a network device that may be associated with many "users." In that case, we will refer to it as *device authentication.*

1. Passwords

Passwords or Personal Identification Numbers (PINS) are the most commonly used authentication technique, representing something a user knows and secretly shares with the

device at the other end. Passwords are typically submitted, as part of a two-way handshake that should be should be part of logging in to hosts and servers, remote access servers, and the management ports of critical devices such as routers. Passwords can also be used within management applications to identify those who have been granted additional privileges for particularly sensitive functions (e.g., managing sensitive monitoring devices like RMON probes). Password-like values can also be used in protocol messages exchanged between devices. SNMP community strings, REPv2 authenticators, and PPP PAP passwords are examples. Passwords can be exchanged in both directions to obtain mutual authentication. Passwords are subject to protocol analyzer attacks and unauthorized reuse. The use of authentication servers to act as centrally administered (and protected) password databases is also recommended where possible. Protocols such as RADITJS (see "RADIUS" section) can be used to securely transport passwords between the access device and the authentication server.

2. Call-Back

Call-back can be considered another form of handshake, commonly used in dialing in over the telephone to remote access servers. These servers can be configured to dial back a specified number associated with the user. While this has limited use for the mobile user, it can be useful in enforcing authentication if a password is lost or "loaned." It is also **useful** for audit and billing purposes and can, in some cases, reduce telephone costs.

3. One-time Passwords

The one-time password mechanism uses a technique in which the password provided is never reused. This defeats protocol analyzer attacks because any password intercepted can no longer be used again. One of the most common examples of this technique uses time as the constantly changing value on which to base the password. The popular SecurID card displays a value on its LCD screen that changes every minute. This value (something the user has) plus the user's PIN (something she knows) can be submitted to the authentication server, where it can be uniquely compared against the value computed for that uses card at that particular time. One-time passwords are the next logical progression for protecting remotely accessed devices. They are particularly important in cases where logins are initiated over the network via remote Telnet. A variation of this technique, using a set of encrypted counters, is used in BaySecure Router Services to authenticate SNMP SET commands.

4. Kerberos Authentication

Kerberos is a more complex method for authenticating network users and protecting network traffic based on DES encryption. As an Internet Engineering Task Force (IETF) standard, it is gaining a strong following, primarily in the UNIX community. Kerberos works by having a central server grant a "ticket" honored by all networked nodes running Kerberos. Tickets are encrypted, so passwords never go over the network in "clear text." The single login feature of Kerberos means that users do not need to reenter their password when accessing a different computer - they just submit a ticket. The granting of a ticket itself can be used to authenticate the user logging into a remote access server. In a full Kerberos deployment, the ticket can be retained by the client and submitted as needed to gain access to other resources without having to login again. Finally, Kerberos tickets can be used to establish full confidentiality as well (see the section on Kerberos Encrypted Login). When operating in this mode, the encryption can be used to protect the communication flow continuously, and thus preserve the authentication of the connection beyond the initial setup.

5. RADIUS

The Remote Authentication Dial-In User Service (RADIUS) protocol is rapidly becoming the basis for future, open standards-based exchange for all types of authentication data (e.g., PAP passwords, CHAP challenges and responses). Using RADIUS, a client can exchange authentication, access control, accounting, and device configuration information with a RADIUS server. The RADIUS server can authenticate the user/device using its database of user IDs and authentication parameters. The keyed-NM5 algorithm is to provide authentication and integrity for the RADIUS messages and selective confidentiality for authentication parameters they might contain. Further discussion of RADIUS is contained in the Access Control and Audit sections.

6. Security Tokens

Security tokens are small portable devices that provide secure storage of authentication parameters and the processing capability to participate in one-time password or challenge response authentication exchanges. In addition to the SecurID card from Security Dynamics, other popular tokens include those from Enigma Logic, Digital Pathways, and Crypto Card. These tokens, and their associated servers can form the basis for an authentication method that covers client, server and host security as well as communication devices such as remote access devices.

c. Access Control Mechanisms

The fundamental purpose of all access control mechanisms is to prevent unauthorized use of a network resource.

1. Access Control Lists

The Access Control List (ACL) is at the heart of most access control mechanisms and constitutes the basis for making authorization decisions. The list can be either inclusive (specifying those users who are authorized - all others are unauthorized) or exclusive (specifying those users who are not authorized - all others are authorized). Lists can be organized by user, user group, device, or device port. User group profiles can be used to simplify the administration of lists with many users. Lists can be centrally administered offline and distributed to the various devices or maintained online in a central set of servers. Devices needing to determine access privileges refer to their local lists or communicate (securely) with the central server to obtain this information. Most networks rely on a mixture of both approaches for both security and reliability reasons.

A common network device example is a list of IP nodes authorized to access embedded services such as SNMP, Telnet, FTP, or TFRP. SNMP agents associated with critical devices such as routers or RMON probes are especially in need of such protection since the community string "passwords" are too easily learned.

Finally, because many networks use the access control lists built into their host and network operating systems, it is important that there is a common method for administering the lists maintained in network devices and network operating systems. Interfaces between network access control mechanisms and UNIX, NetWare, and Windows NT mechanisms will become increasingly important to ensure manageable and consistent access control lists.

3. Authorization Servers

RADIUS servers and other authentication servers are examples of a centrally administered approach to access control in which the server contains not only a means for authentication, but also a database that contains the services that the authenticated user or device is to be granted. In the case of RADIUS, the server can download configuration parameters that can enable authorized communications and security services. RADIUS supported security parameters include user-specific filters and authorized protocols. Communication services examples include session control, channel reservation, and channel aggregation across multiple lines. To ensure scalability, these servers should also support proxy services that allow one server to receive access control information from another server responsible for a particular user.

4. Traffic Filtering

One of the most basic and effective methods for enforcing access controls is at the data packet layer. In its simplest form, a filter can block packets that do not conform with security policy rules and to forward those that do. Filters can assigned to each port and traffic direction (i.e., incoming or outgoing) and is based on source and destination address, protocol type, and other fields within the packet. Routers can be particularly effective filtering engines because they are optimized to make rapid forwarding decisions based on these very same attributes. Filters can be used in switches and remote access servers as well. Besides blocking or forwarding, a filter should also be able to trigger an event for logging and/or alarming.

5. Policy Filters

Formerly called route filters, policy filters are available on routers and enable the network manager to set up an access control policy specifically aimed at controlling access to and from the routing tables. "Accept" filters are used to specify which route updates will be accepted from which routers or networks.

6. Intrusion Detection

One method, similar to filtering, available to control access to LANs is based on the ability of hub repeaters and switches to capture and compare the source address of all packets received from the connected nodes. This capability, which operates at full media rates, can be used in conjunction with "allowed nodes" access control lists, to ensure that only authorized stations are connected to the LAN at the appropriate physical location. Based on security policy, detection of unauthorized nodes can result in a security event, alarm, or shutting off the port.

7. Incoming CLI Screening

For ISDN networks, which supply calling line ID (CLI), CLI inclusive screening can be used to accept or reject incoming connections after comparison with an access control list to authorized CLIS.

8. Inactivity Timeout

Remote access servers can be configured to automatically terminate user sessions when there has been no activity over the line for a specified period of time. This reduces unnecessary security exposures from unattended terminals and also saves on phone charges. A similar facility can be used with Telnet and other connection-oriented network protocols.

9. Routing

Routers, in conjunction with filters, can also play a role in determining which network resources will be granted to a particular stream of packets. For example, IP delivery options allow a network manager to specify in advance the most appropriate path for certain classes of EP traffic based on resource considerations. With this capability, traffic arriving from certain insecure networks might be routed via networks having more security or less valuable attached resources. Access to paths that traverse subnetworks that serve particularly sensitive applications would be implicitly denied.

10. Security Labels

The Revised IP Security Option (REPSO) (RFC 1 108) specifies an optional IP header field that contains a security classification and handling label. Used primarily by the U.S. Government, this label allows the hosts and routers to appropriately label EP traffic based on its security level. Other hosts and routers can then check the labels of arriving datagrams. Based on the rules specified in RFC 1108, traffic may be accepted, rejected, or forwarded based on the security attributes of the host or the attached networks. Although not used by most commercial organizations who use identity-based security policies, labeling is essential to government mandatory access control polices based on security clearances and information classification levels (e.g., Top Secret).

11. VLAN Tagging

The Virtual LAN capabilities of frame switches allows the network administrator to establish Virtual LAN groups that directly parallel an organization's security policy. For example, Finance, Engineering, and Marketing VLANs can be established to ensure that tagged information flows can be logically segregated. VLANs dedicated to network management uses are another possibility. Controlled communication between VLANs can be implemented using any of the other mechanisms discussed in this section.

12. ATM LANE Client Registration

ATM LAN emulation (LANE) services allow administrators to establish a number of security relevant access control policies. For example, selected clients can be preassigned to a specific emulated LAN. In this case, all client registration requests are ignored and the client is placed in a specified emulated LAN or a special default emulated LAN. The default emulated LAN can be further restricted to prevent multicast or broadcast frame transmissions, thus effectively preventing communications between these clients via data-direct SVCS.

13. Protocol Gateways

Gateways that translate from one protocol suite to another can perform access control features as well. For example, a type of firewall can be established between a local NetWare LAN running EPX and the Internet running IP. IPX workstations running IP can access the Internet without any EP traffic traveling between the Internet and the local EP LAN. IP traffic from the Internet is blocked by this gateway as well as effectively hiding the local EP addresses and configurations

14. Firewall

Routers have had a "firewall" function since their first introduction. Originally, a Router served as a barrier that could confine protocol strings to one subnetwork. Subsequently, simple traffic filters could be used to prevent certain types of services (e.g., FTP) from being allowed between networks. As users' needs for these services increase, simple all-or- nothing filtering became insufficient and special purpose security gateways, which did little or no routing, were developed to concentrate on enforcing security rules on the traffic flow. Today firewalls offer a range of services: static traffic filters, dynamic (or stateful) filtering, circuitry level gateways, and application proxies. In almost every firewall deployment, routers are used to perform the static filtering and serve as screening routers to provide a first layer of protection to the firewall and the inner network. It is expected that the distinction between static filtering done in routers and dynamic filtering and proxying done in firewalls will disappear. Common management of the access rule bases between the two devices will continue to evolve (e.g., Checkpoint Firewall-1 Management Center), followed by a merging of some functions onto a single router-firewall platform.

d. Confidentiality Mechanisms

Confidentiality mechanisms protect communications from unauthorized disclosure. While encryption is the most flexible tool that applies here, a number of basic techniques are also discussed, because they can often be deployed quickly and with less system impact.

1. Eavesdrop Protection

Operating at full Ethernet speeds, eavesdrop protection hardware in Ethernet repeaters and hubs can immediately determine the destination MAC address of the packet and compare it with the authorized addresses for each port in the hub. Based on the MAC address, the packet data can be overwritten/erased for all unauthorized ports. With this totally transparent capability, the risks that sensitive traffic and user passwords can be intercepted by anyone plugging a PC into an empty office outlet or Trojan horse protocol analyzer programs introduced by an outside hacker with UNIX root privileges is greatly reduced.

2. Access Control Filters, Firewalls, Labels, or Tags

Traffic Filters, Firewalls, Security Labels, and VLAN Tagging can be effective in blocking information that should not be allowed to leave protected networks or enter unprotected networks or network segments. These access control mechanisms can be used to enforce security policies that have identified particular networks, hosts, or access points as particularly vulnerable to unauthorized disclosure.

3. Routing

Routers can also play a role in determining secure paths for sensitive data. For example, in conjunction with filtering, EP delivery options allow a network manager to specify in advance the most appropriate path for certain classes of IP traffic based on confidentiality considerations. Similar capabilities exist in an ATM context can support explicit control over how call setup requests are routed and more importantly, which calls are routed at all. If a portion of the network is deemed unsecure, it is possible to specify that no route is acceptable and the call request is refused.

4. Policy Filters

Policy filters are available on routers and enable the network administrator to set up policies specifically targeted at controlling the dissemination of route updates. Announce filters specify which routes will be announced to other routers, thus protecting sensitive network route configuration information from external networks, and intruders, which have no need to know this information.

5. Link Encryption

The ability to encrypt the payload of a packet at the data link layer is essential for many applications, especially for private or public WANS. Routers that sit at the LAN-WAN boundary are particularly appropriate locations for this capability. Depending on bandwidth requirements, encryption can be done in either hardware or software. Software has the advantage of being more portable across different communication platforms, if the processing power is available. The ability to remotely manage the keys at each end of the link is essential. Of equal importance is the capability to automatically change the traffic keys in use, frequently, transparently, and without operator intervention. Hardware-based encryption, especially if it integrates into the modular and scaleable architecture of today's router platforms, can provide high-performance encryption processing for the full range of LAN and WAN interfaces.

6. Network Encryption

To extend confidentiality across the extended enterprise, it is imperative that a fully interoperable method of encrypting IP datagrams be available. Bay Networks has, and will continue, to contribute to the IETF's IP Security (IPSEC) Working Group and the IP Security Protocol (IPSP) suite. RFCs 1825-1829 specify an IP level security architecture, encryption (ESP) and authentication (AH) protocols and associated data transforms. These RFCs are currently proposed standards and have already formed the basis for such interoperability initiatives such as the Secure WAN (S/WAN) consortium sponsored by RSA Data, Inc.

7. Secure Tunneling

IPSP encryption (ESP) can operate in both transport and tunnel modes. In transport mode, the datagram payload is encrypted, and the original IP header is left in the clear. In tunnel mode, the entire original EP datagram is encapsulated, encrypted, and placed in the payload of new datagram. This has the advantages of hiding the original user addresses and the flexibility that allows intermediate nodes (e.g., routers, firewalls) to act as proxy destinations for traffic targeted at a particular end system. The net result is that encrypted tunnels can be established between gateways that securely connect enterprise LANs across insecure networks. The encrypted tunnel, depending on the application, can serve as a cryptographic conduit to prevent unauthorized access to the traffic (i.e., confidentiality). Conversely, the tunnel can act as secure pipe to confine user traffic to only authorized paths within the network (access control). Consequently, managing these tunnel endpoints is just as important as establishing the security between the endpoints. Static configuration, dynamic discovery, redundancy, and automatic switch over are essential to ensure that encryption remains transparent and does not degrade any of the dynamics and redundant features that contribute to the reliability of routed networks. Tunnels can be extended directly to workstations and servers if needed.

8. Key Management

Further work is underway within the EPSEC Working Group to expand the IPSP suite to include an Internet Key Management Protocol (IKMP). The most promising Internet drafts include Simple Key management for Internet Protocols (SKIP) and the Internet Security Association Key Management Protocol (ISAKMP) using the Oakley key determination protocol. Both SKIP and ISAKMP/Oakley require the authenticated exchange of public key certificates to be most useful. The Public Key Infrastructure (PKIX) Working Group is standardizing the format of the Public Key Certificates and the Certificate Authority requirements needed for the successful operation of these protocols. Plans are underway within the S/WAN initiative to conduct interoperability testing using one of these proposed IKMPS.

9. Encryption interoperability

The S/WAN initiative is seeking to ensure full interoperability of encryption between routers, firewalls, and other intermediate packet encryption devices, as well as hardware/software implementations of EPSP in the end nodes. This interoperability must be at all levels: algorithms, data transforms, protocol data unit formats and processing, management of keys, negotiation of security parameters, and establishing security associations.

10. Encryption Performance and Scalability

Data encryption is similar to data compression in that it is computationally intensive. While software encryption is certainly feasible, performance in a typical server or router environment will probably be limited to around T 1 speeds for generally accepted algorithm such as DES. Security that limits the performance of a network will not be accepted in most environments. For this reason, as well the advantages of implementing the algorithms and key storage in more tamper resistant hardware, encryption should be available in high performance hardware. These cryptographic accelerators should be modular so that one or more can be configured to provide the security horsepower needed to ensure transparency on backbones as well as remote links.

11. Encryption and Troubleshooting

The widespread use of data encryption services can have an unintended impact on today's methods of monitoring and troubleshooting networks using network protocol analyzers and RMON probes. With the use of link or EP layer encryption, the upper-level protocol control information is not visible to conventional protocol analyzers, and even true source and destination address information can be hidden when operating in secure tunnel mode. Cryptographic management must include features for temporarily disabling encryption for troubleshooting purposes or preferably providing selective decryption for monitoring tools. Access to these features must be, of course, securely controlled.

12. Encryption and Data Compression

Encryption, if not implemented correctly, can also impact the performance of data compression. It is important that any data compression be performed first, prior to encryption. Encrypted data is essentially randomized, without the redundancy of clear text, normally exploited by the compression algorithms. This means that IP encryption followed by data link compression will result in a degradation in overall throughput when compared to compression without encryption. In systems where compression is an important requirement, integrated compression-encryption processing must be carefully architected to ensure that the benefits of compression are not.

13. Outboard Encryption Interfaces

In some environments, it may be appropriate to use standalone encryption devices that interface to network devices such as routers. Traditionally, U.S. Department of Defense applications require this approach. For example, BaySecure Router Services can configure a network interface appropriately to work with the KG-34 and Blacker Front End (BFE) encryption devices. Network devices should continue to support the direct connection of new government and non-government encryption devices that comply with standard network interface, management and protocol standards.

14. Kerberos Encrypted Login

Stronger authentication and continuous protection of the login session can be provided by the use of Kerberos. Kerberos clients can be granted tickets by the Kerberos security server that contain the keys for fully encrypted sessions with "Kerberized" servers. Encryption between client and server provides very strong protection against session hijacking. For example, if Kerberos is used only for initial Telnet authentication, TCP sequence number attacks can be launched to gain control of the authorized session. On the other hand, if the Telnet session is fully encrypted, the attacker must overcome both the encryption and the TCP sequence checking mechanisms - a much more daunting task. Encrypted login can be particularly important when accessing the maintenance and configuration features in critical network devices over the network.

e. Integrity Mechanisms

Integrity mechanisms provide a way to detect unauthorized modifications of the network communication. In many ways, integrity is one of the most important services.
Applications and networks cannot run correctly if the data they are using has been tampered with. To detect tampering by an attacker, who is fully knowledgeable of the applications and protocols, requires cryptographic techniques, similar to those used for authentication.

1. Checksums

A checksum is a mathematical calculation, producing a result that depends on the entire content of the message. This redundant piece of information can be inserted in the message by the sender and recommitted by the receiver to see if the message has been changed. In the case of communication environments, the check is done to be sure no errors in transmission and reception have occurred because of noise problems or processing errors. Mathematical algorithms, variously known as cyclic redundancy checks (CRCS) or frame check sequences (FCSS) have been developed to detect errors with high probability. A knowledgeable attacker can, of course, make changes to the message and the checksum to prevent detection. Encrypting the message and checksum can defeat simple attacks but typically are not sufficient against replay or cut and paste attacks.

2. Message Authenticator

Secure, one-way hash functions efficiently reduce an arbitrary message string into a fixed length quantity (hash). Knowing the hash alone, it is difficult to independently reconstruct the original message. And, unlike checksums, even knowing the original message, it is difficult to compute another message that would have the same hash. If a shared secret key is used as a piece of the message, but is not actually sent, the resulting digest can be used to detect deliberate

attempts at modification as well as serve as an authenticator of the message's origin. This method also has the advantage that the message contents are in the clear and can be used by any recipient. However, only those possessing the shared secret can verify the integrity of the message. (If only the sender and receiver share the key, then origin authentication can also be obtained.) MD5 and SHA- I are commonly used hash algorithms. MD5, for instance, has been specified for use in network management (SNMPv2), router-to-router protocols (RIPv2 and OSPF), IP security (IPSP-AH), and RADIUS communications. This same mechanism can be used to protect file transfers, including user data and the configuration and software images downloaded to communications devices.

3. Sequence Numbers

Sequence numbering can be used to detect message playbacks and deletions. Message authenticators or encryption can be used to protect the sequence numbers included in connection-oriented protocols (e.g., TCP) or can be specified within a security protocol to provide this service.

f. Non-Repudiation Mechanisms

These mechanisms provide proof of the origin and / or delivery of the communication. Generally, this has been considered an application-oriented service. Consequently, various management applications are the most obvious place to look for this service.

1. Digital Signature

Public key encryption systems, in which the encryption key is different from the decryption key, has made digital signatures possible. One key is kept secret by the originator and used to encrypt or "sign" messages. The other key is widely distributed to all potential recipients and is used to decrypt signed messages to "validate" their origin. The original message, the "signed" version, and the public validation key all constitute the proof of origin required for non-repudiation. Signed return receipts can also be used as proof of delivery. The most common signature algorithms are RSA and the Digital Signature Standard (DSS).

Public key based digital signatures have many applications, but in the network management space they will be adopted initially in key management protocols as part of establishing a security association (e.g., ISAKMP/Oakley). Individual device and users will have public keys that will be exchanged as part of that protocol. These public keys will be contained in digitally signed certificates issued by trusted certificate authorities. These authorities can be internal to an organization, but more likely will be third parties that are trusted by many different organizations to securely issue/sign certificates and manage renewals and revocations. This so-called public key infrastructure pioneered in the X.509 directory services standard, will be the basis for building a secure communications and application infrastructure. The IETF is working on the necessary standards in the IPSEC and PKIX working groups.

g. Audit Mechanisms

Audit mechanisms provide independent records of communications activity that enable managers to measure the effectiveness of the security services provided as well as detect any suspicious activities. These records form an objective basis for making changes to the security

services and investing in stronger mechanisms. They also form the basis for adjusting security policies, conducting investigations, and, if properly protected and handled, used as evidence in prosecutions. The value and importance of these records is attested to by the fact that they are among the first things modified by sophisticated attackers after an initial break.

1. Audit Trail

Audit trails are the sum of all records collected and retained that relate to normal and abnormal events, occurring during the daily operation of a system. Network audit trails relate to the events that are noted by the set of devices making up the network. These records should be time stamped and contain information identifying the system, the communicating entities (e.g., user Ds, addresses, ports), the particular event, and other event-specific data. Synchronized system clocks can make the correlation of date-time stamps easier during an audit trail analysis.

Typically, audit trails begin as recorded events in the network device. They can result in immediate notifications (e.g., SNND traps) or can be stored in an internal event log. The manager should be able to select which events should be recorded. A wide set of criteria should be supported (e.g., protocol type, event severity, event identifier/s, subsystem/module) to identify what should be included or excluded from the log. The ability to capture and store files locally or upload them as part of the permanent trail is, of course, required. Event logs and the collected audit trails should be properly protected. Authentication, access control, integrity, and confidentiality mechanisms should be in place to be sure that unauthorized tampering with the event records and the recording criteria can be prevented, or at least detected.

2. Event Monitoring

Events can be monitored either centrally or on an individual device. Regardless, systems should be in place to ensure that the local records can be periodically gathered and protected in a centralized manner for regular analysis. Filtering criteria (e.g., protocol type, event severity, event identifier/s, subsystem module) can again play a role to keep the volume of records forwarded for centralized monitoring to a manageable level. The unfiltered local log can be consulted for more information. Similar display filters are also desirable so that records of interest can be quickly viewed. Syslog messaging is a very common method for transporting logged events to a UNIX system running the syslog daemon. From there the logs can be dispatched to designated hosts, files, or printers.

3. Event Alarms

As mentioned previously, SNNV traps can be directed to the appropriate management station for real-time notification of specific events. These alarms should be logged and should be capable of initiating the usual visual, audible, and pager alerts, based on the severity of the alarm or warning.

4. Accounting Records

Although not strictly part of security, accounting services and mechanisms can be frequently incorporated into an overall audit trail picture of network activities. Accounting and billing mechanisms, such as those included in the RADIUS accounting protocols, are being rapidly standardized as part of dial-in user services. The use of accounting data (e.g., user name, calling number, type of service, session lengths, packets/bytes transferred) should be considered supplementary to event logs, alarms, and audit trails.

There are a number of products that offer enterprise security management solutions. The following chart is a sample product comparison of three products that offer the above mentioned six services in their suite of products.

Product	Authent-ication	Access Control	Confident-iality	Non-Repudiation	Integrity	Audit	Cost
Bay Secure	X	X	X	X	X	X	
Axent	X	X	X	X	X	X	
ISS	X	X	X	X	X	X	

Appendix G:

NMS Applications and Supporting Module Code Review Results

Appendix G:
NMS Applications and Supporting Module Code Review Results

AWACS Application							
	Logic	Perform-ance	Standard	Usability	Port-ability	Identified Errors	Usable Lines of Code
Accounts Payable	1841	6357	4073	1282	732	14285	53622
Accounts Receivable	2916	11001	4533	1449	1308	21207	74038
Funds Management	1909	4239	3099	870	755	10872	39931
Loan Service	1006	1329	1590	635	385	4945	0
Accounts Payable Table Maintenance	1124	1032	1643	902	374	5075	22828
Accounts Receivable Table Maintenance	121	77	241	150	48	637	2524
Payroll	331	291	564	231	203	1620	
Total	9248	24326	15743	5519	3805	58641	192943
Percentage	4.8%	12.6%	8.2%	2.9%	2.0%	30.4%	69.6%

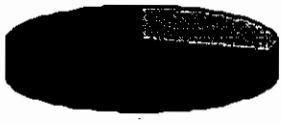


Table G-1: AWACS Code Review Results

A&A Application							
	Logic	Perform-ance	Standard	Usability	Port-ability	Identified Errors	Usable Lines of Code
Administration	1018	4090	2338	507	293	8246	31245
Formation	1915	5820	3576	774	392	12477	51691
Planning	1094	2987	1896	367	768	7112	23528
Small Purchase	2028	7727	3764	614	246	14379	56285
Support	666	1732	1440	365	160	4363	18714
Total	6721	22356	13014	2627	1859	46577	181463
Percentage	3.7%	12.3%	7.2%	1.4%	1.0%	25.7%	74.3%

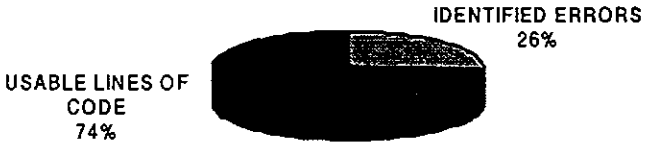


Table G-2: A&A Code Review Results

Budget Application							
	Logic	Perform-ance	Standard	Usability	Port-ability	Identified Errors	Usable Lines of Code
Query	475	1053	1155	305	180	3168	10707
Budget Guidance	1707	1353	1077	168	1258	5563	12657
Formulation	332	1052	903	151	249	2687	11872
Emphasis Area	618	1215	1020	224	301	3378	12090
Object Class Code	150	305	255	74	117	901	3710
Pipe	418	719	619	145	192	2093	7587
Fund Account	666	1597	1159	145	908	4475	19025
Total	4366	7294	6188	1212	3205	22265	77648
Percentage	5.6%	9.4%	8.0%	1.6%	4.1%	28.7%	71.3%

Table G-3: Budget Code Review Results

Operations Application							
	Logic	Perform-ance	Standard	Usability	Port-ability	Identified Errors	Usable Lines of Code
Activity	906	2570	964	231	492	5163	16299
Result Package	188	431	626	121	115	1481	5339
Customer	1097	2087	3391	1030	262	7867	28899
Geo Area	385	846	925	111	217	2484	8109
Lesson Learned	409	745	700	206	353	2413	8152
Org_Mat	350	1043	1220	162	190	2965	
Orglist	285	950	1044	154	133	2566	
Team	607	1109	1665	512	157	4050	15416
Total	4227	9781	10535	2527	1919	28989	82214
Percentage	5.1%	11.9%	12.8%	3.1%	2.3%	35.3%	64.7%

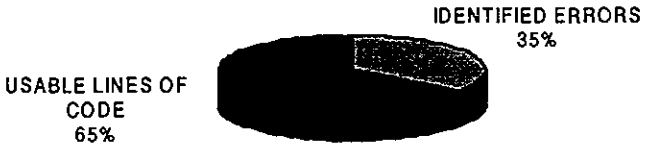


Table G-4: OPS Code Review Results

NMS Module							
	Logic	Perform-ance	Standard	Usability	Port-ability	Identified Errors	Usable Lines of Code
Security	118	675	484	175	300	1752	7585
Logon	525	715	240	190	125	1795	3963
Total	643	1390	724	365	425	3547	11548
Percentage	5.6%	12.0%	6.3%	3.2%	3.7%	30.7%	69.3%

Table G-5: NMS Code Review Results

Appendix H:
Year 2000 Compliance

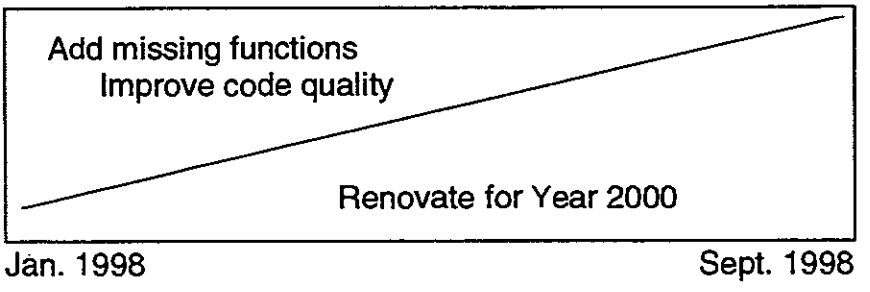
Appendix H-1:
USAID Resource / Cost Estimates for Year 2000 Renovation

As shown in the table below, Year 2000 renovation of all of NMS is estimated to require approximately 550 person/months (46 person/years). We do not believe that USAID can find the resource skills or obtain the necessary additional funding to carry out such an effort in time to be ready for FY 2000 or the "event horizons" that will occur even earlier where future dates are used.

NMS	Lines of Code (Visual Basic)	Costs	Person /Months	Person /Years
Establish Guidance		$130,000	16	1.3
Get tools in place		$550,000 - 790,000	66 - 95	5.5 - 7.9
Renovate: Pilot		$100,000	12	1.0
A & A	181,463	$1,070,000	128	10.7
AWACS	225,904	$1,330,000	160	13.3
Budget	77,648	$460,000	55	4.6
OPS	82,214	$480,000	58	4.8
Other	11,548	$70,000	8	0.7
Cut-over details		$75,000 - 125,000	9 - 15	.8 - 1.2
Final integr./accept. test		$100,000	12	1.0
Totals:	578,777	$4,365,000-4,655,000	524 - 559	43.7- 46.5

Figure H-2.1 NMS Year 2000 Renovation Cost Estimates

Further, this renovation effort can only take place *after* the Visual Basic code for the currently missing functions is completed, and the code quality improved to an acceptable level. Thus, the renovation activity schedule will look like this:



Minimum Mission-Critical Subset: We recommend that USAID define a subset of each of the NMS modules that are mission-critical and meet absolute minimum requirements for operation through the Year 2000 transition period.

Based on the analysis done by our NMS functional teams and on their interviews with end-users, the reduction in work that needs to be done results in the modified Year 2000 renovation costs shown below:

NMS Year 2000 Renovation Cost Estimates

NMS	Lines of Code (Visual Basic)	Costs	Person /Months	Person /Years
Establish Guidance		$130,000	16	1.3
Get tools in place		$450,000 - 700,000	54 - 84	4.5 - 7.0
Renovate: Pilot		$100,000	12	1.0
A & A min. subset	94,000	$560,000	67	5.6
AWACS min. subset	190,000	$1,120,000	134	11.2
Budget min. subset	60,000	$350,000	42	3.5
OPS min. subset	16,000	$91,000	11	0.9
NMS Mod. min. subset	12,000	$70,000	8	0.7
Cut-over details		$55,000 - 105,000	7 - 12	0.55 -1.05
Final integr./accept. test		$75,000	9	0.75
Totals:	372,000	$3,001,000-3,301,000	360 - 395	30.0 - 33.0

When combined with the resource/cost estimates for the Legacy systems which also have been determined to be mission-critical (and therefore must be made Year 2000 ready), the total resources and costs estimated for USAID for Year 2000 renovation can be seen below:

USAID Year 2000 Renovation Cost Estimates (NMS + Legacy)

System	Lines of Code	Costs	Person /Months	Person /Years
NMS Mission-Critical	372,000	$3,001,000-2,480,000	360 - 395	30.0 - 33.0
Legacy systems:				
U101 - Country Fin. Rep.	76,501	$153,000	18	1.5
C445 - Cash Journal	39,083	$16,000	2	0.2
C453 - NAPS - Payroll	198,168	$240,000	Outside	Outside

System	Lines of Code	Costs	Person /Months	Person /Years
C458/M - AETA Missions Time & Attendance	48,386	$97,000	12	1.0
C501 - Ltrs. of Credit Sys.	46,733	$93,000	Outsource	Outsource
C825 - Full Time Equiv.	34,593	$69,000	to Payroll	to Payroll
D521 - Loan Grant System	7,209	$14,000	2	0.2
W500 - MACS - Mission Acctg. & Control System	495,338	$750,000	72	6.0
B432 - Mission Staffing	56,195	$9,000	1	0.1
B632 - Manpower & Pers.	(240,633)	~done ($481,266)	2	0.2
B732 - Applicant Tracking	7,900	$16,000	1	0.1
B832 - Agency Locator	1,731	$60,000	5	0.4
N502 - Equal Opportunity	(35,029)	~done ($70,058)	1	0.1
H140 - Funds Util. Navig.	11,199	$60,000	5	0.4
D520 - Econ./Social D.B.	(18,800)	($37,600)	1	0.1
G100 - Housing Guaranty	16,282	$33,000	4	0.3
J305 - Funds Util. Navig.	5,355	$11,000	4	0.3
Q063 - RUS	15,214	30,000	1	0.1
U003 - Mail Accounting	3,244	$30,000	3	0.3
C449 - Storage Tracking	73,451	$30,000	3	0.3
D103/D104 - Equip. Inv.	28,094	$120,000	9	0.8
W253 - Vehicle Mngmt.	(75,618)	($151,000)	1	0.1
W254 - Mission Property	45,416	$90,000	11	0.9
D011- Cable Switching	(8,476)	($17,000)	1	0.1
D012 - ADP Tracking	8,430	$17,000	2	0.2

System	Lines of Code	Costs	Person /Months	Person /Years
D013 - Library Control	13,460	$27,000	3	0.3
D060 - Electronic Tel. Dir.	10,633	$21,000	3	0.3
E843 - Corresp. Tracking	98,606	$9,000	1	0.1
E850 - Executive Sources				
Q402 - Treasury Translate	(incl. in C425)	(incl. in C425)	(C425)	(C425)
Legacy system totals:	1,341,000	$2,466,000	168	14.1
USAID totals:	1,733,000	$4,996,000-5,296,000	528-563	44.1-47.1

IBM

Appendix H-2:
USAID Year 2000 Questions / Checklist

Has the inventory of all USAID systems and facilities been completed?

- Does this inventory include minis and micros (PCs)?
- Does the inventory also include "embedded microchip" systems in USAID and associated contractor facilities?
- Does the inventory include trading partner systems that exchange data to/from USAID systems (e.g. Treasury)?

Which of these have been assessed, and what is schedule for remainder?

- Has triage been completed - i.e. - priorities assigned?
- Have "event horizons" been determined? (Applications / systems where the type of application is such that failures might occur before 1/1/2000)
- Have computer system vendors supplied Year 2000 compliance statements for hardware / system software / application software installed at USAID?
- Has a fix / replace strategy been determined for each affected system?
- Strategy can be repair, rewrite, purchase, service bureau or eliminate
- Has an agency-wide agreement been established for the approach to Year 2000 compliance and interfaces between different software components?
- For client/server systems, have decisions been made as to where various types of date processing should best be done (server or client)?
- How many, what type of PC systems are there? Which of these have applications done by IRM, which by non-IRM staff (e.g. missions)?
- How many of these PCs interface to IRM systems?
- What are the scheduling / management implications of the fix / replace strategies (e.g. - changing all affected application programs at once if data base date formats are changed from 2 to 4 digits)?

How much corrective code has actually been written?

- On which projects, and what is remaining schedule?
- What are the resource implications of the fix strategies being employed?
- Will USAID able to hold existing resources from "pirating" by business firms?

- What will the effects be on other USAID projects: 1998 /1999 new applications, etc., and on current processing?
- What hardware and base systems software fixes have been delivered by vendors?
- Has BIOS checking been done for PC systems? Have unfixable PC systems been replaced where needed?
- When will affected embedded system microchips be replaced?
- When will affected network / infrastructure systems be fixed / replaced?
- If needed, are changes to trading partner systems being coordinated with USAID? Are they on schedule?
- Note OMB target schedule of Sept. 1998 for completion of code fixes or replacement Year 2000-compliant systems installed.

How much new and corrected code has been tested?

- Are new fixes causing problems with existing application code (regression testing)?
- In client/server configurations, are both servers and clients being tested?
- How long will testing be done in parallel with operational systems, and what are the (duplicate) resource implications?
- Is Year 2000 testing also being done in parallel with 1998 / 1999 new applications? How is this being managed?
- Note OMB target schedule of March 1999 for completion of testing.

Which new / corrected applications have actually been implemented?

- Can mixed applications (fixed / not yet fixed) be run together? - or must all await fixing of all applications in the set before any can be run?
- If data bases are being changed, have all applications using them been adjusted?
- Do these corrected applications include new 1998 / 1999 applications and other current USAID processing changes, or will the schedule have to be adjusted to have all changes take place at once?
- What is the cut-over plan? Will old / new applications be run in parallel for some period of time, or will there be an immediate cut-over for production?
- If old/new applications are to be run in parallel, have intermediate systems configurations and bridges/interfaces/data conversion routines between systems been defined?
- Note that the cut-over will need to be completed by 10/1/1999, FY2000 start.

If some applications cannot be corrected / tested / implemented by the 10/1/1999 deadline, what contingency planning has been put in place?

- What will be the effect of missing the deadline? Wrong information, application or system crashes?
- What will be the effect on USAID's trading partners (e.g. EDI connections)?
- What will be the effect on USAID if trading partner systems miss their deadline? Does the contingency plan address problems resulting from bad inputs from trading partners?
- Will USAID employ "SWAT" teams fix emergency problems? If problems are widely dispersed geographically - e.g. at one or more missions, can fixes be made, transmitted / tested remotely?
- Are there legal exposures to USAID (Washington or missions) or to its trading partners if the deadline is missed on some systems?
- Are there financial exposures to other Government agencies?

General:

- How often will USAID's progress be reported? To whom?
- Will progress reports be publicly available?
- What Congressional Committees are involved?
- What outside vendors and services are being used, and what is the level of their commitment to USAID?
- Procurement - What is the skill level and Year 2000 experience of the contractors employed, and how were they selected?
- Contract management:
  - Is there a clear set of measurable objectives, milestones, deliverables and defined test plans, and a frequent reporting plan?
  - If multiple contractors are being used, how are their efforts and reporting integrated?
  - What is the level of executive review, and are resources in place to manage the contractors effectively?
- Are USAID's operational locations (e.g. missions) in full agreement with the current Year 2000 plan?
  - Do they have the resources to make it happen?
  - Are local employees fully knowledgeable of plans and risks? Is much overtime expected? Might they be called upon to help at other USAID locations?

Review of NMS Modules
Summary of AWACS Critical Functionalities
(from Appendix E of IBM Analysis of NMS)

Local Currency Accounting (accounting for foreign currency-denominated obligations)

Accrual Basis of Accounting (Appendix E-1; pg. 2)

Accounting and Reporting against Congressional Earmarks (Appendix E-2; pg. 7)

Accounting for funds under Section 511/517 Authority (Appendix E-2; pg. 9)

Meeting Internal and External Financial Reporting Needs (Appendix E-1; pgs. 3 and 5)

Prompt Payment Act/OMB A-125 (Appendix E-4; pg. 18)

Standard General Ledger (Appendix E-3; pg. 12)

Capability to Interface with Outside Systems (Appendix E-2; pg. 10)

A&A VERSION 4.0 REQUIREMENTS

REVIEW OF IBM IV&V REPORT, ANNEX E, "NMS Gap Analysis Matrices"

A&A was provided the opportunity to review and comment upon the "draft" IBM scoring of the A&A portion of the Annex E "Gap Analysis". Comments provided were, for the most part, incorporated into the final version. And, as such, A&A does not have a problem with the *correctness* of the IBM Gap Analysis with one major exception: Item No. 68 "Deobligated Funding". The score should be "4" and the findings are not correct. AWACs receives an immediate update of the deobligations. Although, IBM did not have time to independently verify this as suggested, A&A has verified this in the training instance on 2/19/98.

The A&A Gap Analysis is useful but only to a certain level. The "necessary" components are very broadly stated and do not adequately describe necessary A&A implementation issues for this agency. As only one example, the 189 items do not make it clear that A&A must encompass assistance ***and*** acquisitions.

If the "necessary" item list is to be used as a guideline for Version 4.0 requirements within the existing NMS development organization, then it is sufficient as written. If it is to be used as the basis of a functional statement of work for the delivery of a Version 5.0, then A&A would need to expand the requirement---not in basic functionality---but in more detailed requirements. NMS A&A is successful because it appropriately captures the Agency's reengineered way of doing business and appropriately incorporates the Agency's procurement reforms. The identified "necessary" items for A&A in the IBM IV&V Report represent a skeleton description of the necessary functionality based on information directly taken from an *Outline* BAA. It is therefore, extremely important to A&A that the Gap Analysis continue to be viewed only in this context and not expanded to represent something it was never intended to be.

A&A VERSION 4.0 REQUIREMENTS

A&A has carefully reviewed the "necessary" A&A requirements (per the IBM report) and considered these requirements in the context of the current direction of the NMS effort (i.e., a Version 5.0 that consists of "improved" A&A, OPS and Budget modules and a COTS replacement for AWACS----all of which will be integrated.) Given the likelihood that the current NMS database structure will be significantly revised to accommodate the integration of the AWACS COTS in Version 5.0, A&A agrees to postpone ***desired*** enhancements and refinements until Version 5.0

The results of the IBM Gap Analysis of A&A in terms of "necessary" functions is summarized as follows:

Total Necessary Functions: 48

Total Necessary Functions with Score of "0":	2 (5%)
Total Necessary Functions with Score of "1":	10 (21%)
Total Necessary Functions with Score of "2":	3 (7%)
Total Necessary Functions with Score of "3":	3 (7%)
Total Necessary Functions with Score of "4":	28 (59%)

Of the 48 IBM coded "necessary" functions in A&A, 28 (59%) are fully functionally (i.e. earned a score of "4") and thus, are not a problem. A total of 6 were found to be technically working but not integrated into Agency processes (i.e. earned a score of "2" or "3"), and 10 were found to exist but having technical problems (i.e. earned a score of "1"). Finally, 2 were found to be non-existent (i.e. earned a score of "0").

The "0" scores were obtained for lack of incorporation of Past Performance tracking and no electronic signature function. A&A has no issue with delaying these functions in NMS until Version 5.0 as compilation of Past Performance information is currently being adequately accomplished in a stand-alone database and true "electronic signature" is not mandatory until electronic commerce capability is implemented for the Agency.

The "1" scores were obtained primarily for deficient query and reporting/printing functionality across A&A builds. **This must be corrected in Version 4.0 as it is necessary for proper and efficient workload and status management.**

The "2" and "3" scores were obtained primarily due to lack of Agency use of the given functionality mostly because they are viewed as being extraneous processes or not user-friendly. These processes *can* be accomplished in NMS as the functionality works technically---however, most users are accomplishing the process outside of NMS. Some examples include: tracking of deliverables, creating a list of vendors receiving a solicitation, preparing a solicitation, and certain descriptive elements of a Request (e.g., date required, estimated value). Some of these issues cannot be definitively corrected without AWACS effort or, in one instance, without revision/replacement of DGS. It is not likely that AWACS will address these issues in the current Version nor it is it desirable to replace DGS in the current version. Therefore, A&A will look to refining these functionalities in Version 5.0.

Another Version 4.0 requirement for A&A is to **create a plan and method for obtaining A&A data from the missions** for: (1) Federally-mandated FPDC reporting purposes; and (2) Ad Hoc queries of *all Agency* A&A data for purposes of workload management, response to congressional inquiries, etc. The A&A team has recommended that A&A be turned on in the missions. A plan (cost/benefit analysis) for doing so is almost complete. Included in this plan is a broad review of other alternatives (primarily, a stand-alone system or other electronic means of receiving data from the missions) to include a rough-order-of-magnitude (ROM) estimate for each. Regardless of the option selected, A&A must obtain data from the field.

Finally, A&A must **maintain the ability to support Version 4.0** in terms of development staff to respond to IRs and other trouble-shooting problems, data clean-up, etc. To this end, there is work-in-progress that should be completed to prevent costly re-work of the same issues later. An itemized listing of IRs that represent work-in-progress will be included in the Mission Data Collection Proposal. Some of the A&A support effort is handled by direct hire staff in OP, however, a fair number of development staff (with corporate knowledge of A&A) must be retained to accomplish the technical tasks associated with this support. This development staff must include appropriate test and documentation staff.

SUMMARY

Version 4.0 Requirements are summarized as follows:

(1) Correction of critical deficient functionality from IBM Gap Analysis.

(2) Continued production support for IR/troubleshooting of A&A. (includes finishing work-in-progress IRs)

(3) Implementation of Mission A&A Data Collection Plan.

OPS Version Four Functionality

A. Results Tracking Software Module (Current)

1. Add and Edit a Strategic Objective and relate it to the Agencies's 6 goals and objectives. (1)*

2. Create Results Framework (1)*

3. Link to Agency Objectives (1)*

4. Track measures Goals and Indicators (1)*

B. Activity Software Module (Current)

5. Define Activities under an operating unit (1)* objective

6. Define the geographic area that will benefit as a result of this activity (1)*

7. Assign Emphasis Area Coding to each activity by fiscal year and fund account. (1)*

C. Participation Software Module (Current)

8. Define a customer, stakeholder or implementor group. (3)

9. Record an engagement plan for each customer.(3)

10. Generate a Customer Service Plan (3)

---

(1) Indicates IBM Study "necessary" OPS functionality. The IBM study lists 26 OPS functionality of which 16 are necessary, 9 unnecessary and 1 desired.

(2) Indicates IBM "desired" OPS functionality.

(3) Indicates IBM "not necessary" functionality.

(*) OPS Recommendation for Required OPS Functionality.

D. Team Software Module (Current)

11. Coordinate objective team membership, responsibilities, and goals. Keep team journal.(3)

12. Team Access, which allows people from other Bureaus to look at their data. (1) (Planned)

E. Results Package Software Module (Current)

13. Prepare a Results Package (3)*

F. Lessons Learned Software Module (Current)

14. Input Lessons Learned (3)

G. OPS Budget Planning Software Module (In Testing)

15. Plan a Budget(3)

H. Results Planning Software Module (Current)

16. Conduct Results Planning (This module allows a person to create a draft plan and then upload it to the Results Tracking Module)(3)*

I. Reports Software Module (Current)

17. Generate OPS Reports (1)*

18. Query function (new functionality, not defined)(1)*

J. Scheduler Software Module (Planned)

19. Schedule(3)

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(1) Indicates IBM Study "necessary" OPS functionality. The IBM study lists 26 OPS functionality of which 16 are necessary, 9 unnecessary and 1 desired.

(2) Indicates IBM "desired" OPS functionality.

(3) Indicates IBM "not necessary" functionality.

(*) OPS Recommendation for Required OPS Functionality.

K. Other Functionality Listed in IBM Report not related to a specific OPS Module.

20. Print Screens (The OPS Team believes this is a functionality which should be built into each of the applications) (1)*

21. Linkage to Budget (1) (Current)*

22. Linkage to AWACS (1) (Current(*

23. Linkage to A&A (1) (Current)*

24. **Operations PC Software Module** is a local version of the software that would give the missions without NMS the capability to use OPS. (2) (Under Development)*

25. Generate Performance Data for GPRA report.(1) (Current)*

26. Need Reliable AWACS Data. (1) (Current)*

L. Current or Planned OPS Modules not included in IBM Report

27. **Geographic Area Maintenance Software (Current)***

28. **Organization Maintenance Software (Current)***

29. **Common Indicators Software (Current)**

30. **Document Generator Software (Planned)**

31. **Master Activity/Activity Re-parenting Software (Planned)***

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(1) Indicates IBM Study "necessary" OPS functionality. The IBM study lists 26 OPS functionality of which 16 are necessary, 9 unnecessary and 1 desired.

(2) Indicates IBM "desired" OPS functionality.

(3) Indicates IBM "not necessary" functionality.

(*) OPS Recommendation for Required OPS Functionality.

OPS Version Four Functionality

A. Results Tracking Software Module (Current)

1. Add and Edit a Strategic Objective and relate it to the Agencies's 6 goals and objectives. (1)*

2. Create Results Framework (1)*

3. Link to Agency Objectives (1)*

4. Track measures Goals and Indicators (1)*

B. Activity Software Module (Current)

5. Define Activities under an operating unit (1)* objective

6. Define the geographic area that will benefit as a result of this activity (1)*

7. Assign Emphasis Area Coding to each activity by fiscal year and fund account. (1)*

C. Participation Software Module (Current)

8. Define a customer, stakeholder or implementor group. (3)

9. Record an engagement plan for each customer. (3)

10. Generate a Customer Service Plan (3)

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(*) OPS Recommendation for Required OPS Functionality.

D. Team Software Module (Current)

11. Coordinate objective team membership, responsibilities, and goals. Keep team journal.(3)

12. Team Access, which allows people from other Bureaus to look at their data. (1) (Planned)

E. Results Package Software Module (Current)

13. Prepare a Results Package (3)*.

F. Lessons Learned Software Module (Current)

14. Input Lessons Learned (3)

G. OPS Budget Planning Software Module (In Testing)

15. Plan a Budget(3)

H. Results Planning Software Module (Current)

16. Conduct Results Planning (This module allows a person to create a draft plan and then upload it to the Results Tracking Module)(3)*

I. Reports Software Module (Current)

17. Generate OPS Reports (1)*

18. Query function (new functionality, not defined)(1)*

J. Scheduler Software Module (Planned)

19. Schedule(3)

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(*) OPS Recommendation for Required OPS Functionality.

K. Other Functionality Listed in IBM Report not related to a specific OPS Module.

20. Print Screens (The OPS Team believes this is a functionality which should be built into each of the applications) (1)*

21. Linkage to Budget (1) (Current)*

22. Linkage to AWACS (1) (Current)*

23. Linkage to A&A (1) (Current)*

24. Operations PC Software Module is a local version of the software that would give the missions without NMS the capability to use OPS. (2) (Under Development)*

25. Generate Performance Data for GPRA report.(1) (Current)*

26. Need Reliable AWACS Data. (1) (Current)*

L. Current or Planned OPS Modules not included in IBM Report

27. Geographic Area Maintenance Software (Current)*

28. Organization Maintenance Software (Current)*

29. Common Indicators Software (Current)

30. Document Generator Software (Planned)

31. Master Activity/Activity Re-parenting Software (Planned)*

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(1) Indicates IBM Study "necessary" OPS functionality. The IBM study lists 26 OPS functionality of which 16 are necessary, 9 unnecessary and 1 desired.

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(*) OPS Recommendation for Required OPS Functionality.