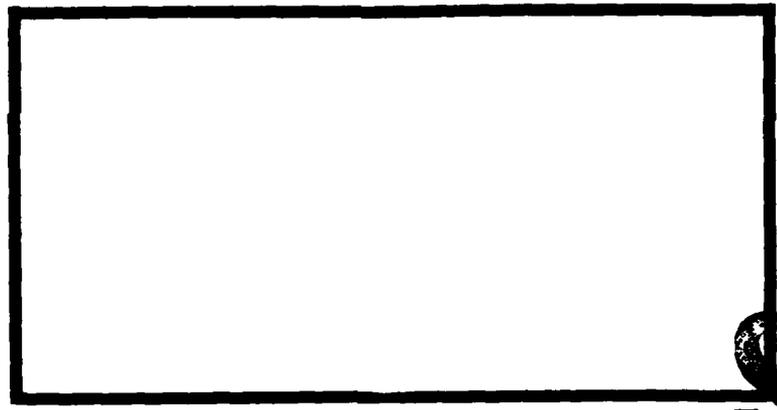


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AN ANALYSIS OF THE ASSIGNMENT
OF THE RESPONSIBLE
TEST ORGANIZATION IN
SIMULATOR TESTING

Richard S. Johnson, Captain, USAF

LSSR 89-81

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AFSC acquisition programs are required by AFSC Supplement 1 to AFR 80-14 to use an independent test organization to accomplish Development Test and Evaluation (DT&E). However, there are a few AFSC acquisition programs where the "uniqueness" of the test requirements make it difficult to identify an independent test organization qualified to perform the testing. In these cases, the program offices are assigned the DT&E responsibilities for the program. Lack of expertise in simulator testing and the small size of the early simulator programs led to assigning DT&E responsibilities directly to the Simulator SPO. This study shows that unique expertise is still required for simulator testing; however, the testing "uniqueness" should not preclude the use of an independent test organization. Test managers of the AFSC programs assigned test responsibilities indicated that if an independent test organization was available to test their programs, the added perspective would enhance the effectiveness of the test program. A recommendation was made to assign simulator test responsibilities to an independent test organization. The Air Force Flight Test Center at Edwards AFB CA was identified as a test organization capable, or potentially capable, of conducting all, or part, of the Air Force simulator DT&E program.

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AN ANALYSIS OF THE ASSIGNMENT OF THE
RESPONSIBLE TEST ORGANIZATION
IN SIMULATOR TESTING

A Thesis

Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the Requirements for the
Degree of Master of Science in Systems Management

By

Richard S. Johnson
Captain, USAF

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TABLE OF CONTENTS

	Page
ACKNOWLEDGMENTS	iii
LIST OF TABLES	vii
CHAPTER	
I. INTRODUCTION	1
Background	1
Development Test and Evaluation	1
Qualification Test and Evaluation	2
Operational Test and Evaluation	2
Responsible Test Organizations	3
Test Program Development	5
Simulator Testing	5
Problem Statement	7
Research Objective	9
Research Questions	9
II. METHODOLOGY.	11
Introduction	11
Unique Testing Characteristics	11
Computational Systems	12
Instructional Systems	12
Mechanoreceptor Cueing Systems	12
Visual Systems.	13
QT&E.	13
Resource Requirements	13

CHAPTER	Page
RTO Survey	14
Population	15
Survey Construction	16
Demographic information	17
Manning requirements	17
Control of test funds	18
Objectivity	18
RTO assignment	19
Suggested improvements	19
Independent Test Organization Identification .	19
Summary	20
III. FINDINGS AND ANALYSIS	22
Introduction	22
Simulator Resource Requirements	22
Introduction	22
Computational Systems	22
Instructional Systems	23
Mechanoreceptor Cueing Systems	24
Visual Systems	24
Analysis	25
Summary	27
Self-RTO Survey	28
Introduction	28
Demographic Information	28
Manning	29

CHAPTER	Page
Control of Test Funds	31
Objectivity	34
RTO Assignment	35
Suggested Improvements	37
Summary	38
Independent RTO Identification	40
Introduction	40
Background	40
Capabilities	41
Summary	42
IV. SUMMARY, CONCLUSIONS, AND RECOMMENDATION . .	43
Summary.	43
Conclusions	44
Recommendation	45
APPENDICES	48
A. SELF-RTO QUESTIONNAIRE	48
B. SURVEY RESULTS	56
BIBLIOGRAPHY	117

LIST OF TABLES

TABLE		Page
3-1	TESTING WORKLOAD/MANNING	30
3-2	IMPACT OF FUNCTIONAL CONTROL	32
3-3	NEED FOR INTERNAL MEMORANDUM OF AGREEMENT .	33
3-4	IMPACT OF INDEPENDENT RTO.	33
3-5	RTO ASSIGNMENT	36

CHAPTER I

INTRODUCTION

Background

Test and evaluation (T&E) of new weapon systems and equipment is an integral part of the acquisition process.

T&E is used in the system acquisition process

. . . to identify, assess, and reduce the acquisition risks, to evaluate operational effectiveness and operational suitability, and to identify any deficiencies in the system [17:2].

Air Force T&E consists of three types: Development Test and Evaluation (DT&E), Qualification Test and Evaluation (QT&E), and Operational Test and Evaluation (OT&E).

Development Test and Evaluation

Development Test and Evaluation is the responsibility of the implementing command. DT&E is basically an in-depth engineering analysis of a system's performance where the system design is tested and evaluated against engineering and performance criteria. The testing begins with individual subsystems, or components, and progresses up to prototypes of the entire system. Modifications to the system, even after production, must undergo DT&E; therefore, DT&E might be conducted throughout the life of the system (17:2).

The objectives of DT&E as outlined in AFR 80-14 are:

- a. To assess the critical issues, as specified in program documents;
- b. To assess the technical risk and evaluate the trade-offs among specification, operational requirements, life cycle costs, and schedules;
- c. To verify the accuracy and completeness of the technical orders developed to maintain and operate the weapons system;
- d. To gather information for training programs and technical training materials needed to support the weapon system;
- e. To provide information on environmental issues to be used in preparing environmental impact assessments;
- f. To determine system performance limitations and safe operating parameters [17:6].

Qualification Test and Evaluation

Qualification Test and Evaluation (QT&E) is performed instead of DT&E on programs where there are no funds in the research, development, test, and evaluation appropriation. QT&E is performed by the implementing command. The test policies for DT&E also apply to QT&E (17:3). QT&E is not as widely known and discussed as its sisters DT&E and OT&E.

Operational Test and Evaluation

AF Operational Test and Evaluation is managed by the Air Force Test and Evaluation Center (AFTEC). OT&E is the test and evaluation to determine the expected operational effectiveness and operational suitability. It is

conducted throughout the system's life cycle beginning with Initial Operational Test and Evaluation (IOT&E) in the pre-production phases and Follow-on Operational Test and Evaluation (FOT&E) after the production decision is made. OT&E is to be conducted in an environment for which the system is intended. This includes the use of personnel with the same types of skills and qualifications as those who will operate, maintain, and support the system when it is deployed (17:2).

The objectives of OT&E as outlined in AFR 80-14 are:

- a. To estimate the operational effectiveness and suitability of the system;
- b. To identify operational deficiencies;
- c. To recommend and evaluate changes in production configuration;
- d. To provide information for developing and refining:
 - (1) Logistics support requirements for the system,
 - (2) Training, tactics, techniques, and doctrine throughout the life of the system;
- e. To provide information to refine operation and support (O&S) cost estimates, and to identify system characteristics of deficiencies that can significantly impact O&S costs;
- f. To find out whether the technical publications and support equipment are adequate;
- g. To estimate the survivability of the system in the operational environment [17:6].

Responsible Test Organizations

Air Force Systems Command Deputy Chief of Staff for

Test and Evaluation (HQ AFSC/TE)¹ is required to appoint a Responsible Test Organization (RTO) during the early phase of each new DT&E program (3:4). The RTO is responsible for accomplishing the test program as approved by the program manager. The RTO provides the program office and HQ AFSC/TE ". . . an independent assessment of the DT&E results in conjunction with program decision points [3:6]." The responsibilities of the RTO include the design of the test program, the collection and reduction of test data, and the arrangement and coordination of the support of all participating organizations (1:4-5).

The RTO is normally assigned by TE. TE examines the mission statements of available Test and Evaluation (T&E) organizations to assess the test organizations' capabilities to accomplish the required testing. Unique test requirements and other significant factors are considered before the decision is made to assign a test organization as the RTO. The test organizations considered qualified are sent messages informing them of their possible assignment as RTO. The T&E organizations respond to TE's message with pertinent plans for the upcoming test period. TE reviews the responses received from the test organizations before making the final decision. The test organization

¹The organization will be referred to as "TE" throughout the thesis.

chosen as the RTO is then notified by message. The RTO is designated on the AFSC Form 56, AFSC Program Direction, which is forwarded to the program office (9; 12).

Test Program Development

In a typical acquisition program, the implementing command assigns an acquisition program to a System Program Office (SPO). A program manager is assigned to the program to manage the entire system acquisition process (except for OT&E). The SPO normally contains a test office which supports the program manager by providing day to day test management; and the RTO, the user, AFTEC, and other supporting organizations develop the Test and Evaluation Master Plan (TEMP). The TEMP identifies critical program issues to be addressed in the test and evaluation program. The TEMP also states how the test will be conducted and how the results will be used to verify the stated requirements (1:1-5; 3:5).

Simulator Testing

The Deputy for Simulators (YW) in the Aeronautical Systems Division (ASD) is responsible for development of devices to be used to train personnel in AF weapon systems operational procedures. The Director of Simulator Test and Deployment (YWT) has the responsibility to:

Develop Qualification Test and Evaluation (QT&E) and Development Test and Evaluation (DT&E) concepts to ensure acquisition of simulation devices with

characteristics comparable to the weapon system being simulated. Establishes procedures for consolidating DT&E and operational test requirements. Establishes and maintains procedures for processing and tracking test discrepancies and service reports for all simulator programs. Develops concepts and policies to ensure that adequate facility planning, as well as pre-operational support are accomplished to ensure the development of simulation devices to all intended sites [2:p.9-2].

The Deputy for Simulators has historically been assigned as the RTO for simulator test programs. This came about because of the perceived "uniqueness" of the simulator business. When YW was first formed, it was primarily a one program office. Its main function at that time was the acquisition of Undergraduate Pilot Training (UPT) simulators for the training of Air Force pilots. As sophistication of Air Force aircraft increased and the cost of flying time increased, the need for ground simulators also increased. The lack of AF test organization expertise in computer software during the early days of simulator testing led to high reliance on contractor testing.

Currently simulator testing is accomplished at the contractor's facility using contractor generated test procedures. The test plan and procedures are also contractor prepared documents. Simulator personnel either provide inputs to the plans or just review them depending on the contractor's experience or expertise. Initial system testing is accomplished by the contractor to verify that proper procedures result in proper indications such as pushing the

throttle forward causes increased RPM on the engine RPM indicator. The contractor also verifies the software program during this phase of testing when it is required. Test personnel from YWT are then sent TDY to the contractor's facility to execute the test plan. Any subsequent problems with the simulator may require additional visits until testing is satisfactorily completed. The simulator is then shipped to the user's location where acceptance testing is performed by YWT personnel to verify that the system works after installation. YWT personnel write the simulator test specifications, manage the development of the test plan, and then actually conduct the test (5).

Problem Statement

The assignment of the Directorate of Simulator Test and Deployment (ASD/YWT) as the RTO provides four potential areas of concern. First, the RTO is charged with providing ". . . the program office and HQ AFSC/TE an independent assessment of the DT&E results [3:6]." With ASD/YWT acting as the RTO, the independent assessment may be lost because of the functional relationship of YWT with the SPO. AFSC guidance for assignment of RTO's also states that care must be taken to ". . . avoid making the SPO the Responsible Test Organization . . . make maximum use of test and user organizations in support of SPO [15]." The independent test organization provides an objective

perspective of the test program (9).

In a normal test program the test support personnel in a SPO, such as YWT, are concerned with overall test planning, identification of critical issues, coordination of all test participants' activities, consultation, and documentation of the test program. The RTO is a separate organization whose personnel are concerned with designing and conducting the actual test program. Assignment of RTO responsibilities to YWT was not accompanied by an increase in YWT manning. Therefore, the potential exists for both test management and RTO responsibilities to suffer because of insufficient manning (4).

Finally, when a program office deals with an outside RTO a contract-like situation exists. The program office sends the RTO a Program Introduction Document (PID) which describes the test support needed. The RTO sends back to the program office a Statement of Capability (SOC) which expresses the test agency's capability to support the test program. A Memorandum of Agreement (MOA), AFSC Form 607, is signed by the program office and the test facility. This document signifies agreement on the type and level of support to be provided by the test facility as well as the cost of that support. However, with the RTO in the program office this type of contractual agreement has been absent. Funds designated for testing can be more easily be diverted into the general program fund and used

for non-test purposes. Therefore, having the RTO in the program office facilitates shortening or deleting tests; this may be detrimental to the overall test program.

The Director of Simulator Test and Deployment proposed that the concerns stated above are reason to re-examine the assignment of the YWT as the RTO for simulator DT&E. It is possible that self-RTO may be the best method for simulator DT&E; however, examination of the concerns stated may indicate a need to create an organization capable of acting as an independent RTO for simulator DT&E. It may also be possible that the original lack of simulator testing expertise in AFSC test organizations, which led to the initial assignment of YW as the RTO, may not be the case today. There may be, in fact, other organizations capable, or potentially capable, of acting as the RTO for simulator testing.

Research Objective

The objective of this research project is to determine the feasibility of assigning an independent Responsible Test Organization for development test and evaluation of Air Force simulators.

Research Questions

In order to accomplish the research objective, the

following questions have been developed to guide the research effort.

1. What are the criteria for success in a simulator program's DT&E?

a. What characteristics of simulator DT&E make it "unique" with respect to other testing programs?

b. What special resources are required to accomplish simulator DT&E?

2. Do potential or real problems with objectivity, control of test funds, and manning indicate a need for an independent RTO?

a. If the problems do exist, can the problems of self-RTO be lessened or eliminated within the self-RTO structure?

b. If the problems do exist, does assignment of an independent RTO provide a better means of lessening or eliminating the problems?

3. If a need exists for an outside test agency for simulator DT&E, is there a test organization capable, or potentially capable, of acting as an independent RTO for all, or part, of simulator testing?

CHAPTER II

METHODOLOGY

Introduction

The research was conducted in three phases:

(1) determination of a conceptual model for simulator testing, (2) data collection, and (3) data analysis. Collectively, these phases comprised the research methodology and provided the basis in which to answer the research questions and satisfy the research objective.

Unique Testing Characteristics

The first research question was answered by defining the simulator DT&E effort. An effective DT&E program for simulator testing was defined as meeting the basic objectives of DT&E set forth in AFR 80-14 (17:6). In addition, it was necessary to define the characteristics of simulator testing which set it apart from other DT&E testing programs. Conversations with YW personnel involved in simulator testing identified the F-16 Flight Simulator as a typical simulator test program (5; 10). Examination of the F-16 simulator program provided four test areas which may not be present in non-simulator test programs.

Computational Systems

Computational system tests are done to verify that hardware and software comply with design specifications. They involve the interaction of the software and hardware. Tests are conducted to demonstrate that the hardware interacts with the computer to provide an accurate simulation of the aircraft's characteristics.

Instructional Systems

Since the simulator is used as a training device, it necessarily has provisions for instruction which must be tested for specification compliance. The instructor must be able to interact with the total simulator system in order to control and monitor the simulator mission. For example, cockpit values must be changeable by the instructor allowing simulated, inflight malfunctions to be given to the student to recognize and overcome.

Mechanoreceptor Cueing Systems

An added dimension incorporated in aircraft simulation is the capability to generate sensations of motion. For example, this may be accomplished by applying pressure to various parts of the student's body through various devices in or on the seat of the simulator. Activation of the system through movements of the flight controls provide realistic flight sensations. Just as any system, the

mechanoreceptor cueing system must be checked for specification compliance.

Visual Systems

Many aircraft simulators provide a visual representation of the flight environment. The sophistication of the visual representation can vary from program to program and each system must be tested for compliance to the design specifications.

QT&E

In addition to the four testing areas which may be considered unique, simulator DT&E is many times accomplished under the label of QT&E because a program has not been funded in the research, development, test, and evaluation appropriation. However, the test policies for DT&E and QT&E are the same. The only difference between the terms is the source of test funds (17:3). For purposes of this research project, a distinction was not made between DT&E and QT&E. Test programs with objectives as described for DT&E in AFR 80-14 (17:6) were referred to under the general classification of DT&E.

Resource Requirements

With the unique characteristics of simulator testing defined, the next step was to determine the special resources required to perform simulator testing in each of

the four unique areas. The F-16 Flight Simulator Trainer was used as a typical aircraft simulator test program. The test plan (13) for the F-16 simulator was examined to determine the types of test personnel required to perform the testing in each of the four areas. With the resource requirements in mind, interviews were conducted with personnel currently involved in each of the four areas peculiar to simulator testing to determine what criteria are used to assign personnel to a test team for each of the areas. For example, when a test plan calls for a "qualified computer person," what criteria are used in the determination of a "qualified" person? Are these qualifications standard for most programs or do they vary? Once these qualifications were determined for each of the "unique" simulator testing areas, it was possible to determine what portion of the simulator test program could be accomplished by personnel outside of the YW organization.

RTO Survey

The second research question was answered by surveying test managers involved in test programs where the program office was assigned RTO responsibilities. The thrust of this survey was directed at determining whether problems exist, or could exist, with regard to objectivity, control of test funds, and manning. Test managers were also asked whether an independent RTO could increase the effectiveness

of testing with regard to these problems, or whether the problems could be rectified within the self-RTO structure. In addition, the test managers were surveyed concerning the factors which were used to determine their status as a self-RTO.

Population

Because the majority of AF acquisition programs are accomplished by AFSC, AFSC was the only implementing command considered as a source of data. In addition, AFSC was further limited to three of its major divisions: Aeronautical Systems Division (ASD); Electronic Systems Division (ESD); and Space Division (SD). After conversations with HQ AFSC/TEV (9) concerning AFSC DT&E and RTO assignment, it was determined that these major divisions contained the total population of organizations involved in DT&E under the self-RTO concept. A current list of programs under self-RTO was obtained from ASD, ESD, and SD with designated points of contact for test and evaluation. Initially, the points of contact were used to determine the current status of their program and the test manager's name. A questionnaire was administered over the telephone to the person designated as a test manager for DT&E for the program. Program managers who were also acting as the test manager were not surveyed because portions of the survey addressed possible conflicts between the program manager and test manager.

Twelve AFSC program offices were found performing DT&E with the test manager located in the program office. These programs were found in ESD and SD. YW was the only program in ASD performing DT&E with test managers in the program office. The limited number of self-RTO programs provided a relatively small population; this small number did allow an exhaustive survey rather than a sample.

Survey Construction

The self-RTO survey (see Appendix A) was used to determine how AFSC DT&E programs operate under the self-RTO concept. The questions were designed to address six general areas:

1. demographic information (1, 2, 30, 31);
2. manning requirements (3 - 8, 24);
3. control of program test funds (9 - 16, 23);
4. program objectivity (17, 18, 23);
5. RTO assignment process (19 - 22, 25, 27, 28); and
6. suggested improvements to self-RTO (29).

The questions were answered in one of three formats. One was the multiple choice method, where the respondent was asked to choose from one of the suggested responses. Due to the possible unique aspects of DT&E testing in the different AFSC divisions, an "other" choice was provided for the multiple choice questions in order to gain additional information while not forcing the respondent to choose an

inaccurate response. The second method involved a five point Likert scale (8:248) which ranged from "strongly agree" to "strongly disagree." A five point scale was used to gain added sensitivity while not complicating the telephone interview with a large number of choices. The final method was the open-ended response which was used to gather information which did not lend itself to the other two methods.

Demographic information. The demographic questions were aimed at gathering data about the program and the respondent's background in T&E. The program questions (1 and 2) showed the types of DT&E testing done by the program test personnel. The background questions (30 and 31) provided an indication of the experience the respondent had in T&E.

Manning requirements. This area of the survey was used to determine: who accomplished the actual testing in the program; where the actual testing was done; and who wrote the test plans and procedures. Questions 3 and 4 represented the workload normally associated with test management duties. Questions 5 and 6 were directed more toward RTO responsibilities. Also implied in 5 and 6 was the possible burden of TDY. Analysis of negative responses to question 24, which measured adequacy of manning, with questions 3 through 6, indicated where some of the workload existed. Positive responses to 24 were also matched with

responses to 3 through 6 to determine whether outside agencies or contractors were picking up more of the load. Questions 7 and 8 examined computer intensive programs similar to simulator testing.

Control of test funds. This portion of the questionnaire was designed to measure the effectiveness of test funds control under the functional relationship between the test personnel and the program manager in a self-RTO program. Test managers were asked if they had a contract-like agreement with the program manager. If they did not, did they think it would be helpful? Questions 10 through 14 assessed the advantages or disadvantages created by the program manager's direct control of testing funds under the self-RTO concept. In an area related to funds control, schedule control, question 23 was used to determine whether the program manager used his functional relationship with the test office to cut testing when schedule "slips" occurred.

Objectivity. Objectivity for this survey dealt with the "independent assessment of DT&E results" which is in the charter of an RTO (3:6). It is extremely difficult, if not impossible, to quantify objectivity. Therefore, self-RTO objectivity was measured relative to independent RTO objectivity, which was assumed to be the standard. Questions 17 and 18 measured whether or not self-RTO personnel perceived an independent RTO as providing more objectivity than a

self-RTO. It follows, that if objectivity can be increased by replacing a self-RTO with an independent RTO, the self-RTO program was not providing objectivity up to the standard.

Objectivity is also implied in the questions which deal with program control. If the test funds are cut from a self-RTO program which would not be cut from an independent RTO's funds, a loss of objectivity may be indicated.

RTO assignment. Questions 19 through 22, 25 and 27 dealt with RTO assignment. They were used to determine the reasons the respondents' programs were under a self-RTO concept. Analysis would show if an independent RTO was considered and, if so, why it was not used. Is there a reason for the self-RTO assignment in this program or has this program office "traditionally" been a self-RTO?

Suggested improvements. This was an open-ended question which gave the respondents an opportunity to recommend improvements for the self-RTO program.

Independent Test Organization Identification

The final research question was answered by examining mission statements of AFSC test facilities to identify possible candidates for assignment of RTO responsibilities for simulator testing. AFSC Pamphlet 80-27 (4) summarizes the AFSC test and evaluation ranges and facilities available for AFSC test programs. It provides the test

activities' locations, missions, capabilities, and some of the typical programs and functions each test agency has supported in the past. Since simulator DT&E has never been performed by any of the test facilities, the potential to develop the capability was also examined. The testing requirements and resources determined from the first research question were used to narrow the field of AFSC test organizations. Once potential candidates were identified, they were contacted to establish which portions, if any, of a typical simulator program they could support.

Summary

The research for this project was aimed at three basic areas. First, the simulator testing program had to be defined and resource requirements needed to perform simulator testing had to be determined. This was accomplished through examination of a typical simulator program and then the resource requirements of the program were defined. Second, a survey was administered to identify the advantages and disadvantages of self-RTO programs. Analysis of the data was to indicate whether a need exists throughout the self-RTO community to increase objectivity, control of funds, and manning. Also incorporated into this survey was a means to identify how other self-RTO's are dealing with these potential problems. Finally, AFSC test facilities were examined for capability to perform simulator RTO

responsibilities. Analysis of their existing capabilities, potential capabilities, and assessment of their ability to function as an independent RTO for simulators would allow matching with the criteria established for simulator DT&E.

CHAPTER III

FINDINGS AND ANALYSIS

Introduction

This chapter presents the results of the research. The results are presented in three sections: (a) Simulator Test Resource Requirements, (b) Self-RTO Survey, and (c) Independent RTO Identification. Each of these sections corresponds to one of the research questions. Analysis of the data is summarized at the conclusion of each section and is used to answer the research question.

Simulator Resource Requirements

Introduction

The data presented in this section was gathered by interviewing personnel considered experts in the four "unique" areas of simulator testing identified in Chapter II. The data were analyzed to determine the criteria used for success in simulator DT&E and what resources were needed to support testing in these areas.

Computational Systems

The testing of the computational system for simulators is not as unique as it has been in the past. Most of

the testing done on the computers is done in the offline mode; therefore, it is not dependent directly on the simulator. No special qualifications are required for a computational test person other than a general background in computers. Although no courses are available to train computer personnel specifically for simulator computer operation, courses are available from general purpose computer manufacturers (6).

Instructional Systems

The testing of instructional systems is a combination of objective and subjective areas. The evaluation of the instructor's station involves assessment of such items as the capability to track student progress and vary the workload. This area is normally checked by monitoring a qualified aircraft instructor operate the instructor's console. Since the simulator is a training device, it is necessary to evaluate the capability of the simulator to transfer training to the student. The subjective nature of this area makes it difficult to quantify and, in turn, difficult to design and test. Experience with simulator instructional techniques with a background in engineering psychology and human factors engineering has proven to be useful in evaluating transfer of training. Current simulator test personnel indicate such a background is needed to facilitate effective trade-offs within specification limits to ensure high training results (11).

Mechanoreceptor Cueing Systems

The hardware involved in a Mechanoreceptor Cueing System (MCS) may be tested by a technician with an engineering background and an understanding of the system provided the test document is well-written. The unique aspect of MCS testing is the subjective determination of the amount of body stimulation needed to provide the desired sensation of motion. The subtleties of how the cues to the eyes work with the cues to the "seat of the pants" are also included in visual system testing. An attempt must be made to evaluate all of the cues available to the student to determine whether they all provide a realistic sensation of motion. The expertise required for MCS testing involves knowing what is available in the field and what can be expected for state-of-the-art systems. Although the MCS hardware is the easiest to develop and test, problems arise in the definition of what constitutes valid cues and how to control the device to get the desired cues (7).

Visual Systems

The basic requirements for a qualified test person for visual system testing include an understanding of:

1. the principles of optics;
2. how images are formed;
3. the operation of test equipment;
4. the operation of related aircraft systems;

5. how to evaluate and recognize trends in data;
and

6. how to make effective trade-offs with the contractor within specification limits.

The first four of these areas may be handled by a technician with a background in optical systems provided the test plan was written in sufficient detail. However, the analysis portion of the test draws on experience gained through previous testing programs and a knowledge of the general design and capabilities of visual systems. For example, visual system testing uses a theodilite to check proper system alignment. This alignment may be critical if the visual system is to be interfaced with a highly accurate Heads-Up-Display (HUD) weapons delivery system. A technician brought in to perform this test may be able to set up the theodilite and align the HUD to obtain the required data. The technician also may be able to complete the entire test if all test requirements meet the specification. The problem arises when some of the tests do not meet all of the criteria and a decision must be made as to what is acceptable. For instance, will pushing the contractor to full compliance in alignment cause a deterioration in resolution? Experience in visual system testing facilitates effective trade-offs among these and other decisions (16).

Analysis

Analysis of the requirements (13) for testing these

four areas indicated that the characteristics which set simulator testing apart from other program testing appear to be: (a) computational systems; (b) instructional systems; (c) mechanoreceptor cueing systems; and (d) visual systems. In all four areas the physical testing tasks were not shown to be extremely complex, or requiring highly complicated test equipment. In most cases, a test person with a general knowledge of the design and operation of the area being tested could determine compliance with specification when testing was accomplished in accordance with a well-written test plan.

The uniqueness of simulator DT&E may be more closely associated with the nature of simulator testing. Simulator testing deals with perception: (a) sensations of motion; (b) visual imagery; and (c) student learning. Testing the actual aircraft can be done by measuring actual performance while simulator testing is based on how well actual performance is approximated. Perceptions are difficult, if not impossible, to quantify. However, in order to have an effective simulator DT&E program, testable specifications must be written (11).

All four test personnel interviewed indicated that the problems in simulator testing arose when deficiencies occurred in specification compliance. In these cases, experience in the four unique areas became the predominant qualification (6; 7; 11; 16). This experience encompasses the

ability to recognize and implement possible trade-offs within specification limits to ensure that the delivered simulator accurately approximates the aircraft's systems and performance. The ability to evaluate and accept trade-offs cannot be written into a test plan but must be acquired through exposure to simulator testing programs.

A factor which further complicates simulator testing is the relatively rapid pace of testing at the contractor's facility. The changes to the computer software which drive the simulator can be made quickly. YWT personnel submit test discrepancy reports to the contractor. The contractor must attempt to bring the deficient areas within specification tolerances. A test may be run which uncovers discrepancies which require as many as fifty software changes. The changes can be made and the test rerun the next day. This fast-paced, iterative process of simulator testing requires an ability to understand the impact of changes on the total system.

Summary

The success of a simulator DT&E program depends on the ability to effectively test the entire simulator system. The simulator contains four areas not usually found in other DT&E programs: (a) computational systems; (b) visual systems; (c) instructional systems; and (d) mechanoreceptor cueing systems. A qualified technician was determined to

be capable of testing these areas provided the technician had a general knowledge of the particular system and a well written test plan to follow.

The unique resource requirements were found to be the personnel with the expertise in each of the four testing areas. Experience in each one of these area was shown to be the primary requirement when specification deviations were encountered during testing. This experience facilitates effective resolution of deficiencies with the contractor. There are no formal training programs available to build up expertise in these four areas; therefore, expertise is developed through working with the simulator systems.

Self-RTO Survey

Introduction

The data presented in this section was gathered using the self-RTO survey (see Appendix A). The questionnaire was administered to the test manager in each program office in ASD, ESD, and SD operating under the self-RTO concept. YWT was not included in the survey. The data were analyzed to answer the second research question.

Demographic Information

The median level of experience of the test managers involved in self-RTO programs was 4 years. Eight of the twelve values were 6 years or less. Three of the twelve

had some experience with an independent RTO on another program. Nine of the twelve programs were involved with a combination of hardware and software DT&E while three were testing only hardware.

Manning

Table 3-1 indicates that 75% of the program offices currently operating under the self-RTO concept are not perceived to be adequately manned to effectively perform both test management and RTO responsibilities. However, the data identifies no one area of the manager's responsibilities as the overriding cause. None of the program offices were responsible for complete preparation of test plans and monitoring of the actual tests. Data indicated those program offices involved in preparation of test plans were not the ones sending personnel TDY to monitor testing, but both indicated the same degree of inadequate manning.

YWT parallels the manning situation in other program offices with RTO duties. YWT is authorized 26 test personnel and has an actual manning of 18. For the most part, simulator testing is accomplished using contractor prepared test plans and procedures. YWT reviews the test documents and may be required to provide inputs depending on the experience of the simulator contractor. Simulator testing is also accomplished away from the program office, at the simulator contractor's facility. However, YW is the

TABLE 3-1

TESTING WORKLOAD/MANNING

Tasks	Number	Manning Adequate	Undecided	Manning Inadequate
Write Test Plans	6(50%)	2(33%)	0	4(67%)
Write Test Procedures	5(42%)	2(40%)	0	3(60%)
Test Away From Program Office	12(100%)	2(17%)	1(8%)	9(75%)
Do Actual Testing	0	0	0	0
Monitor Testing	6(50%)	1(17%)	1(17%)	4(67%)

only self-RTO program office where the program office test support personnel accomplish the actual testing.

Control of Test Funds

Table 3-2 indicates the degree to which the test managers see the effectiveness of the functional relationship with the program manager under self-RTO. Eighty-three percent of the test managers agreed that the program manager has more control over the test program under the self-RTO concept than under the independent RTO concept. Eighty-three percent also indicated that test funds were more easily diverted away from test and back into the general program fund under self-RTO than independent RTO, and 33% saw test funds as the first area usually cut. Test schedules were also seen as an area where program slips in other parts of 41% of the programs were accommodated.

None of the twelve self-RTO programs had a written agreement between the program manager and the test office which provided for testing tasks to be performed and specific funds to be used for testing. Table 3-3 shows 67% believed such a document would be useful for internal control of test funds in the program office and 58% considered it potentially useful for control of tasks.

The data presented in the funds control area shows that the program manager in a self-RTO program can, and does, more easily manipulate test funds and schedules to accommodate the entire program. The ability to exercise

TABLE 3-2

IMPACT OF FUNCTIONAL CONTROL

Under Self-RTO:	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Program Manager Has More Control	7(58%)	3(25%)	2(17%)	0	0
Program Funds More Effectively Used	0	10(83%)	2(17%)	0	0
Test Funds More Easily Diverted	1(8%)	9(75%)	2(17%)	0	0
Test Funds Increased	1(8%)	3(25%)	6(50%)	2(17%)	0
Test Funds Cut First	0	4(33%)	2(17%)	6(50%)	0
Test Schedules Cut	2(17%)	3(25%)	3(25%)	4(33%)	0

TABLE 3-3

NEED FOR INTERNAL MEMORANDUM OF AGREEMENT

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Funds	4 (33%)	4 (33%)	2 (17%)	2 (17%)	0
Tasks	3 (25%)	4 (33%)	3 (25%)	2 (17%)	0

TABLE 3-4

IMPACT OF INDEPENDENT RTO

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Increase Test Plan Quality	6 (50%)	5 (42%)	1 (8%)	0	0
Enhance Test Program Objectivity	2 (17%)	9 (75%)	1 (8%)	0	0

more control over the testing program was perceived to enhance the effective use of program funds by 83% of the test managers. However, 67% of the test managers considered an internal, written agreement between the program manager and the test manager helpful for management of test funds. This may indicate that the program manager, in most cases, uses the functional relationship to benefit the entire program; however, test managers view test funds as too easily accessible.

YWT has no written agreement with program managers to provide for the type and level of support or the cost of test support requirements. Although program managers in YW may be effectively using their functional relationship with YWT, the survey data indicate a need in self-RTO programs for formalized internal control of task requirements and funds. This would tend to provide more stability for the test funds and the tasks these funds represent. In addition, test managers may see a written agreement as a way to reduce potential conflicts with program managers.

Objectivity

The data in Table 3-4 indicates 97% of the test managers currently operating under self-RTO believe that if an independent test agency were available, the inputs from the independent agency could increase the quality of test plans and enhance the objectivity of the entire test program.

The data suggests that test plans under the self-RTO concept have room for improvement and testing objectivity could also be increased. The responses also indicate that improvements could be made with the help of an independent test agency.

RTO Assignment

The reasons for assignment of RTO duties to the program office were found to be in three general areas: (a) high technology; (b) coordination; and (c) schedule conflicts with test organizations. Five of the program offices contacted were assigned RTO responsibilities because of a high degree of unique technology. The expertise needed to deal with the testing question of these programs resided in the program office. Six of the program offices indicated that a great deal of interface between the program office and contractor during testing required close coordination. It was determined by either the program office or AFSC that placing the RTO duties in the program office would facilitate coordination by reducing the number of parties involved in the communication chain. Finally, one program office was appointed the RTO for DT&E testing because the only independent test facility capable of performing the testing was unavailable because of scheduling conflicts.

The self-RTO method was considered the only method of effectively accomplishing DT&E in 83% of the programs.

TABLE 3-5

RTO ASSIGNMENT

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Self-RTO Only Method	3(25%)	7(58%)	0	2(17%)	0
Independent RTO Could Not Test	2(17%)	2(17%)	0	8(67%)	0
Requested To Be Self-RTO	0	8(67%)	5(42%)	0	2(17%)
Independent RTO Considered	1(8%)	3(25%)	3(25%)	3(25%)	2(17%)
Independent RTO Feasible	1(8%)	1(8%)	0	8(67%)	2(17%)
Test Facility Capable	0	2(17%)	4(33%)	5(42%)	1(8%)

Of the two that considered an independent RTO an alternative, one was mentioned above as unable to obtain test support due to scheduling conflicts. The other believed an independent test facility could handle the RTO duties, but anticipated some coordination problems. The four test managers that indicated an independent RTO could not test because of an inability to become familiar with the design were high technology programs. The eight test managers who indicated a test facility could become familiar enough with the design to test it were also the programs where coordination was believed to dictate a self-RTO organization. Sixty-seven percent of the programs had requested to be the RTO. The five undecided responses were from test managers of long-running programs. They were not the original test managers of the program and were unsure of the original reasons for RTO assignment.

Suggested Improvements

The test managers were asked to suggest improvements which could be made to their programs to improve operation under the self-RTO concept. Sixteen percent of the test managers believed their self-RTO programs were operating effectively and saw no needed improvements. Fifty percent indicated a need for increased manning which paralleled the findings presented earlier under the manning section. Sixteen percent of the test managers saw a need for more

experienced test personnel. This was brought out earlier in the demographic section where eight of the test managers had six or less years of test experience. Finally, sixteen percent believed an independent test program assessment was needed.

Summary

Analysis of the data gathered using the self-RTO survey provided the basis to answer the second research question. The responses indicated varying degrees of concern on the part of test managers with regard to objectivity, control of test funds, and manning.

Manning in self-RTO programs is perceived by test managers as inadequate to accomplish both test management and RTO duties. It may be unfair to single out self-RTO programs as undermanned during these times of doing more with less throughout the Air Force. However, 75% of the self-RTO programs considered themselves undermanned. YWT with 18 of 26 authorizations filled is not the exception. In addition to the manning problem, YWT is the only self-RTO program in AFSC with the added responsibility of performing the actual testing.

The program manager appears to have increased control of test funds under the self-RTO concept. Eighty-three percent of the test managers see this as a means by which program managers are more effective in managing their

particular programs. However, the need exists to establish more stability for test funds and the tasks these funds represent by formalizing the funding process with a written agreement between the program manager and the test manager. An internal PID/SOC-type agreement could tie the tasks to the funds. This agreement would prevent the program manager from redirecting funds without knowing the implications of deleting the tests those funds represent. YWT does not have a PID/SOC-type agreement within the program office for control of test funds.

Ninety-two percent of the self-RTO test managers believe an independent test organization could enhance the quality of test plans and procedures as well as increase the objectivity of the test program. However, technology and coordination requirements dictated the use of the self-RTO concept for these programs. Early flight simulation dealt with new frontiers in technology. Early simulator testing required an understanding of testing procedures used in an area of new technology; however, this uniqueness now deals more with system expertise than with complex technological testing procedures. The current body of simulator expertise resides within YW. This consolidation of simulator expertise tends to be the driving factor for the assignment of RTO duties to YW.

Independent RTO Identification

Introduction

Examination of AFSC test facilities in AFSC 80-27 (4) revealed the Air Force Flight Test Center (AFFTC) at Edwards AFB, California, as a facility potentially capable of developing a simulator testing capability.

This Test Wing has pilot, engineer, and support capability to plan, conduct, evaluate, and report on DT&E of manned and unmanned aircraft. . . . The tests range from engineering simulations before actual flight through envelope expansion and sub-system integration to flight tests of fully integrated weapons systems in a mission environment [4:8].

AFFTC personnel (14; 18) were contacted to determine what its present and potential capabilities would be to support a simulator testing program.

Background

AFFTC has provided engineering support to the Simulator SPO on numerous simulator test programs and has been involved in simulator enhancement programs for the Tactical Air Command (TAC).

TAC requested AFFTC to analyze the F-15 simulator to identify areas where the F-15 simulator deviated from actual aircraft performance. AFFTC personnel "flew" the simulator just as they would fly the aircraft in a flight test. Maneuvers in the simulator were compared with maneuvers in the aircraft. The discrepancies were documented;

however, no recommendations were made for correcting the deficiencies.

TAC requested AFFTC to repeat the procedures used on the F-15 simulator on the F-4 simulator. The F-4 simulator, as it existed at Luke AFB, Arizona, was brought up on the AFFTC simulator computer. The AFFTC simulator "flew" with the same deficiencies as the F-4 simulator. AFFTC engineers went back through all of the aeronautical curves, problem statements, and equations to identify problem areas. This time, TAC requested that the discovered deficiencies be corrected. Changes were made to the AFFTC simulator to correct discovered deficiencies. The improvements in fidelity were verified, and the changes were implemented into the Luke F-4 simulator. TAC has now requested an evaluation of the F-111 simulator (14).

Capabilities

To date, AFFTC has restricted its involvement in simulator testing to the aerodynamics of the simulation model. AFFTC test engineers believe portions of a weapons system simulator should be able to be tested and evaluated under ground rules similar to those used in aircraft testing. However, AFFTC does not possess the expertise needed to accomplish testing on the visual, instructional, computational, or motion systems (14; 18).

AFFTC is manned for aircraft testing. The added

workload associated with simulator testing would degrade AFFTC capabilities to test aircraft unless manning was increased (18).

AFFTC personnel have observed contractual give-and-take during simulator testing. It is believed that this negotiation is more evident in simulator testing than in aircraft testing. The concern is that addition of another party in the simulator testing program may be counter-productive because of added coordination problems (18).

Summary

AFFTC has the capability of one day becoming the RTO for simulator testing. They have recently increased their involvement beyond the engineering support provided to the Simulator SPO to simulator troubleshooting for TAC. Although these programs have increased their exposure to simulator testing, they still lack expertise in the testing areas identified as unique to simulator testing. Addition of simulator testing would also create a burden on the AFFTC operation unless increased manning was provided or priorities changed.

CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATION

Summary

The objective of the research was to determine the feasibility of assigning an independent Responsible Test Organization for development test and evaluation of Air Force simulators. Three research questions were used to guide this study. The first addressed the criteria for success in simulator DT&E. This question was directed at determining the "unique" characteristics of simulator testing and the resources required which preclude the use of an independent RTO for DT&E. The second question dealt with the need for an independent test organization. The final research question addressed the availability of an independent test organization capable of performing DT&E for simulators. The research was conducted through personal interviews with personnel involved in simulator DT&E, test managers involved in DT&E under the self-RTO concept, and test personnel at an independent test facility. Based on a background investigation of simulator DT&E and data gathered through the interviews, conclusions were drawn and a recommendation for future assignment of RTO's for simulator DT&E was made.

Conclusions

The unique aspects of simulator DT&E which led to the initial assignment of RTO duties to the Simulator SPO have changed. The unique aspects of simulator DT&E perceived to preclude assignment of an independent RTO are no longer derived from the inability of an outside test organization to accomplish the testing. The primary factor is that an independent tester would need to develop expertise in the four unique testing areas to effectively analyze and deal with deficiencies discovered during testing. Therefore, an independent test organization would have to gradually build up its expertise by working with YW on simulator test programs before totally accepting RTO responsibility.

A substantial number of self-RTO test managers see the need for an independent test organization's added perspective to enhance the effectiveness of the test program (see Table 3-4). Assignment of an independent test organization also complies more closely with the intent of AFR 80-14 and AFSC policy regarding assignment of RTO responsibilities directly to the SPO.

There is a need for an internal PID/SOC-type agreement between the program manager and the test manager in self-RTO programs (see Table 3-3). This document would provide a mating of test funds to test tasks. The program manager would be able to more effectively manage the entire

program because test tasks would be tied to test dollars and the implications of the tests lost by redirecting test funds would be apparent.

There is an independent test organization with an expressed interest in simulator testing and an existing capability to accomplish portions of a simulator test program. AFFTC has provided engineering support on simulator test programs managed by the Simulator SPO. AFFTC has also been involved in simulator enhancement programs for TAC which have increased AFFTC's expertise in the aerodynamic and computational aspects of simulator testing. Therefore, AFFTC is capable of assuming responsibility for the aerodynamic and computational portions of the simulator test program. Instructional, visual, and mechanoreceptor cueing system testing would be added as AFFTC gains experience in testing these systems.

Recommendation

The Air Force Flight Test Center (AFFTC) should become the Responsible Test Organization (RTO) for all, or part, of the DT&E of Air Force simulators. The Deputy for Simulators (ASD/YW) would remain a source of expertise; however, they would concentrate on test management with RTO duties assigned to AFFTC. An evolutionary transfer of RTO duties from YW to AFFTC should be used to overcome difficulties with expertise and manning. This evolutionary

process would also provide a relatively small amount of risk because a gradual transfer of RTO responsibilities would not require an abandonment of current practices for a total commitment to an unknown course of action. YW should also incorporate a PID/SOC-type document for control of test funds and tasks for the remaining period of operation as a self-RTO.

Expertise in testing areas peculiar to simulator testing should be build up gradually at AFFTC. Initially, AFFTC should be given responsibility for the aerodynamic portions of a simulator test program with the RTO assignment remaining in YW. AFFTC would increase areas of testing on subsequent simulator programs. YW personnel would work with and monitor AFFTC personnel until AFFTC testers were capable of independently testing each portion of the simulator system. For example, after AFFTC had completed the aerodynamic testing on a simulator program without a YW monitor, another portion of the simulator test program may be added. YW experts in the added area would again monitor and work with AFFTC until AFFTC was able to independently test this area. This process would be continued until the entire simulator system is being independently tested by AFFTC. The rate of take-over can be regulated by the expertise advances made by AFFTC on each simulator program. This would prevent an overload on AFFTC and possible degradation of simulator testing.

AFFTC manning considerations could also be effectively handled under a gradual acceptance of RTO responsibilities. AFFTC could not handle total take-over of simulator testing with its current manning. The possibility of manning authorization increases in the magnitude necessary to support simulator testing at AFFTC could be difficult to acquire in total. The evolutionary process of testing take-over lends itself to a gradual manning build-up. However, increases in AFFTC manpower would have to be authorized by AFSC as AFFTC gained expertise and added new portions of simulator testing, or AFFTC testing priorities would have to be revised.

The responsibility and authority of AFFTC would have to be clearly delineated to lessen coordination problems. The rapid pace and iterative nature of simulator testing requires continual interface with the contractor. It is possible that YW personnel would be present for critical tests and, therefore, available for contractual coordination. However, AFFTC personnel would have to be given the same authority to work daily problems as has been given to YWT personnel. This would allow AFFTC to work with the contractor during testing to bring system deviations within specification tolerances without excessive coordination with YW. Any deviations outside of the scope of the contract which may impact areas such as cost and schedule would be referred to YW for action.

APPENDIX A
SELF-RTO QUESTIONNAIRE

Instructions

This questionnaire is designed to evaluate your perceptions of the effectiveness of assigning Responsible Test Organization (RTO) responsibilities to the program office versus assigning RTO responsibilities to an independent test organization. For purposes of this questionnaire, the phrase "self-RTO" will denote the assignment of RTO responsibilities directly to the program office. The phrase "independent RTO" denotes assignment of RTO responsibilities to an organization outside of the program office. The questions will be answered in one of three ways. The first is multiple choice, where all responses will be read after the question and you will be asked to choose one response. The second is a short-phrase or one-word response. This will normally be a follow-up question to a multiple choice question. For example, if the answer to a previous question was "no," then the follow-up question may address "why not." The final method for answering the questions is a five degree scale. A statement will be read and you will be asked whether you:

- A. Strongly agree,
- B. Agree,
- C. Neither agree nor disagree,
- D. Disagree, or
- E. Strongly disagree.

Your responses will not be attributed to you personally or

to your office, but will be used in a data base for statistical analysis. If, at any time, you would like any of the questions repeated, please ask. Are there any questions?

RESPONDENT

1. RTO responsibilities for your program are assigned:
 - A. Directly to the program office
 - B. To the prime contractor
 - C. To an independent contractor hired for testing
 - D. Other (Who has RTO responsibilities?)

2. What type of DT&E are you currently performing?
 - A. Software
 - B. Hardware
 - C. Combination of hardware and software
 - D. Other (Explain)

3. The test plans for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test plans?)

4. The test procedures for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test procedures?)

5. The actual DT&E testing in your program is done:
 - A. At the contractor's facility
 - B. At the user's facility
 - C. At an Air Force test facility
 - D. At your facility
 - E. Other (Where is the testing done?)

6. The actual DT&E testing in your program is done by.
- A. Personnel from your program office
 - B. DOD personnel located at the test facility
 - C. Contractor supplied personnel
 - D. Other (Who does the actual testing?)
7. If required, computer support personnel for your program testing are supplied by:
- A. DOD personnel dedicated to your program for computer support
 - B. DOD personnel assigned temporarily to your program from other computer resources
 - C. The contractor
 - D. Other (Who provides computer support?)
 - E. Computer support not required for my program (Omit #8)
8. DOD personnel used for computer support for your program:
- A. Are considered experts for the particular type of computer and associated programs prior to assignment to the test program.
 - B. Have a general knowledge of computer operation, but are assigned to the program early enough to gain expertise prior to program testing.
 - C. Have a general knowledge of computer operation and require no further special training.
 - D. Other (Explain)
9. Does your program have a written agreement between the program manager and the test personnel which provides funds to be used only for test programs?
- A. Yes (What type of document is it?)
 - B. Not aware of any such document

Instructions

The following questions will be answered using the five point scale. A statement will be read to you and you will be asked whether you:

- A. Strongly agree,
- B. Agree,
- C. Neither agree nor disagree,
- D. Disagree,
- E. Strongly disagree.

If you would like the question or the response scale repeated during the questioning, please ask.

10. The program manager has more direct control of the test program funds under the self-RTO concept than under the independent RTO concept.
A B C D E
11. In a self-RTO program, DT&E funds are used more effectively than under an independent RTO program.
A B C D E
12. In a self-RTO program, DT&E funds are more easily diverted back into the general program fund to be used in non-test areas.
A B C D E
13. In a self-RTO program, DT&E funds are more often increased rather than decreased.
A B C D E
14. In a self-RTO program, DT&E funds are often the first to be cut.
A B C D E
15. A contract-like agreement, such as a Memorandum of Agreement normally signed by the program office and an independent RTO, would be helpful for control of funds under the self-RTO concept.
A B C D E
16. A contract-like agreement, such as a Memorandum of Agreement, would be helpful for control of the tasks to be performed in a test program under the self-RTO concept.
A B C D E
17. Test plan inputs made by a qualified independent RTO could increase the quality of test plans.
A B C D E
18. The perspective added by an independent test agency could enhance the objectivity of the test program.
A B C D E

19. Your program requested to be the RTO for your test program.
A B C D E
20. An independent RTO is a feasible alternative for your test program.
A B C D E
21. An active search for an independent RTO for your program was conducted prior to your assignment as the RTO.
A B C D E
22. There is an independent test organization capable of acting as the RTO for your program.
A B C D E
(If A or B, what organization and why is it not used?)
23. The program manager shortens test schedules to accommodate other program slips.
A B C D E
24. Current manning in your program provides for effective accomplishment of test management and RTO responsibilities.
A B C D E
25. An independent RTO could not become familiar enough with the specifications and design of your program to effectively perform the test program.
A B C D E
26. There is no difference in the effectiveness of the control of funds on a program with an independent RTO.
A B C D E
27. Assignment of RTO responsibilities to your program office is the only method of effectively accomplishing your program's DT&E testing.
A B C D E
(If D or E, what other alternatives exist?)

28. Why is the self-RTO concept considered the most effective method of DT&E for your program?
(Explain)
29. What improvements would you suggest to improve testing under the self-RTO concept?
(Explain)
30. Have you been involved in any programs that used an independent RTO for all or part of the DT&E testing?
A. Yes
B. No
31. How many years have you been involved in test and evaluation?

This completes the questionnaire. Would you like to have any questions repeated? Do you have any general comments about self-RTO that were not covered in the questionnaire?

APPENDIX B
SURVEY RESULTS

RESPONDENT

1

1. RTO responsibilities for your program are assigned:
 - A. Directly to the program office
 - B. To the prime contractor
 - C. To an independent contractor hired for testing
 - D. Other (Who has RTO responsibilities?)

2. What type of DT&E are you currently performing?
 - A. Software
 - B. Hardware
 - C. Combination of hardware and software
 - D. Other (Explain)

3. The test plans for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test plans?)

4. The test procedures for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test procedures?)

5. The actual DT&E testing in your program is done:
 - A. At the contractor's facility
 - B. At the user's facility
 - C. At an Air Force test facility
 - D. At your facility
 - E. Other (Where is the testing done?)

6. The actual DT&E testing in your program is done by:
- A. Personnel from your program office
 - B. DOD personnel located at the test facility
 - C. Contractor supplied personnel
 - D. Other (Who does the actual testing?)
7. If required, computer support personnel for your program testing are supplied by:
- A. DOD personnel dedicated to your program for computer support
 - B. DOD personnel assigned temporarily to your program from other computer resources
 - C. The contractor
 - D. Other (Who provides computer support?)
 - E. Computer support not required for my program (Omit #8)
8. DOD personnel used for computer support for your program:
- A. Are considered experts for the particular type of computer and associated programs prior to assignment to the test program.
 - B. Have a general knowledge of computer operation, but are assigned to the program early enough to gain expertise prior to program testing.
 - C. Have a general knowledge of computer operation and require no further special training.
 - D. Other (Explain)
9. Does your program have a written agreement between the program manager and the test personnel which provides funds to be used only for test programs?
- A. Yes (What type of document is it?)
 - B. Not aware of any such document

Instructions

The following questions will be answered using the five point scale. A statement will be read to you and you will be asked whether you:

- A. Strongly agree,
- B. Agree,
- C. Neither agree nor disagree,
- D. Disagree,
- E. Strongly disagree.

If you would like the question or the response scale repeated during the questioning, please ask.

10. The program manager has more direct control of the test program funds under the self-RTO concept than under the independent RTO concept.
 A B C D E
11. In a self-RTO program, DT&E funds are used more effectively than under an independent RTO program.
 A B C D E
12. In a self-RTO program, DT&E funds are more easily diverted back into the general program fund to be used in non-test areas.
 A B C D E
13. In a self-RTO program, DT&E funds are more often increased rather than decreased.
 A B C D E
14. In a self-RTO program, DT&E funds are often the first to be cut.
 A B C D E
15. A contract-like agreement, such as a Memorandum of Agreement normally signed by the program office and an independent RTO, would be helpful for control of funds under the self-RTO concept.
 A B C D E
16. A contract-like agreement, such as a Memorandum of Agreement, would be helpful for control of the tasks to be performed in a test program under the self-RTO concept.
 A B C D E
17. Test plan inputs made by a qualified independent RTO could increase the quality of test plans.
 A B C D E
18. The perspective added by an independent test agency could enhance the objectivity of the test program.
 A B C D D

19. Your program requested to be the RTO for your test program.
A B C D E
20. An independent RTO is a feasible alternative for your test program.
A B C D E
21. An active search for an independent RTO for your program was conducted prior to your assignment as the RTO.
A B C D E
22. There is an independent test organization capable of acting as the RTO for your program.
A B C D E
(If A or B, what organization and why is it not used?)
23. The program manager shortens test schedules to accommodate other program slips.
A B C D E
24. Current manning in your program provides for effective accomplishment of test management and RTO responsibilities.
A B C D E
25. An independent RTO could not become familiar enough with the specifications and design of your program to effectively perform the test program.
 A B C D E
26. There is no difference in the effectiveness of the control of funds on a program with an independent RTO.
A B C D E
27. Assignment of RTO responsibilities to your program office is the only method of effectively accomplishing your program's DT&E testing.
 A B C D E
(If D or E, what other alternatives exist?)

28. Why is the self-RTO concept considered the most effective method of DT&E for your program?
(Explain)
Response: unique technology
29. What improvements would you suggest to improve testing under the self-RTO concept?
(Explain)
Response: manning
30. Have you been involved in any programs that used an independent RTO for all or part of the DT&E testing?
A. Yes
 B. No
31. How many years have you been involved in test and evaluation?
Response: 6 years

This completes the questionnaire. Would you like to have any questions repeated? Do you have any general comments about self-RTO that were not covered in the questionnaire?

RESPONDENT

2

1. RTO responsibilities for your program are assigned:
 - A. Directly to the program office
 - B. To the prime contractor
 - C. To an independent contractor hired for testing
 - D. Other (Who has RTO responsibilities?)

2. What type of DT&E are you currently performing?
 - A. Software
 - B. Hardware
 - C. Combination of hardware and software
 - D. Other (Explain)

3. The test plans for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test plans?)

4. The test procedures for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test procedures?)

5. The actual DT&E testing in your program is done:
 - A. At the contractor's facility
 - B. At the user's facility
 - C. At an Air Force test facility
 - D. At your facility
 - E. Other (Where is the testing done?)

Response: contractor and Air Force facilities

6. The actual DT&E testing in your program is done by:
- A. Personnel from your program office
 - B. DOD personnel located at the test facility
 - C. Contractor supplied personnel
 - D. Other (Who does the actual testing?)
7. If required, computer support personnel for your program testing are supplied by:
- A. DOD personnel dedicated to your program for computer support
 - B. DOD personnel assigned temporarily to your program from other computer resources
 - C. The contractor
 - D. Other (Who provides computer support?)
 - E. Computer support not required for my program (Omit #8)
8. DOD personnel used for computer support for your program:
- A. Are considered experts for the particular type of computer and associated programs prior to assignment to the test program.
 - B. Have a general knowledge of computer operation, but are assigned to the program early enough to gain expertise prior to program testing.
 - C. Have a general knowledge of computer operation and require no further special training.
 - D. Other (Explain)
9. Does your program have a written agreement between the program manager and the test personnel which provides funds to be used only for test programs?
- A. Yes (What type of document is it?)
 - B. Not aware of any such document

Instructions

The following questions will be answered using the five point scale. A statement will be read to you and you will be asked whether you:

- A. Strongly agree,
- B. Agree,
- C. Neither agree nor disagree,
- D. Disagree,
- E. Strongly disagree.

If you would like the question or the response scale repeated during the questioning, please ask.

10. The program manager has more direct control of the test program funds under the self-RTO concept than under the independent RTO concept.
 A B C D E
11. In a self-RTO program, DT&E funds are used more effectively than under an independent RTO program.
 A B C D E
12. In a self-RTO program, DT&E funds are more easily diverted back into the general program fund to be used in non-test areas.
 A B C D E
13. In a self-RTO program, DT&E funds are more often increased rather than decreased.
 A B C D E
14. In a self-RTO program, DT&E funds are often the first to be cut.
 A B C D E
15. A contract-like agreement, such as a Memorandum of Agreement normally signed by the program office and an independent RTO, would be helpful for control of funds under the self-RTO concept.
 A B C D E
16. A contract-like agreement, such as a Memorandum of Agreement, would be helpful for control of the tasks to be performed in a test program under the self-RTO concept.
 A B C D E
17. Test plan inputs made by a qualified independent RTO could increase the quality of test plans.
 A B C D
18. The perspective added by an independent test agency could enhance the objectivity of the test program.
 A B C D E

19. Your program requested to be the RTO for your test program.
A B C D E
20. An independent RTO is a feasible alternative for your test program.
A B C D E
21. An active search for an independent RTO for your program was conducted prior to your assignment as the RTO.
A B C D E
22. There is an independent test organization capable of acting as the RTO for your program.
A B C D E
- (If A or B, what organization and why is it not used?)
23. The program manager shortens test schedules to accommodate other program slips.
A B C D E
24. Current manning in your program provides for effective accomplishment of test management and RTO responsibilities.
A B C D E
25. An independent RTO could not become familiar enough with the specifications and design of your program to effectively perform the test program.
A B C D E
26. There is no difference in the effectiveness of the control of funds on a program with an independent RTO.
A B C D E
27. Assignment of RTO responsibilities to your program office is the only method of effectively accomplishing your program's DT&E testing.
 A B C D E
- (If D or E, what other alternatives exist?)

28. Why is the self-RTO concept considered the most effective method of DT&E for your program?
(Explain)
Response: unique technology
29. What improvements would you suggest to improve testing under the self-RTO concept?
(Explain)
Response: manning
30. Have you been involved in any programs that used an independent RTO for all or part of the DT&E testing?
A. Yes
 B. No
31. How many years have you been involved in test and evaluation?
Response: 17 years

This completes the questionnaire. Would you like to have any questions repeated? Do you have any general comments about self-RTO that were not covered in the questionnaire?

RESPONDENT

3

1. RTO responsibilities for your program are assigned:
 - A. Directly to the program office
 - B. To the prime contractor
 - C. To an independent contractor hired for testing
 - D. Other (Who has RTO responsibilities?)

2. What type of DT&E are you currently performing?
 - A. Software
 - B. Hardware
 - C. Combination of hardware and software
 - D. Other (Explain)

3. The test plans for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test plans?)

4. The test procedures for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test procedures?)

5. The actual DT&E testing in your program is done:
 - A. At the contractor's facility
 - B. At the user's facility
 - C. At an Air Force test facility
 - D. At your facility
 - E. Other (Where is the testing done?)

6. The actual DWF testing in your program is done by
- A. Personnel from your program office
 - B. DOD personnel located at the test facility
 - C. Contractor supplied personnel
 - D. Other (Who does the actual testing?)
7. If required, computer support personnel for your program testing are supplied by:
- A. DOD personnel dedicated to your program for computer support
 - B. DOD personnel assigned temporarily to your program from other computer resources
 - C. The contractor
 - D. Other (Who provides computer support?)
Response: independent contractor & SPO personnel
 - E. Computer support not required for my program (Omit #8)
8. DOD personnel used for computer support for your program:
- A. Are considered experts for the particular type of computer and associated programs prior to assignment to the test program.
 - B. Have a general knowledge of computer operation, but are assigned to the program early enough to gain expertise prior to program testing.
 - C. Have a general knowledge of computer operation and require no further special training.
 - D. Other (Explain)
Response: phased in & out during program
9. Does your program have a written agreement between the program manager and the test personnel which provides funds to be used only for test programs?
- A. Yes (What type of document is it?)
 - B. Not aware of any such document

Instructions

The following questions will be answered using the five point scale. A statement will be read to you and you will be asked whether you:

- A. Strongly agree,
- B. Agree,
- C. Neither agree nor disagree,
- D. Disagree,
- E. Strongly disagree.

If you would like the question or the response scale repeated during the questioning, please ask.

10. The program manager has more direct control of the test program funds under the self-RTO concept than under the independent RTO concept.
 A B C D E
11. In a self-RTO program, DT&E funds are used more effectively than under an independent RTO program.
 A B C D E
12. In a self-RTO program, DT&E funds are more easily diverted back into the general program fund to be used in non-test areas.
 A B C D E
13. In a self-RTO program, DT&E funds are more often increased rather than decreased.
 A B C D E
14. In a self-RTO program, DT&E funds are often the first to be cut.
 A B C D E
15. A contract-like agreement, such as a Memorandum of Agreement normally signed by the program office and an independent RTO, would be helpful for control of funds under the self-RTO concept.
 A B C D E
16. A contract-like agreement, such as a Memorandum of Agreement, would be helpful for control of the tasks to be performed in a test program under the self-RTO concept.
 A B C D E
17. Test plan inputs made by a qualified independent RTO would increase the quality of test plans.
 A B C D E
18. The perspective added by an independent test agency could enhance the objectivity of the test program.
 A B C D E

19. Your program requested to be the RTO for your test program.
 A B C D E
20. An independent RTO is a feasible alternative for your test program.
 A B C D E
21. An active search for an independent RTO for your program was conducted prior to your assignment as the RTO.
 A B C D E
22. There is an independent test organization capable of acting as the RTO for your program.
 A B C D E
- (If A or B, what organization and why is it not used?)
 Response: 6595th SRG; coordination difficulties
23. The program manager shortens test schedules to accommodate other program slips.
 A B C D E
24. Current manning in your program provides for effective accomplishment of test management and RTO responsibilities.
 A B C D E
25. An independent RTO could not become familiar enough with the specifications and design of your program to effectively perform the test program.
 A B C D E
26. There is no difference in the effectiveness of the control of funds on a program with an independent RTO.
 A B C D E
27. Assignment of RTO responsibilities to your program office is the only method of effectively accomplishing your program's DT&E testing.
 A B C D E
- (If D or E, what other alternatives exist?)

28. Why is the self-RTO concept considered the most effective method of DT&E for your program?
(Explain)
Response: independent test agency
29. What improvements would you suggest to improve testing under the self-RTO concept?
(Explain)
30. Have you been involved in any programs that used an independent RTO for all or part of the DT&E testing?
 A. Yes
B. No
31. How many years have you been involved in test and evaluation?

This completes the questionnaire. Would you like to have any questions repeated? Do you have any general comments about self-RTO that were not covered in the questionnaire?

RESPONDENT

4

1. RTO responsibilities for your program are assigned:
 - A. Directly to the program office
 - B. To the prime contractor
 - C. To an independent contractor hired for testing
 - D. Other (Who has RTO responsibilities?)

2. What type of DT&E are you currently performing?
 - A. Software
 - B. Hardware
 - C. Combination of hardware and software
 - D. Other (Explain)

3. The test plans for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test plans?)

4. The test procedures for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test procedures?)

5. The actual DT&E testing in your program is done:
 - A. At the contractor's facility
 - B. At the user's facility
 - C. At an Air Force test facility
 - D. At your facility
 - E. Other (Where is the testing done?)

6. The actual DT&E testing in your program is done by:
- A. Personnel from your program office
 - B. DOD personnel located at the test facility
 - C. Contractor supplied personnel
 - D. Other (Who does the actual testing?)
7. If required, computer support personnel for your program testing are supplied by:
- A. DOD personnel dedicated to your program for computer support
 - B. DOD personnel assigned temporarily to your program from other computer resources
 - C. The contractor
 - D. Other (Who provides computer support?)
Response: dedicated & temporary SPO personnel
 - E. Computer support not required for my program (Omit #8)
8. DOD personnel used for computer support for your program:
- A. Are considered experts for the particular type of computer and associated programs prior to assignment to the test program.
 - B. Have a general knowledge of computer operation, but are assigned to the program early enough to gain expertise prior to program testing.
 - C. Have a general knowledge of computer operation and require no further special training.
 - D. Other (Explain)
9. Does your program have a written agreement between the program manager and the test personnel which provides funds to be used only for test programs?
- A. Yes (What type of document is it?)
 - B. Not aware of any such document

Instructions

The following questions will be answered using the five point scale. A statement will be read to you and you will be asked whether you:

- A. Strongly agree,
- B. Agree,
- C. Neither agree nor disagree,
- D. Disagree,
- E. Strongly disagree.

If you would like the question or the response scale repeated during the questioning, please ask.

10. The program manager has more direct control of the test program funds under the self-RTO concept than under the independent RTO concept.
 A B C D E
11. In a self-RTO program, DT&E funds are used more effectively than under an independent RTO program.
 A B C D E
12. In a self-RTO program, DT&E funds are more easily diverted back into the general program fund to be used in non-test areas.
 A B C D E
13. In a self-RTO program, DT&E funds are more often increased rather than decreased.
 A B C D E
14. In a self-RTO program, DT&E funds are often the first to be cut.
 A B C D E
15. A contract-like agreement, such as a Memorandum of Agreement normally signed by the program office and an independent RTO, would be helpful for control of funds under the self-RTO concept.
 A B C D E
16. A contract-like agreement, such as a Memorandum of Agreement, would be helpful for control of the tasks to be performed in a test program under the self-RTO concept.
 A B C D E
17. Test plan inputs made by a qualified independent RTO could increase the quality of test plans.
 A B C D E
18. The perspective added by an independent test agency could enhance the objectivity of the test program.
 A B C D D

19. Your program requested to be the RTO for your test program.
A B C D E
20. An independent RTO is a feasible alternative for your test program.
A B C D E
21. An active search for an independent RTO for your program was conducted prior to your assignment as the RTO.
A B C D E
22. There is an independent test organization capable of acting as the RTO for your program.
A B C D E
(If A or B, what organization and why is it not used?)
23. The program manager shortens test schedules to accommodate other program slips.
 A B C D E
24. Current manning in your program provides for effective accomplishment of test management and RTO responsibilities.
A B C D E
25. An independent RTO could not become familiar enough with the specifications and design of your program to effectively perform the test program.
A B C D E
26. There is no difference in the effectiveness of the control of funds on a program with an independent RTO.
A B C D E
27. Assignment of RTO responsibilities to your program office is the only method of effectively accomplishing your program's DT&E testing.
A B C D E
(If D or E, what other alternatives exist?)

28. Why is the self-RTO concept considered the most effective method of DT&E for your program?

(Explain)

Response: coordination difficulties

29. What improvements would you suggest to improve testing under the self-RTO concept?

(Explain)

Response: more test training available

30. Have you been involved in any programs that used an independent RTO for all or part of the DT&E testing?

A. Yes

B. No

31. How many years have you been involved in test and evaluation?

Response: 3 years

This completes the questionnaire. Would you like to have any questions repeated? Do you have any general comments about self-RTO that were not covered in the questionnaire?

RESPONDENT

5

1. RTO responsibilities for your program are assigned:
 - A. Directly to the program office
 - B. To the prime contractor
 - C. To an independent contractor hired for testing
 - D. Other (Who has RTO responsibilities?)

2. What type of DT&E are you currently performing?
 - A. Software
 - B. Hardware
 - C. Combination of hardware and software
 - D. Other (Explain)

3. The test plans for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test plans?)

4. The test procedures for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test procedures?)

5. The actual DT&E testing in your program is done:
 - A. At the contractor's facility
 - B. At the user's facility
 - C. At an Air Force test facility
 - D. At your facility
 - E. Other (Where is the testing done?)

Response: combination of A, B, C, and D

6. The actual DT&E testing in your program is done by:
- A. Personnel from your program office
 - B. DOD personnel located at the test facility
 - C. Contractor supplied personnel
 - D. Other (Who does the actual testing?)
Response: combination of A, E, and C
7. If required, computer support personnel for your program testing are supplied by:
- A. DOD personnel dedicated to your program for computer support
 - B. DOD personnel assigned temporarily to your program from other computer resources
 - C. The contractor
 - D. Other (Who provides computer support?)
Response: contractor & DOD personnel
 - E. Computer support not required for my program (Omit #8)
8. DOD personnel used for computer support for your program:
- A. Are considered experts for the particular type of computer and associated programs prior to assignment to the test program.
 - B. Have a general knowledge of computer operation, but are assigned to the program early enough to gain expertise prior to program testing.
 - C. Have a general knowledge of computer operation and require no further special training.
 - D. Other (Explain)
9. Does your program have a written agreement between the program manager and the test personnel which provides funds to be used only for test programs?
- A. Yes (What type of document is it?)
 - B. Not aware of any such document

Instructions

The following questions will be answered using the five point scale. A statement will be read to you and you will be asked whether you:

- A. Strongly agree,
- B. Agree,
- C. Neither agree nor disagree,
- D. Disagree,
- E. Strongly disagree.

If you would like the question or the response scale repeated during the questioning, please ask.

10. The program manager has more direct control of the test program funds under the self-RTO concept than under the independent RTO concept.
 A B C D E
11. In a self-RTO program, DT&E funds are used more effectively than under an independent RTO program.
 A B C D E
12. In a self-RTO program, DT&E funds are more easily diverted back into the general program fund to be used in non-test areas.
 A B C D E
13. In a self-RTO program, DT&E funds are more often increased rather than decreased.
 A B C D E
14. In a self-RTO program, DT&E funds are often the first to be cut.
 A B C D E
15. A contract-like agreement, such as a Memorandum of Agreement normally signed by the program office and an independent RTO, would be helpful for control of funds under the self-RTO concept.
 A B C D E
16. A contract-like agreement, such as a Memorandum of Agreement, would be helpful for control of the tasks to be performed in a test program under the self-RTO concept.
 A B C D E
17. Test plan inputs made by a qualified independent RTO could increase the quality of test plans.
 A B C D E
18. The perspective added by an independent test agency could enhance the objectivity of the test program.
 A B C D E

19. Your program requested to be the RTO for your test program.
A B C D E
20. An independent RTO is a feasible alternative for your test program.
A B C D E
21. An active search for an independent RTO for your program was conducted prior to your assignment as the RTO.
A B C D E
22. There is an independent test organization capable of acting as the RTO for your program.
A B C D E
(If A or B, what organization and why is it not used?)
23. The program manager shortens test schedules to accommodate other program slips.
A B C D E
24. Current manning in your program provides for effective accomplishment of test management and RTO responsibilities.
A B C D E
25. An independent RTO could not become familiar enough with the specifications and design of your program to effectively perform the test program.
A B C D E
26. There is no difference in the effectiveness of the control of funds on a program with an independent RTO.
A B C D E
27. Assignment of RTO responsibilities to your program office is the only method of effectively accomplishing your program's DT&E testing.
A B C D E
(If D or E, what other alternatives exist?)

28. Why is the self-RTO concept considered the most effective method of DT&E for your program?
(Explain)
Response: unique technology
29. What improvements would you suggest to improve testing under the self-RTO concept?
(Explain)
Response: no changes necessary
30. Have you been involved in any programs that used an independent RTO for all or part of the DT&E testing?
 A. Yes
 B. No
31. How many years have you been involved in test and evaluation?
Response: 13 years

This completes the questionnaire. Would you like to have any questions repeated? Do you have any general comments about self-RTO that were not covered in the questionnaire?

RESPONDENT

6

1. RTO responsibilities for your program are assigned:
 - A. Directly to the program office
 - B. To the prime contractor
 - C. To an independent contractor hired for testing
 - D. Other (Who has RTO responsibilities?)

2. What type of DT&E are you currently performing?
 - A. Software
 - B. Hardware
 - C. Combination of hardware and software
 - D. Other (Explain)

3. The test plans for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test plans?)

4. The test procedures for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test procedures?)

5. The actual DT&E testing in your program is done:
 - A. At the contractor's facility
 - B. At the user's facility
 - C. At an Air Force test facility
 - D. At your facility
 - E. Other (Where is the testing done?)

6. The actual DT&E testing in your program is done by:
- A. Personnel from your program office
 - B. DOD personnel located at the test facility
 - C. Contractor supplied personnel
 - D. Other (Who does the actual testing?)
7. If required, computer support personnel for your program testing are supplied by:
- A. DOD personnel dedicated to your program for computer support
 - B. DOD personnel assigned temporarily to your program from other computer resources
 - C. The contractor
 - D. Other (Who provides computer support?)
- E. Computer support not required for my program (Omit #8)
8. DOD personnel used for computer support for your program:
- A. Are considered experts for the particular type of computer and associated programs prior to assignment to the test program.
 - B. Have a general knowledge of computer operation, but are assigned to the program early enough to gain expertise prior to program testing.
 - C. Have a general knowledge of computer operation and require no further special training.
 - D. Other (Explain)
9. Does your program have a written agreement between the program manager and the test personnel which provides funds to be used only for test programs?
- A. Yes (What type of document is it?)
 - B. Not aware of any such document

Instructions

The following questions will be answered using the five point scale. A statement will be read to you and you will be asked whether you:

- A. Strongly agree,
- B. Agree,
- C. Neither agree nor disagree,
- D. Disagree,
- E. Strongly disagree.

If you would like the question or the response scale repeated during the questioning, please ask.

10. The program manager has more direct control of the test program funds under the self-RTO concept than under the independent RTO concept.
A B C D E
11. In a self-RTO program, DT&E funds are used more effectively than under an independent RTO program.
A B C D E
12. In a self-RTO program, DT&E funds are more easily diverted back into the general program fund to be used in non-test areas.
A B C D E
13. In a self-RTO program, DT&E funds are more often increased rather than decreased.
A B C D E
14. In a self-RTO program, DT&E funds are often the first to be cut.
A B C D E
15. A contract-like agreement, such as a Memorandum of Agreement normally signed by the program office and an independent RTO, would be helpful for control of funds under the self-RTO concept.
A B C D E
16. A contract-like agreement, such as a Memorandum of Agreement, would be helpful for control of the tasks to be performed in a test program under the self-RTO concept.
A B C D E
17. Test plan inputs made by a qualified independent RTO could increase the quality of test plans.
 A B C D E
18. The perspective added by an independent test agency could enhance the objectivity of the test program.
A B C D D

19. Your program requested to be the RTO for your test program.
A B C D E
20. An independent RTO is a feasible alternative for your test program.
A B C D E
21. An active search for an independent RTO for your program was conducted prior to your assignment as the RTO.
A B C D E
22. There is an independent test organization capable of acting as the RTO for your program.
A B C D E
- (If A or B, what organization and why is it not used?)
23. The program manager shortens test schedules to accommodate other program slips.
A B C D E
24. Current manning in your program provides for effective accomplishment of test management and RTO responsibilities.
A B C D E
25. An independent RTO could not become familiar enough with the specifications and design of your program to effectively perform the test program.
A B C D E
26. There is no difference in the effectiveness of the control of funds on a program with an independent RTO.
A B C D E
27. Assignment of RTO responsibilities to your program office is the only method of effectively accomplishing your program's DT&E testing.
A B C D E
- (If D or E, what other alternatives exist?)

28. Why is the self-RTO concept considered the most effective method of DT&E for your program?
(Explain)
Response: coordination difficulties
29. What improvements would you suggest to improve testing under the self-RTO concept?
(Explain)
Response: manning
30. Have you been involved in any programs that used an independent RTO for all or part of the DT&E testing?
A. Yes
 B. No
31. How many years have you been involved in test and evaluation?
Response: 1 year

This completes the questionnaire. Would you like to have any questions repeated? Do you have any general comments about self-RTO that were not covered in the questionnaire?

RESPONDENT

7

1. RTO responsibilities for your program are assigned:
 - A. Directly to the program office
 - B. To the prime contractor
 - C. To an independent contractor hired for testing
 - D. Other (Who has RTO responsibilities?)

2. What type of DT&E are you currently performing?
 - A. Software
 - B. Hardware
 - C. Combination of hardware and software
 - D. Other (Explain)

3. The test plans for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test plans?)

4. The test procedures for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test procedures?)

5. The actual DT&E testing in your program is done:
 - A. At the contractor's facility
 - B. At the user's facility
 - C. At an Air Force test facility
 - D. At your facility
 - E. Other (Where is the testing done?)

6. The actual DT&E testing in your program is done by:
- A. Personnel from your program office
 - B. DOD personnel located at the test facility
 - C. Contractor supplied personnel
 - D. Other (Who does the actual testing?)
7. If required, computer support personnel for your program testing are supplied by:
- A. DOD personnel dedicated to your program for computer support
 - B. DOD personnel assigned temporarily to your program from other computer resources
 - C. The contractor
 - D. Other (Who provides computer support?)
 - E. Computer support not required for my program (Omit #8)
8. DOD personnel used for computer support for your program:
- A. Are considered experts for the particular type of computer and associated programs prior to assignment to the test program.
 - B. Have a general knowledge of computer operation, but are assigned to the program early enough to gain expertise prior to program testing.
 - C. Have a general knowledge of computer operation and require no further special training.
 - D. Other (Explain)
9. Does your program have a written agreement between the program manager and the test personnel which provides funds to be used only for test programs?
- A. Yes (What type of document is it?)
 - B. Not aware of any such document

Instructions

The following questions will be answered using the five point scale. A statement will be read to you and you will be asked whether you:

- A. Strongly agree,
- B. Agree,
- C. Neither agree nor disagree,
- D. Disagree,
- E. Strongly disagree.

If you would like the question or the response scale repeated during the questioning, please ask.

10. The program manager has more direct control of the test program funds under the self-RTO concept than under the independent RTO concept.
A B C D E
11. In a self-RTO program, DT&E funds are used more effectively than under an independent RTO program.
A B C D E
12. In a self-RTO program, DT&E funds are more easily diverted back into the general program fund to be used in non-test areas.
A B C D E
13. In a self-RTO program, DT&E funds are more often increased rather than decreased.
A B C D E
14. In a self-RTO program, DT&E funds are often the first to be cut.
A B C D E
15. A contract-like agreement, such as a Memorandum of Agreement normally signed by the program office and an independent RTO, would be helpful for control of funds under the self-RTO concept.
A B C D E
16. A contract-like agreement, such as a Memorandum of Agreement, would be helpful for control of the tasks to be performed in a test program under the self-RTO concept.
A B C D E
17. Test plan inputs made by a qualified independent RTO could increase the quality of test plans.
 A B C D E
18. The perspective added by an independent test agency could enhance the objectivity of the test program.
A B C D D

19. Your program requested to be the RTO for your test program.
A B C D E
20. An independent RTO is a feasible alternative for your test program.
A B C D E
21. An active search for an independent RTO for your program was conducted prior to your assignment as the RTO.
A B C D E
22. There is an independent test organization capable of acting as the RTO for your program.
A B C D E

(If A or B, what organization and why is it not used?)
23. The program manager shortens test schedules to accommodate other program slips.
A B C D E
24. Current manning in your program provides for effective accomplishment of test management and RTO responsibilities.
A B C D E
25. An independent RTO could not become familiar enough with the specifications and design of your program to effectively perform the test program.
 A B C D E
26. There is no difference in the effectiveness of the control of funds on a program with an independent RTO.
A B C D E
27. Assignment of RTO responsibilities to your program office is the only method of effectively accomplishing your program's DT&E testing.
 A B C D E

(If D or E, what other alternatives exist?)

28. Why is the self-RTO concept considered the most effective method of DT&E for your program?
(Explain)
Response: unique technology
29. What improvements would you suggest to improve testing under the self-RTO concept?
(Explain)
Response: manning
30. Have you been involved in any programs that used an independent RTO for all or part of the DT&E testing?
A. Yes
 B. No
31. How many years have you been involved in test and evaluation?
Response: 2 years

This completes the questionnaire. Would you like to have any questions repeated? Do you have any general comments about self-RTO that were not covered in the questionnaire?

RESPONDENT

8

1. RTO responsibilities for your program are assigned:
 - A. Directly to the program office
 - B. To the prime contractor
 - C. To an independent contractor hired for testing
 - D. Other (Who has RTO responsibilities?)

2. What type of DT&E are you currently performing?
 - A. Software
 - B. Hardware
 - C. Combination of hardware and software
 - D. Other (Explain)

3. The test plans for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test plans?)

4. The test procedures for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test procedures?)

5. The actual DT&E testing in your program is done:
 - A. At the contractor's facility
 - B. At the user's facility
 - C. At an Air Force test facility
 - D. At your facility
 - E. Other (Where is the testing done?)

6. The actual DT&E testing in your program is done by:
- A. Personnel from your program office
 - B. DOD personnel located at the test facility
 - C. Contractor supplied personnel
 - D. Other (Who does the actual testing?)
7. If required, computer support personnel for your program testing are supplied by:
- A. DOD personnel dedicated to your program for computer support
 - B. DOD personnel assigned temporarily to your program from other computer resources
 - C. The contractor
 - D. Other (Who provides computer support?)
- E. Computer support not required for my program (Omit #8)
8. DOD personnel used for computer support for your program:
- A. Are considered experts for the particular type of computer and associated programs prior to assignment to the test program.
 - B. Have a general knowledge of computer operation, but are assigned to the program early enough to gain expertise prior to program testing.
 - C. Have a general knowledge of computer operation and require no further special training.
 - D. Other (Explain)
9. Does your program have a written agreement between the program manager and the test personnel which provides funds to be used only for test programs?
- A. Yes (What type of document is it?)
 - B. Not aware of any such document

Instructions

The following questions will be answered using the five point scale. A statement will be read to you and you will be asked whether you:

- A. Strongly agree,
- B. Agree,
- C. Neither agree nor disagree,
- D. Disagree,
- E. Strongly disagree.

If you would like the question or the response scale repeated during the questioning, please ask.

10. The program manager has more direct control of the test program funds under the self-RTO concept than under the independent RTO concept.
 A B C D E
11. In a self-RTO program, DT&E funds are used more effectively than under an independent RTO program.
 A B C D E
12. In a self-RTO program, DT&E funds are more easily diverted back into the general program fund to be used in non-test areas.
 A B C D E
13. In a self-RTO program, DT&E funds are more often increased rather than decreased.
 A B C D E
14. In a self-RTO program, DT&E funds are often the first to be cut.
 A B C D E
15. A contract-like agreement, such as a Memorandum of Agreement normally signed by the program office and an independent RTO, would be helpful for control of funds under the self-RTO concept.
 A B C D E
16. A contract-like agreement, such as a Memorandum of Agreement, would be helpful for control of the tasks to be performed in a test program under the self-RTO concept.
 A B C D E
17. Test plan inputs made by a qualified independent RTO could increase the quality of test plans.
 A B C D E
18. The perspective added by an independent test agency could enhance the objectivity of the test program.
 A B C D E

19. Your program requested to be the RTO for your test program.
A B C D E
20. An independent RTO is a feasible alternative for your test program.
A B C D E
21. An active search for an independent RTO for your program was conducted prior to your assignment as the RTO.
 A B C D E
22. There is an independent test organization capable of acting as the RTO for your program.
A B C D E
(If A or B, what organization and why is it not used?)
23. The program manager shortens test schedules to accommodate other program slips.
 A B C D E
24. Current manning in your program provides for effective accomplishment of test management and RTO responsibilities.
A B C D E
25. An independent RTO could not become familiar enough with the specifications and design of your program to effectively perform the test program.
A B C D E
26. There is no difference in the effectiveness of the control of funds on a program with an independent RTO.
A B C D E
27. Assignment of RTO responsibilities to your program office is the only method of effectively accomplishing your program's DT&E testing.
A B C D E
(If D or E, what other alternatives exist?)

28. Why is the self-RTO concept considered the most effective method of DT&E for your program?
(Explain)
Response: unique technology
29. What improvements would you suggest to improve testing under the self-RTO concept?
(Explain)
Response: more experienced personnel
30. Have you been involved in any programs that used an independent RTO for all or part of the DT&E testing?
A. Yes
 B. No
31. How many years have you been involved in test and evaluation?
Response: 30 years

This completes the questionnaire. Would you like to have any questions repeated? Do you have any general comments about self-RTO that were not covered in the questionnaire?

RESPONDENT

9

1. RTO responsibilities for your program are assigned:
 - A. Directly to the program office
 - B. To the prime contractor
 - C. To an independent contractor hired for testing
 - D. Other (Who has RTO responsibilities?)

2. What type of DT&E are you currently performing?
 - A. Software
 - B. Hardware
 - C. Combination of hardware and software
 - D. Other (Explain)

3. The test plans for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test plans?)

4. The test procedures for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test procedures?)

5. The actual DT&E testing in your program is done:
 - A. At the contractor's facility
 - B. At the user's facility
 - C. At an Air Force test facility
 - D. At your facility
 - E. Other (Where is the testing done?)

6. The actual DT&E testing in your program is done by:
- A. Personnel from your program office
 - B. DOD personnel located at the test facility
 - C. Contractor supplied personnel
 - D. Other (Who does the actual testing?)
7. If required, computer support personnel for your program testing are supplied by:
- A. DOD personnel dedicated to your program for computer support
 - B. DOD personnel assigned temporarily to your program from other computer resources
 - C. The contractor
 - D. Other (Who provides computer support?)
 - E. Computer support not required for my program (Omit #8)
8. DOD personnel used for computer support for your program:
- A. Are considered experts for the particular type of computer and associated programs prior to assignment to the test program.
 - B. Have a general knowledge of computer operation, but are assigned to the program early enough to gain expertise prior to program testing.
 - C. Have a general knowledge of computer operation and require no further special training.
 - D. Other (Explain)
9. Does your program have a written agreement between the program manager and the test personnel which provides funds to be used only for test programs?
- A. Yes (What type of document is it?)
 - B. Not aware of any such document

Instructions

The following questions will be answered using the five point scale. A statement will be read to you and you will be asked whether you:

- A. Strongly agree,
- B. Agree,
- C. Neither agree nor disagree,
- D. Disagree,
- E. Strongly disagree.

If you would like the question or the response scale repeated during the questioning, please ask.

10. The program manager has more direct control of the test program funds under the self-RTO concept than under the independent RTO concept.
A B C D E
11. In a self-RTO program, DT&E funds are used more effectively than under an independent RTO program.
A B C D E
12. In a self-RTO program, DT&E funds are more easily diverted back into the general program fund to be used in non-test areas.
A B C D E
13. In a self-RTO program, DT&E funds are more often increased rather than decreased.
A B C D E
14. In a self-RTO program, DT&E funds are often the first to be cut.
A B C D E
15. A contract-like agreement, such as a Memorandum of Agreement normally signed by the program office and an independent RTO, would be helpful for control of funds under the self-RTO concept.
A B C D E
16. A contract-like agreement, such as a Memorandum of Agreement, would be helpful for control of the tasks to be performed in a test program under the self-RTO concept.
A B C D E
17. Test plan inputs made by a qualified independent RTO could increase the quality of test plans.
 A B C D E
18. The perspective added by an independent test agency could enhance the objectivity of the test program.
A B C D D

19. Your program requested to be the RTO for your test program.
A B C D E
20. An independent RTO is a feasible alternative for your test program.
A B C D E
21. An active search for an independent RTO for your program was conducted prior to your assignment as the RTO.
A B C D E
22. There is an independent test organization capable of acting as the RTO for your program.
A B C D E
(If A or B, what organization and why is it not used?)
23. The program manager shortens test schedules to accommodate other program slips.
A B C D E
24. Current manning in your program provides for effective accomplishment of test management and RTO responsibilities.
A B C D E
25. An independent RTO could not become familiar enough with the specifications and design of your program to effectively perform the test program.
A B C D E
26. There is no difference in the effectiveness of the control of funds on a program with an independent RTO.
A B C D E
27. Assignment of RTO responsibilities to your program office is the only method of effectively accomplishing your program's DT&E testing.
A B C D E
(If D or E, what other alternatives exist?)

28. Why is the self-RTO concept considered the most effective method of DT&E for your program?
(Explain)
Response: coordination difficulties
29. What improvements would you suggest to improve testing under the self-RTO concept?
(Explain)
Response: manning
30. Have you been involved in any programs that used an independent RTO for all or part of the DT&E testing?
A. Yes
 B. No
31. How many years have you been involved in test and evaluation?
Response: 3 years

This completes the questionnaire. Would you like to have any questions repeated? Do you have any general comments about self-RTO that were not covered in the questionnaire?

RESPONDENT

10

1. RTO responsibilities for your program are assigned:
 - A. Directly to the program office
 - B. To the prime contractor
 - C. To an independent contractor hired for testing
 - D. Other (Who has RTO responsibilities?)

2. What type of DT&E are you currently performing?
 - A. Software
 - B. Hardware
 - C. Combination of hardware and software
 - D. Other (Explain)

3. The test plans for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test plans?)

4. The test procedures for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test procedures?)

5. The actual DT&E testing in your program is done:
 - A. At the contractor's facility
 - B. At the user's facility
 - C. At an Air Force test facility
 - D. At your facility
 - E. Other (Where is the testing done?)

6. The actual DT&E testing in your program is done by:
- A. Personnel from your program office
 - B. DOD personnel located at the test facility
 - C. Contractor supplied personnel
 - D. Other (Who does the actual testing?)
7. If required, computer support personnel for your program testing are supplied by:
- A. DOD personnel dedicated to your program for computer support
 - B. DOD personnel assigned temporarily to your program from other computer resources
 - C. The contractor
 - D. Other (Who provides computer support?)
- E. Computer support not required for my program (Omit #8)
8. DOD personnel used for computer support for your program:
- A. Are considered experts for the particular type of computer and associated programs prior to assignment to the test program.
 - B. Have a general knowledge of computer operation, but are assigned to the program early enough to gain expertise prior to program testing.
 - C. Have a general knowledge of computer operation and require no further special training.
 - D. Other (Explain)
9. Does your program have a written agreement between the program manager and the test personnel which provides funds to be used only for test programs?
- A. Yes (What type of document is it?)
 - B. Not aware of any such document

Instructions

The following questions will be answered using the five point scale. A statement will be read to you and you will be asked whether you:

- A. Strongly agree,
- B. Agree,
- C. Neither agree nor disagree,
- D. Disagree,
- E. Strongly disagree.

If you would like the question or the response scale repeated during the questioning, please ask.

10. The program manager has more direct control of the test program funds under the self-RTO concept than under the independent RTO concept.
A B C D E
11. In a self-RTO program, DT&E funds are used more effectively than under an independent RTO program.
A B C D E
12. In a self-RTO program, DT&E funds are more easily diverted back into the general program fund to be used in non-test areas.
A B C D E
13. In a self-RTO program, DT&E funds are more often increased rather than decreased.
A B C D E
14. In a self-RTO program, DT&E funds are often the first to be cut.
A B C D E
15. A contract-like agreement, such as a Memorandum of Agreement normally signed by the program office and an independent RTO, would be helpful for control of funds under the self-RTO concept.
A B C D E
16. A contract-like agreement, such as a Memorandum of Agreement, would be helpful for control of the tasks to be performed in a test program under the self-RTO concept.
A B C D E
17. Test plan inputs made by a qualified independent RTO could increase the quality of test plans.
A B C D E
18. The perspective added by an independent test agency could enhance the objectivity of the test program.
A B C D D

19. Your program requested to be the RTO for your test program.
 A B C D E
20. An independent RTO is a feasible alternative for your test program.
 A B C D E
21. An active search for an independent RTO for your program was conducted prior to your assignment as the RTO.
 A B C D E
22. There is an independent test organization capable of acting as the RTO for your program.
 A B C D E
 (If A or B, what organization and why is it not used?)
23. The program manager shortens test schedules to accommodate other program slips.
 A B C D E
24. Current manning in your program provides for effective accomplishment of test management and RTO responsibilities.
 A B C D E
25. An independent RTO could not become familiar enough with the specifications and design of your program to effectively perform the test program.
 A B C D E
26. There is no difference in the effectiveness of the control of funds on a program with an independent RTO.
 A B C D E
27. Assignment of RTO responsibilities to your program office is the only method of effectively accomplishing your program's DT&E testing.
 A B C D E
 (If D or E, what other alternatives exist?)

28. Why is the self-RTO concept considered the most effective method of DT&E for your program?
(Explain)
Response: coordination difficulties
29. What improvements would you suggest to improve testing under the self-RTO concept?
(Explain)
Response: no changes necessary
30. Have you been involved in any programs that used an independent RTO for all or part of the DT&E testing?
A. Yes
 B. No
31. How many years have you been involved in test and evaluation?
Response: 4 years

This completes the questionnaire. Would you like to have any questions repeated? Do you have any general comments about self-RTO that were not covered in the questionnaire?

RESPONDENT

11

1. RTO responsibilities for your program are assigned:
 - A. Directly to the program office
 - B. To the prime contractor
 - C. To an independent contractor hired for testing
 - D. Other (Who has RTO responsibilities?)

2. What type of DT&E are you currently performing?
 - A. Software
 - B. Hardware
 - C. Combination of hardware and software
 - D. Other (Explain)

3. The test plans for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test plans?)

4. The test procedures for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test procedures?)

5. The actual DT&E testing in your program is done:
 - A. At the contractor's facility
 - B. At the user's facility
 - C. At an Air Force test facility
 - D. At your facility
 - E. Other (Where is the testing done?)

Response: combination of A, B, C, and D

6. The actual DT&E testing in your program is done by:
- A. Personnel from your program office
 - B. DOD personnel located at the test facility
 - C. Contractor supplied personnel
 - D. Other (Who does the actual testing?)
7. If required, computer support personnel for your program testing are supplied by:
- A. DOD personnel dedicated to your program for computer support
 - B. DOD personnel assigned temporarily to your program from other computer resources
 - C. The contractor
 - D. Other (Who provides computer support?)
 - E. Computer support not required for my program (Omit #8)
8. DOD personnel used for computer support for your program:
- A. Are considered experts for the particular type of computer and associated programs prior to assignment to the test program.
 - B. Have a general knowledge of computer operation, but are assigned to the program early enough to gain expertise prior to program testing.
 - C. Have a general knowledge of computer operation and require no further special training.
 - D. Other (Explain)
9. Does your program have a written agreement between the program manager and the test personnel which provides funds to be used only for test programs?
- A. Yes (What type of document is it?)
 - B. Not aware of any such document

Instructions

The following questions will be answered using the five point scale. A statement will be read to you and you will be asked whether you:

- A. Strongly agree,
- B. Agree,
- C. Neither agree nor disagree,
- D. Disagree,
- E. Strongly disagree.

If you would like the question or the response scale repeated during the questioning, please ask.

10. The program manager has more direct control of the test program funds under the self-RTO concept than under the independent RTO concept.
A B C D E
11. In a self-RTO program, DT&E funds are used more effectively than under an independent RTO program.
A B C D E
12. In a self-RTO program, DT&E funds are more easily diverted back into the general program fund to be used in non-test areas.
A B C D E
13. In a self-RTO program, DT&E funds are more often increased rather than decreased.
A B C D E
14. In a self-RTO program, DT&E funds are often the first to be cut.
A B C D E
15. A contract-like agreement, such as a Memorandum of Agreement normally signed by the program office and an independent RTO, would be helpful for control of funds under the self-RTO concept.
A B C D E
16. A contract-like agreement, such as a Memorandum of Agreement, would be helpful for control of the tasks to be performed in a test program under the self-RTO concept.
A B C D E
17. Test plan inputs made by a qualified independent RTO could increase the quality of test plans.
A B C D E
18. The perspective added by an independent test agency could enhance the objectivity of the test program.
A B C D D

19. Your program requested to be the RTO for your test program.
 A B C D E
20. An independent RTO is a feasible alternative for your test program.
 A B C D E
21. An active search for an independent RTO for your program was conducted prior to your assignment as the RTO.
 A B C D E
22. There is an independent test organization capable of acting as the RTO for your program.
 A B C D E
- (If A or B, what organization and why is it not used?)
 Response: 3246th TW; schedule conflicts
23. The program manager shortens test schedules to accommodate other program slips.
 A B C D E
24. Current manning in your program provides for effective accomplishment of test management and RTO responsibilities.
 A B C D E
25. An independent RTO could not become familiar enough with the specifications and design of your program to effectively perform the test program.
 A B C D E
26. There is no difference in the effectiveness of the control of funds on a program with an independent RTO.
 A B C D E
27. Assignment of RTO responsibilities to your program office is the only method of effectively accomplishing your program's DT&E testing.
 A B C D E
- (If D or E, what other alternatives exist?)
 Response: independent test facility

28. Why is the self-RTO concept considered the most effective method of DT&E for your program?
(Explain)

Response: test facility schedule problems

29. What improvements would you suggest to improve testing under the self-RTO concept?
(Explain)

Response: independent assessment needed

30. Have you been involved in any programs that used an independent RTO for all or part of the DT&E testing?

- A. Yes
- B. No

31. How many years have you been involved in test and evaluation?

Response: 22 years

This completes the questionnaire. Would you like to have any questions repeated? Do you have any general comments about self-RTO that were not covered in the questionnaire?

RESPONDENT

12

1. RTO responsibilities for your program are assigned:
 - A. Directly to the program office
 - B. To the prime contractor
 - C. To an independent contractor hired for testing
 - D. Other (Who has RTO responsibilities?)

2. What type of DT&E are you currently performing?
 - A. Software
 - B. Hardware
 - C. Combination of hardware and software
 - D. Other (Explain)

3. The test plans for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test plans?)

4. The test procedures for your program are written by:
 - A. Your office
 - B. The contractor
 - C. Your office with contractor inputs
 - D. The contractor with your inputs
 - E. Your office and the contractor equally
 - F. Other (Who writes the test procedures?)

5. The actual DT&E testing in your program is done:
 - A. At the contractor's facility
 - B. At the user's facility
 - C. At an Air Force test facility
 - D. At your facility
 - E. Other (Where is the testing done?)

6. The actual DT&E testing in your program is done by:
 - A. Personnel from your program office
 - B. DOD personnel located at the test facility
 - C. Contractor supplied personnel
 - D. Other (Who does the actual testing?)

7. If required, computer support personnel for your program testing are supplied by:
 - A. DOD personnel dedicated to your program for computer support
 - B. DOD personnel assigned temporarily to your program from other computer resources
 - C. The contractor
 - D. Other (Who provides computer support?)

E. Computer support not required for my program (Omit #8)

8. DOD personnel used for computer support for your program:
 - A. Are considered experts for the particular type of computer and associated programs prior to assignment to the test program.
 - B. Have a general knowledge of computer operation, but are assigned to the program early enough to gain expertise prior to program testing.
 - C. Have a general knowledge of computer operation and require no further special training.
 - D. Other (Explain)

9. Does your program have a written agreement between the program manager and the test personnel which provides funds to be used only for test programs?
 - A. Yes (What type of document is it?)
 - B. Not aware of any such document

Instructions

The following questions will be answered using the five point scale. A statement will be read to you and you will be asked whether you:

- A. Strongly agree,
- B. Agree,
- C. Neither agree nor disagree,
- D. Disagree,
- E. Strongly disagree.

If you would like the question or the response scale repeated during the questioning, please ask.

10. The program manager has more direct control of the test program funds under the self-RTO concept than under the independent RTO concept.
A B C D E
11. In a self-RTO program, DT&E funds are used more effectively than under an independent RTO program.
A B C D E
12. In a self-RTO program, DT&E funds are more easily diverted back into the general program fund to be used in non-test areas.
A B C D E
13. In a self-RTO program, DT&E funds are more often increased rather than decreased.
A B C D E
14. In a self-RTO program, DT&E funds are often the first to be cut.
A B C D E
15. A contract-like agreement, such as a Memorandum of Agreement normally signed by the program office and an independent RTO, would be helpful for control of funds under the self-RTO concept.
A B C D E
16. A contract-like agreement, such as a Memorandum of Agreement, would be helpful for control of the tasks to be performed in a test program under the self-RTO concept.
A B C D E
17. Test plan inputs made by a qualified independent RTO could increase the quality of test plans.
A B C D E
18. The perspective added by an independent test agency could enhance the objectivity of the test program.
A B C D D

19. Your program requested to be the RTO for your test program.
A B C D E
20. An independent RTO is a feasible alternative for your test program.
A B C D E
21. An active search for an independent RTO for your program was conducted prior to your assignment as the RTO.
A B C D E
22. There is an independent test organization capable of acting as the RTO for your program.
A B C D E
(If A or B, what organization and why is it not used?)
23. The program manager shortens test schedules to accommodate other program slips.
A B C D E
24. Current manning in your program provides for effective accomplishment of test management and RTO responsibilities.
A B C D E
25. An independent RTO could not become familiar enough with the specifications and design of your program to effectively perform the test program.
A B C D E
26. There is no difference in the effectiveness of the control of funds on a program with an independent RTO.
A B C D E
27. Assignment of RTO responsibilities to your program office is the only method of effectively accomplishing your program's DT&E testing.
A B C D E
(If D or E, what other alternatives exist?)

28. Why is the self-RTO concept considered the most effective method of DT&E for your program?
(Explain)
Response: coordination difficulties
29. What improvements would you suggest to improve testing under the self-RTO concept?
(Explain)
Response: manning
30. Have you been involved in any programs that used an independent RTO for all or part of the DT&E testing?
A. Yes
 B. No
31. How many years have you been involved in test and evaluation?
Response: 4 years

This completes the questionnaire. Would you like to have any questions repeated? Do you have any general comments about self-RTO that were not covered in the questionnaire?

BIBLIOGRAPHY

1. Aeronautical Systems Division. A Guide for Test and Evaluation Management. ASDP 80-14. Wright-Patterson AFB OH, 18 February 1980.
2. _____. Organization and Functions. ASDR 23-1. Wright-Patterson AFB OH, 1 June 1977.
3. Air Force Systems Command. Research and Development Test and Evaluation. Supplement 1 to AFR 80-14. Andrews AFB MD, 19 February 1981.
4. _____. Summary of AFSC Major Ranges and Test Facilities. AFSCP 80-27. Andrews AFB MD, 26 January 1981.
5. Baer, Major Les, USAF. Director of Test and Deployment, Deputy for Simulators, ASD, Wright-Patterson AFB OH. Personal interview. 2 June 1981.
6. Barnard, Tom. Computer Systems Engineer, Deputy for Simulators, ASD, Wright-Patterson AFB OH. Telephone interview. 4 August 1981.
7. Blair, Jim. Electronics Engineer, Deputy for Engineering, ASD, Wright-Patterson AFB OH. Telephone interview. 3 August 1981.
8. Emory, C. William. Business Research Methods. Homewood IL: Richard D. Irwin, Inc., 1976.
9. Larkin, Major Michael E., USAF. Manager, Computer Test and Evaluation Policy, HQ AFSC, Andrews AFB MD. Telephone interview. 29 May 1981.
10. Kottman, Hank. Deputy Director of Engineering, Deputy for Simulators, ASD, Wright-Patterson AFB OH. Personal interview. 20 July 1981.
11. McClain, Craig. Engineering Psychologist, Deputy for Simulators, ASD, Wright-Patterson AFB OH. Personal interview. 17 August 1981.
12. Ossinger, Lieutenant Colonel Donald, USAF. Director, Test and Evaluation, ASD, Wright-Patterson AFB OH. Telephone interview. 29 May 1981.

13. Singer-Link Corporation. Qualification Test Procedures, F-16 Trainer Flight Simulator. Binghamton NY, June, 1980.
14. Somsel, John. Chief, Tactical Projects Branch, Flight Dynamics Division, AFFTC, Edwards AFB CA. Telephone interview. 14 August 1981.
15. Stansberry, Lieutenant General James W., USAF. Commander, ESD, Hanscom AFB MA. Letter, subject: SPO Management Style, to AD/CC, ASD/CC, BMO/CC, and SD/CC, 17 April 1981.
16. Tippin, Ray. Electronics Engineer, Deputy for Simulators, ASD, Wright-Patterson AFB OH. Telephone interview. 3 August 1981.
17. U. S. Department of the Air Force. Research and Development Test and Evaluation. AFR 80-14. Washington: Government Printing Office, 1980.
18. Wood, Richard. Chief, Special Projects Branch, Flight Dynamics Division, AFFTC, Edwards AFB CA. Telephone interview. 17 August 1981.

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AFSC acquisition programs are required by AFSC Supplement 1 to AFR 80-14 to use an independent test organization to accomplish Development Test and Evaluation (DT&E). However, there are a few AFSC acquisition programs where the "uniqueness" of the test requirements make it difficult to identify an independent test organization qualified to perform the testing. In these cases, the program offices are assigned the DT&E responsibilities for the program. Lack of expertise in simulator testing and the small size of the early simulator programs led to assigning DT&E responsibilities directly to the Simulator SPO. This study shows that unique expertise is still required for simulator testing; however, the testing "uniqueness" should not preclude the use of an independent test organization. Test managers of the AFSC programs assigned test responsibilities indicated that if an independent test organization was available to test their programs, the added perspective would enhance the effectiveness of the test program. A recommendation was made to assign simulator test responsibilities to an independent test organization. The Air Force Flight Test Center at Edwards AFB CA was identified as a test organization capable, or potentially capable, of conducting all, or part, of the Air Force simulator DT&E program.

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