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THE EFFECT OF FEEDBACK ON COST PERFORMANCE REPORT UTILITY

THESIS

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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 Cost Analysis

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September 1989

Preface

The purpose of this thesis was to assess the effect of feedback on the utility of the Cost Performance Report (CPR). An experimental setting was used to investigate the effect of providing feedback to preparers of the CPR.

Two separate experiments were conducted to collect data concerning the effect of feedback. One experiment included government personnel while the other included contractor personnel. The results of the research suggest that there is no statistical difference in the quality of the CPR variance analyses when one provides feedback in the form given during the experiments.

In conducting this research, I was given excellent support from Lt Col Tom Bowman from ASD/ACC, Maj Ron Cohen from SD/ACCI, and Mr Charlie Gardella from ESD/ACC. Lt Col Tony Presutti was always available to answer any question I had for him, despite his busy transition to the "good life." I would also like to acknowledge the support of Mr Joe Houser for accomodating my study in the NSIA conference. Finally, I must thank my wife Nena for her boundless love and her patience with me through the many long nights I sat at my computer.

Juan H. Amaral
Phillipians 4:6-8

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Abstract

The purpose of this thesis was to assess the effect of feedback on the utility of the Cost Performance Report (CPR). The effort consisted of administering a controlled experiment to two groups: a gathering of contractor personnel and a group of Government employees. Both groups had some degree of knowledge in the area of variance analysis reporting.

Each experiment consisted of two randomly assigned instruments, the feedback instrument (given to the experimental group) and the non-feedback instrument (given to the control group).

The feedback used in this experiment was similar in structure to the Defense Acquisition Executive Summary Format 11, specifically as formatted in the Program Director's Assessment Review. Both of these reports are used by government program offices to report contract cost and schedule information to higher levels of the government procurement community.

The experiment required the subjects to perform a task similar to that performed during the preparation of a CPR and to provide a response in the form of a variance analysis. The responses were rated by three experts and the mean values of the feedback responses and non-feedback responses

were tested to determine if a statistically significant difference existed between the two means.

No statistically significant difference was found to exist between the two means suggesting that providing feedback to subjects, as given in this experiment, has no effect on the quality of the variance analyses they prepare.

Although supporting the fact that feedback as a whole is beneficial, the results of this thesis suggest that in order to produce a statistically significant difference in the quality of variance analyses, the feedback given in these experiments needs to be reevaluated.

A recommendation was made to conduct a follow-on thesis with an improved feedback measure possibly involving a feedback briefing, an increase in time allotted to the experiment, or a change to the feedback vocabulary.

THE EFFECT OF FEEDBACK ON COST PERFORMANCE REPORT UTILITY

I. Introduction

General Issue

The Cost Performance Report (CPR) is currently the main vehicle by which the U.S. Government collects cost and schedule information on major defense contracts. Guidelines for preparation of this report are outlined in Department of Defense Data Item Description, DI-F-6000C, which is readily available to defense contractors. However, much of the literature in CPR utility, addressed in Chapter II of this proposal, suggests that a high percentage of defense contractors fail to provide adequate background information in support of cost and schedule performance as required by the guidelines. Since the CPR, if properly prepared, provides useful information to high-level decision makers, it is imperative to improve its value to the decision-making process.

Problem Statement & Hypothesis

Although defense contractors are provided with the instructions for the preparation of Cost Performance Reports, the usefulness of the information contained in these reports is limited. A review of the literature in Chapter II will identify a number of sources who claim that the lack

of CPR utility is not a result of providing improper instructions to the contractors, but instead due to a lack of appreciation, on the part of a number of defense contractors, of the importance of the information they include in their submissions to the Government.

The second part of the literature review addresses the effect of feedback on the quality of performance reports. As detailed further in Chapter II, it appears that providing feedback to subjects on the usefulness of performance reports prior to their preparation by the subjects results in a higher degree of accuracy in the performance reports. The author hypothesizes that by applying this information in the area of CPRs, the overall quality of the CPRs will improve.

Specifically, the effect that feedback has on the quality of the CPRs submitted to the Government needs to be adequately measured. At the core of this thesis is an experiment to study if there is, in fact, a positive effect in having the Government provide feedback to contractor personnel who prepare the CPR. The author's hypothesis is that providing feedback to these individuals will improve the quality of the variance analyses contained in the CPRs. If a positive effect does exist, this information should be applied throughout the acquisition environment.

Investigative Questions

The following questions are relevant in addressing the effect of feedback on CPR utility:

1) What specific background information do high-level decision-makers use in making their decisions?

2) How should this information be formatted to include it as feedback to preparers of CPRs?

3) Who should serve as subjects for this experiment?

4) How does feedback improve the quality of performance reports?

Justification of the Research

Recently, the Government has had to endure sharp criticism for serious blunders in defense contract management, particularly in the area of cost. Most people have heard the stories in the news of Government mismanagement resulting in exorbitant prices for items normally costing several dollars. Of course, this situation is embarrassing to the Department of Defense. More importantly, however, it causes the public to lose confidence in the ability of the Defense Department to manage the cost of defense contracts.

The mismanagement referred to above is certainly the exception to the normal way of doing business. However, the attention it draws to the acquisition process enforces the notion that the public cares very much about the efficient cost management of defense contracts. As previously mentioned, the CPR is the document designated by the Government as the main vehicle for obtaining this information from defense contractors.

Scope

The CPR falls under the overall concept of the Cost/ Schedule Control Systems Criteria (C/SCSC). In order to properly address the issue of CPR utility and specifically the effect of feedback on variance analyses within the CPR, it is important to understand what C/SCSC entails.

This thesis does not provide a validation of C/SCSC as a whole, but instead accepts the ideas incorporated in this discipline as appropriate for collecting contract cost and schedule information. As an integral part of C/SCSC, the CPR has been in use for numerous years and the author assumes that if properly prepared, the CPR provides the information government decision-makers want, and actually need, to make the best decisions possible concerning major defense acquisitions.

Background

During the late 1960s, Government program managers were faced with the highly complex task of managing large defense contracts in an unfavorable atmosphere of "increased technical complexity of weapon systems, the long lead times in procuring them, the environment of uncertainty in the defense business, and the inflationary spiral of the economy" (16:23).

Since there was no existing requirement to manage contracts in a certain way, program managers controlled the cost on their contracts to the best of their abilities. As

one would expect, some were more successful than others. More importantly, however, was the realization by individuals in charge of the acquisition process that the lack of adequate and uniform contract cost control needed to be addressed.

During this time, two approaches to cost control emerged. The first of these was the Program Evaluation and Review Technique (PERT). PERT is a network scheduling technique applied by the Navy to its Polaris missile program. At the heart of PERT, "was a work breakdown structure that subdivided the program through successive levels of detail, corresponding to the way in which the work was to be performed" (18:6).

The second approach was the "Earned Value" concept used by the Air Force on its Minuteman missile program. This method adopted the work breakdown structure idea of PERT and added a set of criteria that a contractor's management system should meet. These criteria specify guidelines which must be met, but do not require that a contractor use a particular management system. A further improvement was the establishment of a contract provision allowing for the inspection of a contractor's facility to verify proper implementation of the system criteria (9:14).

In June 1966, the Air Force combined the strong points of PERT and the Earned Value concept and published the Cost/Schedule Planning and Control Specification (C/SPCS) (18:7).

The final step in the evolution of C/SCSC came in December of 1967, when the Assistant Secretary of Defense (Comptroller) published Department of Defense Instruction 7000.2, Performance Measurement for Selected Acquisitions, "which formally implemented the Cost/Schedule Control Systems Criteria on a defense-wide basis" (16:2).

II. Literature Review

The literature review section of this thesis consists of three parts. The first part is a discussion of the literature on the Cost/Schedule Control Systems Criteria. Part two of the literature review addresses the issue of feedback. Of particular importance to this effort is its effect on the quality of performance reports. Part three of this section outlines the implications that the literature review has on the use of feedback to improve CPR utility.

Cost/Schedule Control Systems Criteria

Department of Defense Instruction 7000.2 states the main objective of C/SCSC as follows:

> To provide an adequate basis for responsible decision-making by both contractor management and DoD Components, contractor's internal management control systems must provide data which (a) indicate work progress, (b) properly relate cost, schedule and technical accomplishment, (c) are valid, timely and auditable, and (d) supply DoD managers with information at a practicable level of summarization. (7:1)

The responsibility of ensuring that the contractor maintain a management control system that meets the criteria conditions stated above rests with the government program manager. To help alleviate the burden on the program manager, the Departments of the Air Force, Army, Navy, the Defense Logistics Agency, and the Defense Contract Audit Agency published the Cost/Schedule Control Systems Criteria

Joint Implementation Guide. This document provides invaluable information concerning the implementation of C/SCSC, and categorizes the criteria as follows: 1) Organization, 2) Planning and Budgeting, 3) Accounting, 4) Analysis, and 5) Revisions and Access to Data (4:3-1 - 3-20).

C/SCSC is required for selected contracts within programs designated as major system acquisitions as defined in Department of Defense Directive 5000.1, Major System Acquisitions (6:1). The present thresholds within the Air Force above which C/SCSC is required are $40 million for Research, Development, Testing, & Evaluation (RDT&E) contracts and $160 million for Production contracts (3:1-2).

The Criteria Concept. During the initial implementation stages of C/SCSC, the Government was faced with a large amount of opposition by defense contractors. The major reason for their reluctance to apply C/SCSC was due to their belief that C/SCSC required them to use a particular system for the management of their contracts.

It took some time for the Government to convince contractors that C/SCSC is not a system, but rather, "a set of criteria designed to define an adequate contractor cost and schedule management control system. Changes to an existing system are required only to the extent that it does not meet the criteria" (1:45). Proper application of the criteria assures the Government that a contractor's system will generate timely and reliable data.

It is important to briefly point out at this time that C/SCSC, in and of itself, does not require the preparation of the CPR. However, by specifying criteria that contractors must follow, C/SCSC provides a standardized framework for collecting the data used to generate the CPR. (This point will be expanded upon in the section on financial reporting.)

Earned Value. At the core of C/SCSC is the concept of Earned Value. It is important to understand what "earned value" is because this concept provides the basis for performance measurement of defense contracts. In order to understand earned value, it is necessary to first introduce some terminology.

Hemphill and Fleming state that the following list essentially comprises the "earned value" concept:

BCWS - Budgeted Cost for Work Scheduled
BCWP - Budgeted Cost for Work Performed
ACWP - Actual Cost of Work Performed
EAC - Estimate At Completion
METC - Monthly Estimate To Complete
BAC - Budget At Completion
Cost and Schedule Variances
Traceability (12:28)

Definitive guidance for most of the terms listed above can be found in the C/SCSC Joint Implementation Guide. This guide provides direction to both Government and contractor personnel regarding the purpose and implementation of C/SCSC.

BCWS, as defined by the guide, is "the sum of the budgets for all work packages, planning packages, etc.,

scheduled to be accomplished (including in-process work packages), plus the amount of level-of-effort and apportioned effort scheduled to be accomplished within a given period of time" (4:2-2). Prior to explaining the new terms introduced by this definition, it is important to note that BCWS refers to *scheduled* work.

The "work package" is a concept which allows for a more uniform means of work measurement. It denotes a particular subdivision of work from which all performance measurement is derived. The Joint Implementation Guide states that a work package must have the following characteristics:

> 1) It represents units of work at levels where work is to be performed.
> 2) It is clearly distinguished from all other packages.
> 3) It is assignable to a single organizational element.
> 4) It has scheduled start and completion dates, and as applicable, interim milestones, all of which are representative of physical accomplishment.
> 5) It has a budget or assigned value expressed in terms of dollars, man-hours, or other measurable units.
> 6) Its deviation is limited to a relatively short span of time or it is subdivided by discrete value milestones to facilitate the objective measurement of work performed.
> 7) It is integrated with detailed engineering, manufacturing, or other schedules. (4:2-3)

Unlike a work package, a planning package has not been fully defined. The definition of a planning package, as well as those of "level of effort" and apportioned effort, both referring to effort which is not tied to specific units of work, is included in the Joint Implementation Guide

(4:2-2), but further discussion of these terms is beyond the scope of this thesis.

BCWP refers to "the sum of the budgets for completed work packages and completed portions of open work packages, plus the applicable portion of the budgets for level of effort and apportioned effort" (4:2-2). Gadeken and Tison define BCWP as "the work actually accomplished measured in terms of the budget planned for that work" (9:14). The important thing to remember in this case is that BCWP refers to work performed (rather than scheduled), measured not by the *actual* cost of that work, but rather by the amount originally *planned* for that work to cost. Several techniques exist for the measurement of BCWP, but discussion of them is beyond the scope of this thesis.

ACWP is defined as "the costs actually incurred and recorded in accomplishing the work performed within a given time period" (4:2-1). At the risk of oversimplifying this definition, it is significant to point out that ACWP, refers to work performed (rather than scheduled); but unlike BCWP, it is measured by the *actual* cost and not the *planned* cost.

The Estimate at Completion (EAC) consists of "actual direct costs, plus indirect costs allowable to the contract, plus the estimate of costs (direct and indirect) for authorized work remaining" (4:2-2). The EAC, therefore, is an aggregation of actual costs to date on completed work plus the expected cost of work to be done. If one assumes, as is

usually the case, that the contractor submits a monthly CPR, then the second part of the EAC definition above refers to the Monthly Estimate to Complete noted by Hemphill and Fleming.

The Budget at Completion (BAC) refers to the overall budget set aside for the completion of a certain amount of work. Specifically, it consists of "the sum of the original budgets plus or minus budget changes resulting from contract changes, internal replanning, and application of management reserves" (5:8). The contract BAC is a summation of the budgets for all the contract work packages (including planning packages.)

Until now we have discussed only the meaning of the terms listed by Hemphill and Fleming. But in order for these terms to be of any value, they need to be compared to one another. The resulting differences from comparing BCWS, BCWP, and ACWP are called "variances."

The term "variance" which is central to the concept of earned value, simply denotes a deviation from either the cost plan or schedule plan outlined by the contractor. Both cost and schedule variances discussed in the CPR are derived from the concept of earned value.

Specifically, subtracting BCWS from BCWP results in a schedule variance. A positive schedule variance indicates a favorable variance and a negative variance indicates an unfavorable variance (5:6-7). Positive schedule variances

result when one is further along in the completion of a unit of work than one planned to be at the present (this does not imply time, rather it is a *work* variance). Schedule variances say nothing about the actual costs incurred.

Cost variances result from subtracting ACWP from BCWP. A positive figure indicates a favorable variance and a negative variance indicates an unfavorable variance (5:7). A positive cost variance simply means that the amount of money spent in completing a unit of work is less than the amount budgeted for that work. Cost variances say nothing about how far ahead or behind schedule one is.

The final item listed by Hemphill and Fleming is "traceability." This term simply means that all work needs to be traceable to a single responsible individual. The work package concept addresses this requirement by stipulating that work packages must be assigned so that one individual manager is held responsible for the work (4:2-3). Traceability results in a system of accountability for the contractor, and an effective form of visibility for the Government. Whenever a problem arises, both the contractor and the Government know where to start looking for a solution to the problem.

During the early years of C/SCSC usage, many of its proponents understood that contractors would resist the introduction of new terms such as the ones previously

listed. J. Stanley Baumgartner, Director of C/SCSC Management Courses for the Defense Systems Management College, wrote in 1974:

> If terms like BCWP, BCWS and ACWP sound like jargon that will soon go out of style, two points are worth noting. One is that they have been in widespread use for some years and are destined to be in use for a long time because of general acceptance of the criteria approach. The other is that the terms that are used and their meaning is well understood by decision makers at high levels of DOD. (2:34)

With the possible exceptions of the BCWP, and hence the cost and schedule variances, the other terms were not new to contractors when C/SCSC was introduced. Generally, information regarding the incremental and cumulative budgets, the time-phased plan for accomplishing the work, and the actual costs of completed work is readily available in any good management control system.

C/SCSC and Financial Reporting. As stated by Gadeken and Tison, the criteria:

> Do not require the submission of any reports to the Government, but specify the reporting capabilities contractors' internal systems must have and the types of data that the systems should be able to produce. The type and detail of reports are then selected by the Government program office after considering individual service and program requirements. (9:15)

The DoD currently requires the submission of the Cost Performance Report for all contracts which qualify as "major system acquisitions" as described earlier. The CPR consists of five parts, or "formats," which incorporate the necessary cost and schedule information.

Format 1 categorizes the contract cost and schedule data by summary level work breakdown structure elements. Format 2 categorizes the data by functional cost categories. Format 3 delineates the budget plan used to measure the contract performance. Format 4 addresses the manpower requirements to meet the plan. Finally, Format 5 provides a narrative report which, among other things, is used to explain cost and schedule variances which exceed specified thresholds. Specific guidance for the preparation of this report is contained in DOD Data Item Description DI-F-6000C (5:1-18).

Effectiveness. The criteria approach to C/SCSC is effective because it "offers flexibility to contractors in selecting systems and techniques best suited to their own internal needs while still satisfying the requirements of the Government" (23:38). Contractors are free to use their innovation in implementing systems for cost and schedule management which do not conflict with their internal procedures, yet provide the necessary information to prepare the required reports for the Government.

Additionally, the ability of contractors to choose a particular system allows them the opportunity to minimize the amount of redundancy involved in preparing both internal and Government reports. The effectiveness of C/SCSC is clearly stated by Weisberg:

> Variances resulting from these comparisons provide DOD and contractor managers with cost and schedule performance indicators enabling them to:

1) Determine program progress by specific element of work.
2) Identify problem areas and their significance to the source so corrective action can be taken.
3) Evaluate organizational performance.
4) Have a factual basis for projecting future cost and schedule performance. (23:37)

Problems. Until now, only the positive aspects of C/SCSC have been discussed. As may be expected, some problems with the criteria approach have been noted. Despite the general acceptance of C/SCSC, there are still some problems concerning the criteria approach. There is still "a lack of understanding in industry and the Government of C/SCSC and how it works.... Another problem is the effort required to understand the terminology" (2:35).

In addition to the problems pertaining to the criteria themselves, two major problems still exist concerning the implementation of C/SCSC. One concerns the C/SCSC review process. Specifically, numerous sources claim that team members are not well-qualified to perform contractor site visitations (9:17;16:173;22:17).

The other major problem area, and the one of significance to this effort, was documented in a 1975 study of "corporate memory" for the years 1968 through 1975. This problem area addresses the inability of both the Government and contractors to effectively use the CPRs generated by validated systems (16:170). Webster, in his 1987 study, reconfirmed this area as one requiring improvement (22:21).

Capt J. B. Holeman Jr., USA, an instructor in the Computer Systems & Simulation Department of the Defense Systems Management College, devoted an entire article to the proper analysis of CPRs. He conducted a three-month study in which he investigated the methods of improving the use of data generated by defense contractors and reported in the CPRs (13:39-42).

Holeman summarized the four problem areas he noticed and suggested a plan for improving the overall analysis of these reports. The four problem areas were:

> 1. General lack of effective communication regarding C/SCSC analysis within the program management community.
> 2. Reluctance to use the computer and/or operations research approaches.
> 3. Failure to understand and incorporate significant factors such as overhead, the contractor's management philosophy, general economic trends and the impact of technical performance in the total analysis picture.
> 4. Difficulty in analyzing schedule variance and predicting a Government estimated cost to complete, including estimated overrun or underrun for all authorized work. (13:39-42)

Varady and Lumer offer a much more critical view of the lack of contractor knowledge concerning the CPR:

> It is clear from involvement in implementing [C/SCSC] with several contractors that they have no idea who gets, reads or grades the report. Many contractors believe that the CPR submissions are just piled on top of the dozens (or hundreds) of other data item reports that serve only to keep dust off an 8- by 11-inch piece of desk.... These reports have tremendous exposure up through the highest levels of the Defense Department, and contractors must become aware that these reports are read, thoroughly analyzed, and briefed to people who can kill programs with the stroke of a pen. (21:12)

Dr. Anthony Webster, professor of financial management at the Defense Systems Management College, concluded an exhaustive study of C/SCSC in 1987. In addition to the finding already mentioned, he found many other areas where C/SCSC could be improved. Additional areas of interest to this effort included timeliness of the CPRs and quality of the variance analysis within the CPRs (22:17). His specific recommendations are discussed in the section on the implications of the literature.

Feedback

This section will begin with a brief definition of feedback followed by a discussion of the effect of feedback in other disciplines and its documented effect in the area of performance reports.

Greller documents that literature on feedback falls into the following categories: 1) identifying the characteristics of effective feedback; 2) distribution of feedback; and 3) application of feedback (10:24). Discussion on the distribution of feedback is not within the scope of this thesis, but it is beneficial to address the other two categories.

Definition of Feedback. According to Huczynski, much of the pioneering work in the area of feedback is credited to Leon Festinger and his "social comparison theory" (14:12-5). This theory noted that individuals are very interested in getting information concerning their performance. The

name given to this information is "feedback." Huczynski provides his own definition of feedback, calling it a "shorthand term for the intervention procedure... whereby information about the consequences of an individual's actions or responses to a task are reported back to him (14:126).

Tosi, providing a simpler definition, refers to feedback as "the amount of information that a person gets about the results of a job" (20:95). He further states that sources for this information include coworkers, supervisors, and the job itself.

Characteristics of Effective Feedback. In order for feedback to be a valuable tool, Tosi states that it should have certain characteristics. Effective feedback:

1) Should be as precise and as specific as possible.
2) Should be timely.
3) Should be impersonal rather than aimed at personality traits.
4) Should be noticeable.
5) Should be given frequently. (20:590-592)

Application of Feedback. The application of feedback and its general effect on performance has been documented in various studies. Komaki, Heinzman, and Lawson concluded that feedback increased the level of performance in a driver safety program at a city vehicle maintenance facility (15: 261-270). Sulzer-Azaroff & de Santamaria documented a decrease in hazardous conditions due to the effective introduction of feedback at a small factory specializing in the manufacturing of customized plastic parts (19:518).

The effect of feedback was also documented by Zemke and Gunkler in a report which outlined the improvement in the management of a theme park due to proper implementation of feedback into the organization (24:565-583).

Feedback and Performance Reports. Feedback has also been applied in the area of performance reports. All of the information in this section is based on an article which explains an experiment conducted at an air force base in Texas. The experiment was designed to determine the effect of feedback on the decision-making behavior of mid-level Air Force officers. Seventy-five subjects were randomly assigned into five experimental groups. All five groups were presented with hypothetical data and asked to evaluate the overall performance of the base training wings during a pre-test. No significant difference was found between the five groups.

Prior to the post-test, groups two through five received a policy statement which associated relative weights to the five goals of the pilot training wings. Additionally, during the post-test, groups three through five received feedback indicating the decision reached by senior managers on each case. For group three, the decision was consistent with the policy statement. Group four received feedback indicating that senior managers had ignored the policy statement. Random feedback was given to group five.

Results of this experiment concluded that mid-level managers exhibited a statistically different decision-making behavior when feedback indicating senior manager evaluations was introduced (11:833-841).

Implications of the Literature

The C/SCSC literature seems to suggest that the defense contracting community could benefit from increased communication between contractors and the Government. As previously stated, Webster's 1987 study noted deficiencies in the timeliness of CPRs and in the quality of the CPR variance analyses. Among his proposed solutions in these areas are the following:

> 1) Improvise ways to help contractor and Government analyst to better appreciate value of the data and emphasize a greater understanding of how to analyze and utilize the data.
> 2) Service focal points should assure that the contractor is aware of the need for timely and quality data for the reports to yield their maximum utility.

Although Webster's solutions do not specifically address the use of feedback, one can view his second point and interpret from the information in the C/SCSC and feedback literature that feedback would be appropriate to help correct the deficiencies he notes. Feedback has been found to be beneficial in many different situations and specifically in the area of performance reports.

By its very name, the Cost Performance Report is a performance report. Of course, the performance addressed in

the CPR concerns the work related to the contract itself. This thesis does not suggest that providing feedback to contractors might help the contract performance. However, the utility to the Government of the information concerning contract performance, specifically included in the variance analysis section of the CPR, could reasonably be expected to improve by the introduction of feedback. Telling contractors how to prepare the CPR, via the Data Item Descriptions is not enough. If Government personnel inform contractors *what* the Government does with the information once it is received, the utility of the CPR should improve.

III. METHODOLOGY

Much of the research in the early part of the thesis centered on formulating the best possible approach to answer the investigative questions posed in Chapter I:

1) What specific background information do high-level decision-makers use in making their decisions?

2) How should this information be formatted to include it as feedback to preparers of CPRs.

3) Who should serve as subjects for this experiment?

4) How does feedback improve the quality of performance reports?

In this section the author will discuss the research conducted to answer investigative questions 1, 2, and 3. Investigative question 4 was partially answered in Chapter II, but the specific effect of the feedback used in this experiment is addressed in Chapter IV.

In addition to the above, this chapter provides an in-depth discussion of the instrument administered during the experiment and discusses the two phases of the experiment: the rater calibration phase and the response evaluation phase.

Selection of the Feedback

To answer investigative questions 1 and 2, research was conducted at the Aeronautical Systems Division (ASD) at

Wright-Patterson AFB to determine what information the Government requires from contractors on major contracts and in what format this same information is transmitted to upper levels of the Government. ASD was chosen for this research because of its large volume of contracts requiring C/SCSC and its proximity and accessibility to the researcher.

Information originating at the contractor's facility and reported to the Government via the CPR is transcribed into many different formats and included in a number of reports. These reports are sent to offices representing various levels of the Government acquisition process. Appendix E is a matrix which outlines the reporting requirements for ASD.

The Selected Acquisition Report (SAR) and Unit Cost Report (UCR) are primarily used to provide information to Congress on the status of funding requirements and overall performance of major defense contracts. Department of Defense Directive 7000.3 is the guidance for preparing these reports.

The Defense Acquisition Executive Summary (DAES) provides similar contract information as the two reports above, but the information is presented in "formats," or sections, with each format addressing a particular aspect of the contract. The ultimate destination of the DAES is the Office of the Under Secretary of Defense for Acquisition. Department of Defense Directive 5000.5 provides guidance for

preparing the DAES. A scaled-down version of the DAES is the Acquisition Information Monthly Report (AIMR), which is required by policy letter. It requests only certain parts of the DAES, but on a monthly basis rather than quarterly as is the case with the DAES.

The Acquisition Program Baseline (APB) and Program Director's Acquisition Report (PDAR) provide much of the same information, but they only go as far as the Air Force Systems Command level.

Although CPR information is an integral part of each of the reports addressed in Appendix E, in assessing the usefulness of these reports to this thesis, it was evident that one of the DAES formats, specifically format 11, would serve as the best source of feedback to provide to contractors. The information contained on format 11 was found in several of the reports and was of major importance in the PDAR which appeared to be the most widely circulated report. This format requires a narrative explaining any conditions which are less than satisfactory. The narrative must address the following: 1) Problem, 2) Impact, 3) Action Taken, and 4) Get Well Date.

Since the Government is required to submit the contract information using the DAES formats, requiring the contractors to submit the same type of information would make the government analyst's job much easier. This requirement does not add any extra work for the contractor since the intent

of variance analysis is to receive this very same information (5:18).

An example of DAES Format 11 was included in the feedback version of the experimental instruments administered to the subjects. The format will be discussed in the section which explains the experimental instruments.

Selection of the Subjects

In an informal poll of graduate students who were conducting experiments or surveys for their theses efforts at the Air Force Institute of Technology (AFIT), School of Systems and Logistics, it was found that a majority of them used graduate or Professional Continuing Education (PCE) students as subjects. Discussions with the academic advisor for this effort, LTC Anthony Presutti, confirmed that using students as surrogates for the general contracting community would be valid.

Permission was requested in early March of 1989, to use AFIT students in the PCE course SYS 362 (99C) - Cost/Schedule Control Systems Criteria - as subjects for this experiment. Approximately 40-50 students attend this course which meets four times during the year. Generally, it is comprised exclusively of Government personnel. Occasionally, a few contractors attend the course.

Members of this class are typically familiar with variance analysis, but are not experts in the field. The experiment was designed to use subjects who had a some

familiarity with the subject area. It was felt that scheduling the experiment in the latter part of the class would ensure that all students became familiar with the subject matter. Class 89C met from 01 May 89 to 19 May 89. The instrument was administered on 17 May 1989 to a total of 40 PCE students, 3 of whom were contractor personnel.

During subsequent discussions with people knowledgeable in this area, it was determined that generalizability of the experimental results to the contracting community would be much easier to substantiate if contractors could be used as subjects. After several telephone discussions with potential sources for contractor involvement in this thesis, Mr. Joe Houser, Chairman of the Management Systems Subcommittee of the National Security Industrial Association (NSIA), was contacted. He offered a way to include interested contractor personnel in this thesis by allowing the experiment to be administered during one of the periodic NSIA national conferences.

The original plan was to try to conduct the experiment using contractor personnel sometime after the scheduled PCE experiment. However, Mr. Houser presented a better alternative by suggesting that the best forum for administering the experiment to contractor personnel would be the NSIA national conference scheduled for 14-15 March 1989 in Long Beach, CA. The agenda at this conference was specifically designed

to cover topics involving C/SCSC. The instrument was administered on 15 March 1989 to 55 contractor personnel.

Experimental Design: The Instrument

A controlled experiment, in which a randomly-assigned experimental group received a feedback version of the instrument and a randomly-assigned control group was given a non-feedback version of the same instrument, was administered on two separate occasions to two distinct groups. This segment of the thesis provides an in-depth discussion of the instruments given at the two locations.

Additionally, this segment addresses the process used in evaluating the responses received during the two experiments. The rating process was conducted in two phases. Phase one involved the rater calibration process. Phase two dealt with the actual rating of the responses received during the experiments.

Experiment at NSIA Conference. On 15 March 1989, the instrument included as Appendix A was administered to 55 contractor personnel at the NSIA conference held in Long Beach, California on 14-15 March 1989. The experiment began with a five minute pre-brief introducing the experimenter and the instrument. The two versions of the instrument were randomly assigned to those present. Based on conversations with the thesis advisor, 20 minutes was considered an appropriate amount of time to complete the instrument and was

allotted to the subjects for that purpose. There was a five minute post-brief immediately following the experiment.

Page 1 of Appendix A highlights the information concerning the specifics of the experimental setting. The first item of interest on that page is that only 46 of the 55 instruments were returned. There is no explanation concerning the nine missing instruments. Of the 46 instruments returned, only 42 were considered usable. Of the total usable responses, 21 were responses on non-feedback versions and 21 were responses on feedback versions. The four unusable responses were either incoherent or simply did not exist. Only one subject commented that there was not enough time to complete the instrument.

Pages 2 through 9 of Appendix A are the non-feedback version of the instrument. Page 2 introduces an imaginary contractor scenario which calls for the prompt action of the subject. The subject is provided some information consisting of the company's CPR Format 1 and internal variance analyses for work breakdown structure level two items which are currently breaching contract thresholds. The task involves the writing of a level one variance analysis on Page 7.

Page 3 is the CPR Format 1. Pages 4 through 6 are the internal variance analyses for the elements breaching the thresholds. Page 7 is the blank page on which the subjects were to write their level one variance analysis. Finally,

page 8 is a demographic survey included to gain information concerning the experience of each subject with C/SCSC and with information relative to the Program Director's Assessment Report (this issue will be discussed further in the next section.)

Pages 10 through 18 of Appendix A are the feedback version of the instrument. All of the pages in this version are identical to the non-feedback version except for the wording in the introduction page of the instrument. Additionally, the feedback version includes an extra page not found in the non-feedback version.

The differences on the introduction page are only to discuss the feedback loop that has been started and to explain why the extra page is present in the instrument. The extra page, found on page 7 of the feedback version, is the feedback for this experiment. This page is simply a section of the previous month's PDAR (DAES Format 11) outlining the cost performance on the imaginary contract. As in the PDAR, the variance is explained using the categorization which was explained previously. Additionally, the "program analyst" has added his own comments to the report to provide feedback to the contractor. The effect of this additional information was the basic thesis question. The exact nature of the rating process is addressed in the section on the rating process.

Experiment at AFIT C/SCSC Course. On 17 May 1989, the instrument included as Appendix B was administered to 40 students (three of these students were contractor personnel) during the SYS 362 (89C) class of the Cost/Schedule Control Systems Criteria course held at the Air Force Institute of Technology School of Systems and Logistics from 1 May 1989 to 19 May 1989. As in the NSIA experiment, this experiment began with a five minute pre-brief introducing the experimenter and the instrument. The two versions of the instrument were randomly assigned to those present. These subjects were also given 20 minutes to complete the instrument and then post-briefed for 5 minutes immediately following the experiment.

Page 1 of Appendix B highlights the information concerning the specifics of the experimental setting. Of the 40 instruments administered, all 40 were returned. There were a total of 32 usable responses. Of these, 16 were from the control group and 16 were from the feedback group. There was a larger proportion of unusable responses in this group in that 8 responses had to be disregarded.

The biggest problem was that four subjects were unable to put themselves in the shoes of the contractor and instead approached the variance analysis from the Government perspective. There were two incoherent responses and two subjects commented that there was not enough time to complete the instrument.

The rest of the instrument is identical to that given at the NSIA conference except that all the dates were moved forward two months to give the instrument the appearance of being current.

Experimental Design: The Rating Process

The quality of the CPR was rated by three experts in the field of C/SCSC. The experts for this experiment were: LTC Tom Bowman, ASD/ACCM; Maj Ron Cohen, SD/ACCI; and Mr. Charlie Gardella (with assistance from Mr. Art Marangus), ESD/ACCI. All three of these individuals run the Performance Measurement Divisions at the major procurement centers of the Air Force Systems Command.

Due to the number of responses requiring a rating, it was necessary to solicit the help of more than one rater in order to spread the responses into manageable amounts. As it turned out, the spreading of the evaluation duties to these three individuals resulted in the receipt of ratings from a cross-section of the air force product divisions.

In this section, the two phases of the rating process are discussed. The first phase of the rating process was the rater calibration phase and the second phase was the response evaluation phase.

The Rater Calibration Phase. During the preliminary discussions concerning the method of rating the responses, it was determined that some form of rater calibration must occur to ensure that the raters rated on an equal basis.

Appendix C is the rater calibration package which was sent to all three expert raters. Page 1 of this appendix is simply the cover letter sent along with the instructions and sample variances. Page 2 of the appendix is the set of instructions concerning the rater calibration phase. In short, each rater was to rank order the three sample variance analyses by giving a rating of "1" to the best and so on.

All three raters rank-ordered the sample variances in the same order. This agreement was enough to conclude that the three expert raters had been calibrated. Page 3 of Appendix C shows the scores given by each rater to the sample variances analyses.

The Response Evaluation Phase. Once the three expert raters had been successfully calibrated and all the data from the two experiments had been tabulated into a format amenable to rating, the next step was to have the experts assign ratings to the responses.

Each rater was randomly assigned one-third of the usable results. Appendix D is the response evaluation package. Page 1 of this appendix is the cover letter sent to the raters. Pages 2 and 3 provide guidance concerning the experiment and the rating process. Beginning with page 4 and ending with page 37, the responses are listed under a Likert scale heading and the response ratings are included.

IV. ANALYSIS

This chapter discusses the analysis of the data obtained from the experiments conducted during this thesis. The result of the hypothesis test used to evaluate the data is explained and all the significant variables included in the experiments are examined in order to address the validity of the experimental instruments and response evaluation procedure.

Hypothesis Test

A hypothesis test was done to determine if there was any statistically significant difference in the mean of the feedback variance analyses received and the mean of the non-feedback variance analyses received. The confidence level for determining statistical significance in this thesis was set at 90%. There were 37 samples in each category.

Appendix G provides the specific information concerning the hypothesis test of the data and gives the result of the test. As stated in this appendix, giving subjects feedback, via the Defense Acquisition Executive Summary (DAES) format 11, did not produce a statistically significant difference in the quality of the variance analyses as rated by the expert raters.

As addressed in Chapter II of this thesis, the use of feedback has had a positive effect in various settings.

Providing feedback to contractors helps to improve the communication between the government and the contracting community, thereby enhancing the government to contractor relationship. The lack of a statistical difference in the quality of the responses obtained during this experiment does not diminish the benefits that would be gained by providing feedback to contractors.

In order to adequately analyze the hypothesis test result, it is necessary to examine the significant variables included in the experimental and response evaluation segments of this thesis. The three most significant variables - the raters (and response rating process), the subjects, and the feedback itself - will be investigated. The purpose of these investigations is to determine if the variables were handled appropriately during the experimental and response evaluation segments of the thesis and to offer some possible explanations for the lack of a statistically significant difference in the quality of the subject variance analyses received.

Raters and Rating Process

For the purpose of this thesis, the expert raters had complete anonymity concerning the ratings they provided for the responses. Appendix F tabulates the scores for each response and categorizes the raters only as rater A, rater B, and rater C.

In order to diminish rater error, the raters were calibrated during the first part of the response evaluation phase. As addressed in Chapter III, this process was done to demonstrate that the raters were consistent in their rating of variance analyses and to allow the author to divide the responses into manageable portions.

Additionally, as tabulated in Appendix F, the raters were randomly assigned both feedback and non-feedback responses from all the responses obtained. This randomization helped to further suppresses rater error.

A series of t-tests were conducted to address the issue of statistically significant differences *between* the raters. In addition, t-tests were conducted to investigate whether there was a statistically significant difference in the feedback to non-feedback scores *within* each rater.

Differences Between Raters. Six separate t-tests addressing the differences between raters were conducted. Feedback ratings for each rater were individually compared to the feedback ratings of the other raters. Similarly, non-feedback ratings for each rater were individually compared to the non-feedback ratings of the other raters. In all six cases, no statistically significant difference was found between raters.

The lack of a statistically significant difference between raters supports the notion that the raters, as a whole, rated the feedback responses equally as compared to

the feedback ratings of the other raters. The same logic holds true for the rating of the non-feedback responses between raters. Until one compares the feedback to non-feedback responses, the only assertion that can be made thus far is that the raters are consistent in their rating of feedback and non-feedback responses.

Differences Within Raters. Three t-tests were conducted to investigate the individual differences in the feedback to non-feedback ratings within each rater. In all three cases, no statistically significant differences were found.

Combining the lack of statistically significant differences within each rater with the lack of a statistically significant difference overall, results in one of two conclusions. The first is that there is no difference in the quality of variance analysis when one provides feedback, as given in these experiments, to individuals who prepare the CPR. (This conclusion will be addressed in the next chapter.) The other conclusion is that some confounding variable exists which may be affecting the results.

Possible Confounding Variables in the Rating Process. Durso and Mellgren discuss a number of confounding variables which can affect experimental results (8:84-86). Two of these variables, "history" and "instrumentation," are relevant in analyzing the rating process of this thesis, specifically as it pertains to the raters themselves.

As noted in Appendix C, the calibration packages were sent to the three expert raters on 12 May 89. Raters A and C returned the package within a week, while rater B took about three weeks to return the package. A similar time lag was experienced by rater B in returning the response evaluation package (Appendix D) mailed on 12 June 89. While raters A and C took less than two weeks to return the responses, rater B needed over two months to complete the evaluations.

Durso and Mellgram define "history" as, "specific events external to the subject that distinguish one condition from another besides the independent variable" (8:85). In the rating process, the "subject" mentioned in the definition would be each rater himself. It is possible that the rater's evaluations may have been affected differently by their surroundings.

The confounding variable, "instrumentation," is defined as "changes in the instrument used to measure the dependent variable" (8:85). It is possible that this confounding variable may also have affected the response evaluation since different raters rated the responses. Randomization and rater calibration were specifically intended to control for this confounding variable, but the possibility exists that instrumentation still affected the response evaluation phase of this thesis.

Experimental Subjects

The validity of using the Professional Continuing Education (PCE) students as subjects for the experiments was discussed in Chapter III. The generalizability of the experimental results was enhanced by also using contractor personnel as subjects. For the purpose of this thesis, the two groups were considered together and no comparison was made between them.

Although a few of the responses received from both groups were unusable, their existence did not affect the experiment. A satisfactory amount of responses were obtained to conduct the "large sample" hypothesis test outlined in Appendix G.

The type of instrument (feedback or non-feedback) was randomly assigned to each subject. The only differences in the two instruments were outline in Chapter III and dealt with changing the scenario dates to make the instruments appear up-to-date.

The same experimental procedure was used in each experiment. Subjects were briefed by the experimenter using the same briefing in both experiments. The only difference between the two cases was the title page which noted the location of the experiment

In the absence of any other unknown variables, no confounding errors concerning the subjects were noted during the conduct of either experiment.

Experimental Feedback

As noted in Appendix G and previously mentioned in the section on the rating process, there was no statistically significant difference in the overall feedback to non-feedback ratings, nor was there a statistically significant difference in the individual rater feedback to non-feedback ratings. This section analyzes the feedback as given in the experiments to determine if any confounding variables in this area may have affected the response evaluations.

Content of Feedback. Chapter III addresses the preliminary research conducted in order to assess the feedback potential of various types of government reports. The rationale given for selecting Format 11 of the Defense Acquisition Executive Summary (DAES) as the feedback to use in the experiments was that this format seemed to be the most widely distributed of the reports examined.

The sub-categories included in this format outline the type of information which the government requires in order to report to higher levels of the acquisition community. The assumption that the most widely distributed report format would provide the best source of feedback to subjects may not have been totally correct. Many other reports provide the same type of information to different levels of the government acquisition environment. Perhaps another report would provide a better source of feedback. Additional research in this area is appropriate.

Feedback and Time Allotted. It is also possible that a more simple source of feedback would work better in the experimental setting. Although subjects, with very few exceptions, had enough time to complete the experiments, the feedback group was given the same amount of time to complete the experiment as was given to the non-feedback group.

It is possible that including an entire page of information affected the quality of the responses given by the feedback groups. Since the feedback groups had to assimilate the feedback information, they had less time to provide a response. Perhaps providing a form of feedback which requires less time to digest might help to reduce this possible confounding variable.

Presentation of Feedback. In order to maintain the integrity of the experimental setting, the feedback subjects were not given any additional information concerning the feedback other than what was given in the instruments. It is possible that simply placing the feedback in the instruments was not enough. Had the subjects received a briefing on the feedback itself, or had they been allowed to discuss the feedback, the results might have been different.

In an actual government/contractor setting, the communication and feedback loop is more highly developed. Government analysts and contractor personnel have frequent discussions concerning the quality of the data included in the CPRs. Additionally, contractors have ample time to

consider the feedback provided by government analysts and determine how to incorporate this information into the variance analyses they include in their CPR submissions.

The additional considerations noted above may not have been adequately addressed by simply including a page of comments as feedback within an experimental instrument and giving subjects 20 minutes to incorporate this information into their responses.

V. CONCLUSIONS AND RECOMMENDATIONS

This thesis is the first attempt at improving the utility of the Cost Performance Report by addressing issues at the "grass roots" level. Given the discussion of possible confounding variables in the previous chapter, it is not possible to reach a definite conclusion concerning the effect of feedback on Cost Performance Report (CPR) utility as studied in this thesis.

This chapter discusses the results of the analysis included in the previous chapter. Depending on the reader's interpretation of the possible confounding variables discussed in Chapter IV, two conclusions are possible. These conclusions are addressed in this chapter. Recommendations concerning follow-up research in this area are given for each of the conclusions.

Conclusion A: Experiment Inconclusive

Chapter IV addressed the areas in which possible confounding variables may exist. The three main areas of discussion are: the rating process; the subjects; and the feedback. If the reader believes in the existence of one of the confounding variables mentioned, or perhaps in one not mentioned, then the conclusion of this thesis is that the experiment is inconclusive.

The author's recommendation is to run the experiment again and control for the confounding variables which are believed to exist. Suggested further control depends on the area of the experiment where the confounding variables are believed to exist.

Rating Process Control. The raters in this thesis were not given a definite time in which to complete either of the two phases of response evaluation. The expert raters took as much time as they felt necessary to complete and return both the calibration and response evaluation packages.

To control for potential errors in "history" as defined in the previous chapter, the author recommends that raters be placed under the same type of controlled setting as the subjects were. Perhaps it would be possible to gather the expert raters in one room and allow them only a certain amount of time to complete the calibration and response evaluation packages.

To completely control for potential errors in "instrumentation" as defined in the previous chapter, the author recommends that one expert rater be given the task of rating all of the evaluations. Although randomization and calibration were intended to control for this confounding variable, having one expert rater rate the responses eliminates any possibility that this confounding variable will affect the results.

Subject Control. No potential confounding variables were found in this area. Therefore, No recommendations are given for dealing with confounding variables in this area. Ideally, only contractors would be used as subjects.

Feedback Control. Three potential confounding variables in this area were discussed. One dealt with the content of the feedback, the second covered the time allotted to digest the information in the feedback, and the third concerned the presentation of the feedback.

This thesis lends itself for a follow-on thesis in which the feedback provided to subjects is enhanced to adequately cover the issues discussed above. Intuitively, providing feedback to contractors is beneficial. Perhaps a different method of providing this feedback to the subjects would result in a statistically significant improvement in the quality of CPR analysis as measured in an experimental setting. More research in the area of feedback control is necessary.

Possible changes to the feedback given during this thesis include, but are not limited to: 1) Changing the form in which the feedback is given; 2) Increasing the amount of time allotted to feedback subjects for completion of the instrument; and 3) Providing a feedback briefing in conjunction with the feedback given in the instruments.

Enhancing the prominence of the feedback by using more direct vocabulary might result in a statistically

significant difference in the quality of the responses. For example, the wording in the instrument might read, "this information is of vital importance," instead of, "this information is recommended."

Conclusion B: Feedback Has No Effect on CPR Utility

Until now, all discussions in the two last chapters have centered on possible confounding variables in the experiments which may have affected the hypothesis test and led to an incorrect conclusion. This approach is partially based on a methodical analysis of the assumptions used in this thesis. Admittedly, the intuitive belief that feedback *should* have a positive effect on CPR utility also fueled the author's critical approach towards the experimental procedure used in this thesis.

However, if one accepts the assumptions of this thesis, the conclusion that feedback (as given in this experiment) has no effect on CPR utility is completely logical. Perhaps the additional information provided by the feedback is not necessary. It may be that individuals who prepare the CPR are familiar with the needs of the Government.

Government guidance documents are very specific in outlining how contractors should prepare government reports. Although the literature suggests that contractors could improve the quality of the CPR variance analyses, perhaps the way to do so does not involve the use of feedback.

Appendix A: NSIA Survey (Page 1 of 18)

National Security Industrial Association Survey
Long Beach, California
March 15, 1989

Subjects: Contractors at all levels of the organization with very few exceptions, all of the subjects had an extensive knowledge of C/SCSC. Most had at least a moderate level of working with the Cost Performance Report and a moderate level of writing variance analysis reports.

Statistics: 55 Administered
46 Returned
42 Usable
21 Control Group
21 Experimental Group

Errors: I became aware of two errors in the instrument. One involved the inadvertent switching of two variance explanations. The group was briefed on this error. Additionally, one of the subjects came to me after the experiment noting a math error in one of the columns. This column was not a key area of the experiment. (Though neither error was consequential, this paragraph was added to note that the errors were noticed.)

MARCH 15, 1989

NATIONAL SECURITY INDUSTRIAL ASSOCIATION SURVEY

TO BE USED IN

"THE EFFECT OF FEEDBACK ON COST PERFORMANCE REPORT QUALITY"
MASTERS THESIS - AFIT/GCA/LSY/89S-2
AIR FORCE INSTITUTE OF TECHNOLOGY

CAPTAIN JUAN H. AMARAL

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Table of Contents

INTRODUCTION

Scenario: Ms. Lee, the JHA SYSTEMS Program Control Manager on the DAGGER F-26 program, is away on an emergency. Although you are very busy as a Program Control Manager on another program, the F-26 Program Manager, Mr. Jones, has requested your help since it appears Ms. Lee will be unavailable for a few weeks. Today is the thirteenth working day after the February accounting close. The CPR is due to the customer on the 17th working day following the accounting close. In order to meet your deadline, you must finish the CPR today. The data is in, but the variance analysis is yet to be completed.

Information Available: Mr. Phillips, the F-26 Assistant Program Control Manager, has brought you the JHA Systems Management Reports which help explain the cost situation. These reports are required by Mr. Jones for all work breakdown structure elements which have a cost variance in excess of 10% for current month or in excess of 5% and $250,000 at cumulative.

Task: Your immediate task is to use the information in the CPR and JHA Management Reports to write up a variance analysis report (included as page 7 of this package) for the total contract cost variance only. Mr. Phillips is handling all the schedule variance analyses as well as the level 2 and lower (if required) cost variance analyses. The variance analysis report you write should meet with approval from Mr. Jones and the government. You have a meeting with Mr. Jones in 15 minutes to discuss the overall status of the F-26 contract cost variance. Good luck!

Note: Format 5 variance analysis guidance states the following for total contract reporting:

"Provide a summary analysis, identifying significant problems affecting performance. Indicate corrective actions required, including Government action where applicable."

CONTRACTOR: JHA SYSTEMS
LOCATION: DAYTON OHIO
NOISE ☒ PRODUCTION ☐

COST PERFORMANCE REPORT – WORK BREAKDOWN STRUCTURE

CONTRACT TYPE/NO.: FPIF/F33657-89-C-0000
PROGRAM NAME/NUMBER: DAGGER F-26
REPORT PERIOD: 01/30/89 TO 02/24/89

SIGNATURE, TITLE & DATE: R. JONES, PROGRAM MANAGER

FORM APPROVED OMB NUMBER 22R0280

QUANTITY	NEGOTIATED COST	EST COST AUTH. UNPRICED WORK	TGT PROFIT/FEE %	TGT PRICE	EST PRICE	SHARE RATIO	CONTRACT CEILING	EST CEILING
1	363312	0	10%	399643	401240	80/20	439607	441364

ITEM	CURRENT PERIOD					CUMULATIVE TO DATE					AT COMPLETION		
	BUDGETED COST		ACTUAL COST WORK PERFORMED	VARIANCE		BUDGETED COST		ACTUAL COST WORK PERFORMED	VARIANCE		BUDGETED	LATEST REVISED ESTIMATED	VARIANCE
	Work Scheduled	Work Performed		Schedule	Cost	Work Scheduled	Work Performed		Schedule	Cost			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
WORK BREAKDOWN STRUCTURE													
2 AIR VEHICLE													
3 AIRFRAME	4176	3773	4372	(403)	(599)	83261	87484	95900	(4223)	(8416)	139169	153893	(14424)
3 PROPULSION	1268	1102	1218	(166)	(116)	29615	31679	33481	(2064)	(1802)	49233	52216	(2983)
3 COMMUNICATIONS	326	338	322	12	16	6613	6790	6574	(177)	216	11262	10628	634
3 NAVIGATION & GUIDANCE	606	616	589	10	27	11638	11818	11416	(180)	402	19628	18634	994
3 AUTOMATIC FLIGHT CONTROL	423	451	440	28	11	9216	9386	9496	(170)	(110)	16624	16816	(192)
2 TRAINING	71	76	71	5	5	1365	1443	1540	(78)	(67)	2216	2308	(92)
2 PECULIAR SUPPORT EQUIPMENT	158	168	152	10	16	3442	3326	3156	116	170	5714	5398	316
2 SYSTEM TEST & EVALUATION	773	628	782	(145)	(154)	15986	18606	20417	(2620)	(1811)	27223	29893	(2670)
2 SYSTEM/PROJECT MANAGEMENT	767	738	761	(29)	(23)	15666	15827	16097	(161)	(270)	25487	25898	(411)
2 DATA	77	79	72	2	7	1300	1306	1308	(6)	(2)	2172	2179	(7)
2 OPERATIONAL/SITE ACTIVATION	56	61	58	5	3	1103	1155	1231	(52)	(76)	1814	1928	(114)
2 COMMON SUPPORT EQUIPMENT	96	99	92	3	7	1882	1792	1693	90	99	3122	2963	159
2 INDUSTRIAL FACILITIES	61	61	60	0	1	1028	986	960	42	26	1729	1658	41
2 INITIAL SPARES	0	0	0	0	0	0	0	0	0	0	0	0	0
COST OF MONEY	161	162	162	1	0	3111	3128	3144	(17)	(16)	5162	5182	(20)
G&A AND A&D	1202	1220	1209	18	11	22891	22957	23029	(66)	(72)	38151	38262	(111)
UNDISTRIBUTED BUDGET											2686	2686	
SUBTOTAL	10221	9572	10360	(649)	(788)	208120	217683	229442	(9563)	(11759)	351692	370572	(18880)
MANAGEMENT RESERVE											11620	0	11620
TOTAL	10221	9572	10360	(649)	(788)	208120	217683	229442	(9563)	(11759)	363312	370572	(7260)
RECONCILIATION TO CONTRACT BUDGET BASELINE													
VARIANCE ADJUSTMENT													
TOTAL CONTRACT VARIANCE													

(ALL ENTRIES IN THOUSANDS OF DOLLARS)

JHA SYSTEMS
MANAGEMENT REPORT

AS OF: 2/24/89

☒ COST	☐ CURRENT PERIOD >+10%
☐ SCHEDULE	☒ CURRENT PERIOD >-10%
☐ TECHNICAL	☐ CUMULATIVE >+5% & $250K
☐ CONTRACTS	☒ CUMULATIVE >-5% & $250K

WBS ELEMENT: AIRFRAME | MANAGER: R. MARSHALL

	CURRENT/(%)	CUM/(%)	BAC: $139469K
COST VAR	($599K)/(15.9%)	($8416K)/(9.6%)	EAC: $153893K
SCHED VAR	($403K)/(10.7%)	($4223K)/(4.8%)	

NARRATIVE:

We are still having difficulty with the chemical structure of the composite material. The problem surfaces are the vertical stabilizer and the trailing portions of the wings. The problem is that the exhaust from the engines is reacting with the chemical composition of the lifting surfaces, forming a thin coating on the surfaces. This residue is affecting the flight characteristics of the lifting surfaces. I have discussed the problem with Mr. Andersen and he is looking into possibly altering the exhaust heat. We have been analyzing the residue to see how we can alter the chemical structure of the composite material and are close to uncovering the problem. I expect resolution of this problem by June with minimal impact to the program.

JHA SYSTEMS MANAGEMENT REPORT

AS OF: 2/24/89

☒ COST	☐ CURRENT PERIOD >+10%
☐ SCHEDULE	☒ CURRENT PERIOD >-10%
☐ TECHNICAL	☐ CUMULATIVE >+5% & $250K
☐ CONTRACTS	☒ CUMULATIVE >-5% & $250K

WBS ELEMENT: PROPULSION | MANAGER: C. ANDERSEN

	CURRENT/(%)	CUM/(%)	BAC: $49233K
COST VAR	($116K)/(10.5%)	($1802K)/(5.7%)	EAC: $52216K
SCHED VAR	($166K)/(15.1%)	($2061K)/(6.5%)	

NARRATIVE:

We continue to have a problem with the chemical reaction between the exhaust and the composite material. I have tried altering the exhaust gas temperature (EGT), but it has not affected the accumulation of sediment on the vertical stabilizer and trailing portions of the wings. The changes in the EGT have caused my WBS element to incur the variances noted above. I will continue with my plans and remain optimistic that the designed EGT is appropriate. However, I may have to modify other areas of the propulsion, hence my revised EAC is as previously submitted to you and noted above. The problem will be resolved when the AIRFRAME WBS Manager solves the chemical structure problem of the composite material. My discussion with Mr. Marshall signifies that the problem should be resolved by June.

JHA SYSTEMS
MANAGEMENT REPORT

AS OF: 2/24/89

[X] COST	[ ] CURRENT PERIOD >+10%
[ ] SCHEDULE	[X] CURRENT PERIOD >-10%
[ ] TECHNICAL	[ ] CUMULATIVE >+5% & $250K
[ ] CONTRACTS	[X] CUMULATIVE >-5% & $250K

WBS ELEMENT: SYS TEST & EVAL MANAGER: D. KYOTO

	CURRENT/(%)	CUM/(%)	BAC: $27223K
COST VAR	($154K)/(24.5%)	($1811K)/(9.7%)	EAC: $29893K
SCHED VAR	($145K)/(23.1%)	($2620K)/(14.1%)	

NARRATIVE:

The most recent test suggests that either the chemical composition of the lifting surfaces needs to change or the propulsion exhaust gas temperature (EGT) must change. Both WBS managers are aware of the recurring problem. It has set me back as noted above. The next systems test is in July. Both managers have assured me that the problem will be fixed by then and that the system will pass the test. No further impacts are expected, except for the unfavorable cost variance at completion as already recorded by the Cost Accounting System.

JHA SYSTEMS

AS OF: 2/24/88

VARIANCE ANALYSIS REPORT

☒ COST	☐ CURRENT PERIOD >+10%
☐ SCHEDULE	☐ CURRENT PERIOD >-10%
☐ TECHNICAL	☐ CUMULATIVE >+5% & $250K
☐ CONTRACTS	☒ CUMULATIVE >-5% & $250K

WBS ELEMENT: TOTAL CONTRACT | MANAGER: R. JONES

	CURRENT/(%)	CUM/(%)	BAC: $351692K
COST VAR	($788K)/(8.2%)	($11758K)/(5.4%)	EAC: $370572K
SCHED VAR	($649K)/(6.8%)	($9563K)/(4.4%)	

NARRATIVE:

SURVEY QUESTIONNAIRE

Please circle the most appropriate responses.

1. What is your level of education?

   A. High School Graduate.
   B. Some College.
   C. 4 Year College Graduate.
   D. Masters.
   E. Post-Masters.

2. What is your level of familiarity with Department of Defense Contracts?

   A. Never worked on one.
   B. Some experience working with DoD.
   C. Moderate knowledge of DoD practices.
   D. Extensive familiarity with DoD practices.

3. What is your level of experience with Cost/Schedule Control Systems Criteria?

   A. None.
   B. Some knowledge of C/SCSC.
   C. Moderate knowledge.
   D. Extensive familiarity with C/SCSC.

4. What is your level of experience with the Cost Performance Report?

   A. None.
   B. Some knowledge of the CPR.
   C. Moderate knowledge of the CPR.
   D. Extensive knowledge of the CPR.

5. What experience do you have writing Variance Analyses?

   A. None.
   B. Some experience.
   C. Moderate experience.
   D. Extensive experience.

6. What is your level of familiarity with the Program Director's Assessment Report?

   A. I don't know what it is.
   B. Some familiarity with the PDAR.
   C. I have moderate familiarity with the PDAR.
   D. I have extensive familiarity with the PDAR.

Appendix A: NSIA Survey (Page 10 of 18)

MARCH 15, 1989

NATIONAL SECURITY INDUSTRIAL ASSOCIATION SURVEY

TO BE USED IN

"THE EFFECT OF FEEDBACK ON COST PERFORMANCE REPORT QUALITY"
MASTERS THESIS - AFIT/GCA/LSY/89S-2
AIR FORCE INSTITUTE OF TECHNOLOGY

CAPTAIN JUAN H. AMARAL

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Table of Contents

INTRODUCTION

Scenario: Ms. Lee, the JHA SYSTEMS Program Control Manager on the DAGGER F-26 program, is away on an emergency. Although you are very busy as a Program Control Manager on another program, the F-26 Program Manager, Mr. Jones, has requested your help since it appears Ms. Lee will be unavailable for a few weeks. Today is the thirteenth working day after the February accounting close. The CPR is due to the customer on the 17th working day following the accounting close. In order to meet your deadline, you must finish the CPR today. The data is in, but the variance analysis is yet to be completed.

Information Available: Mr. Phillips, the F-26 Assistant Program Control Manager, has brought you the JHA Systems Management Reports which help explain the cost situation. These reports are required by Mr. Jones for all work breakdown structure elements which have a cost variance in excess of 10% for current month or in excess of 5% and $250,000 at cumulative. Additionally, Mr. Phillips has brought you a copy of the customer's report, based on last month's data, which the customer sends to its headquarters. Ms. Lee requested a copy of the customer report to understand what the government does with the data it receives in the CPR. The feedback Ms. Lee has received from the government centers on the lack of a complete explanation of the problem areas. Capt Hoyt, the customer F-26 program control analyst, thought that sending Ms. Lee a copy of the previous Program Director's Comments would show her just how much detail was actually missing in the variance analysis. He included handwritten comments on the copy he sent Ms. Lee to point out that the information the government requests "up the chain" was not making its way into the variance analysis reports, especially at total contract level.

Task: Your immediate task is to use the information in the CPR and JHA Management Reports to write up a variance analysis report (included as page 7 of this package) for the total contract cost variance only. Mr. Phillips is handling all the schedule variance analyses as well as the level 2 and lower (if required) cost variance analyses. The variance analysis report you write should meet with approval from Mr. Jones and the government. You have a meeting with Mr. Jones in 15 minutes to discuss the overall status of the F-26 contract cost variance. Good luck!

Note: Format 5 variance analysis guidance states the following for total contract reporting: "Provide a summary analysis, identifying significant problems affecting performance. Indicate corrective actions required, including Government action where applicable."

CONTRACTOR: JHA SYSTEMS
LOCATION: DAYTON OHIO
R&D $ ☒ PRODUCTION ☐

COST PERFORMANCE REPORT – WORK BREAKDOWN STRUCTURE

CONTRACT TYPE/NO.: PPIP/P33657-89-C-0000
PROGRAM NAME/NUMBER: DAGGER F-26
REPORT PERIOD: 01/30/89 TO 02/24/89

SIGNATURE, TITLE & DATE: R. JONES, PROGRAM MANAGER

FORM APPROVED OMB NUMBER 22R0260

QUANTITY	NEGOTIATED COST	EST COST AUTH. UNPRICED WORK	TGT PROFIT/FEE %	TGT PRICE	EST PRICE	SHARE RATIO	CONTRACT CEILING	EST CEILING
1	363312	0	10%	399643	401240	80/20	439607	441364

ITEM	CURRENT PERIOD					CUMULATIVE TO DATE					AT COMPLETION		
	BUDGETED COST		ACTUAL COST WORK PERFORMED	VARIANCE		BUDGETED COST		ACTUAL COST WORK PERFORMED	VARIANCE		BUDGETED	LATEST REVISED ESTIMATED	VARIANCE
	Work Scheduled	Work Performed		Schedule	Cost	Work Scheduled	Work Performed		Schedule	Cost			
(1)	(2)	(3)	(4)	(6)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
WORK BREAKDOWN STRUCTURE													
2 AIR VEHICLE													
3 AIRFRAME	4176	3773	4372	(403)	(599)	83261	87484	95900	(4223)	(8416)	139169	153893	(14424)
3 PROPULSION	1268	1102	1218	(166)	(116)	29618	31679	33481	(2061)	(1802)	49233	52216	(2983)
3 COMMUNICATIONS	326	338	322	12	16	6613	6790	6574	(177)	216	11262	10628	634
3 NAVIGATION & GUIDANCE	606	616	589	10	27	11638	11818	11416	(180)	402	19628	18634	994
3 AUTOMATIC FLIGHT CONTROL	423	451	440	28	11	9216	9386	9496	(170)	(110)	16624	16816	(192)
2 TRAINING	71	76	71	5	5	1365	1443	1510	(78)	(67)	2216	2308	(92)
2 PECULIAR SUPPORT EQUIPMENT	158	168	152	10	16	3442	3326	3156	116	170	5714	5398	316
2 SYSTEM TEST & EVALUATION	773	628	782	(145)	(154)	15986	12506	20417	(2620)	(1811)	27223	29893	(2670)
2 SYSTEM/PROJECT MANAGEMENT	767	738	761	(29)	(23)	15666	15827	16097	(161)	(270)	25487	25898	(411)
2 DATA	77	79	72	2	7	1300	1306	1308	(6)	(2)	2172	2179	(7)
2 OPERATIONAL/SITE ACTIVATION	56	61	58	5	3	1103	1155	1231	(52)	(76)	1814	1928	(114)
2 COMMON SUPPORT EQUIPMENT	96	99	92	3	7	1882	1792	1693	90	99	3122	2963	159
2 INDUSTRIAL FACILITIES	61	61	60	0	1	1028	986	960	42	26	1729	1688	41
2 INITIAL SPARES	0	0	0	0	0	0	0	0	0	0	0	0	0
COST OF MONEY	161	162	162	1	0	3111	3128	3144	(17)	(16)	5162	5182	(20)
G&A AND AUC	1202	1220	1209	18	11	22891	22957	23029	(66)	(72)	38151	38262	(111)
UNDISTRIBUTED BUDGET											2686	2686	
SUBTOTAL	10221	9572	10360	(649)	(788)	208120	217683	229442	(9563)	(11759)	351692	370572	(18880)
MANAGEMENT RESERVE											11620	0	11620
TOTAL	10221	9572	10360	(649)	(788)	208120	217683	229442	(9563)	(11759)	363312	370572	(7260)
RECONCILIATION TO CONTRACT BUDGET BASELINE													
VARIANCE ADJUSTMENT													
TOTAL CONTRACT VARIANCE													

(ALL ENTRIES IN THOUSANDS OF DOLLARS)

JHA SYSTEMS
MANAGEMENT REPORT

AS OF: 2/24/89

☒ COST	☐ CURRENT PERIOD >+10%
☐ SCHEDULE	☒ CURRENT PERIOD >-10%
☐ TECHNICAL	☐ CUMULATIVE >+5% & $250K
☐ CONTRACTS	☒ CUMULATIVE >-5% & $250K

WBS ELEMENT: AIRFRAME | MANAGER: R. MARSHALL

	CURRENT/(%)	CUM/(%)	BAC: $139469K
COST VAR	($599K)/(15.9%)	($8416K)/(9.6%)	EAC: $153893K
SCHED VAR	($403K)/(10.7%)	($4223K)/(4.8%)	

NARRATIVE:

We are still having difficulty with the chemical structure of the composite material. The problem surfaces are the vertical stabilizer and the trailing portions of the wings. The problem is that the exhaust from the engines is reacting with the chemical composition of the lifting surfaces, forming a thin coating on the surfaces. This residue is affecting the flight characteristics of the lifting surfaces. I have discussed the problem with Mr. Andersen and he is looking into possibly altering the exhaust heat. We have been analyzing the residue to see how we can alter the chemical structure of the composite material and are close to uncovering the problem. I expect resolution of this problem by June with minimal impact to the program.

JHA SYSTEMS
MANAGEMENT REPORT

AS OF: 2/24/89

☒ COST	☐ CURRENT PERIOD >+10%
☐ SCHEDULE	☒ CURRENT PERIOD >-10%
☐ TECHNICAL	☐ CUMULATIVE >+5% & $250K
☐ CONTRACTS	☒ CUMULATIVE >-5% & $250K

WBS ELEMENT: PROPULSION | MANAGER: C. ANDERSEN

	CURRENT/(%)	CUM/(%)	BAC: $49233K
COST VAR	($116K)/(10.5%)	($1802K)/(5.7%)	EAC: $52216K
SCHED VAR	($166K)/(15.1%)	($2061K)/(6.5%)	

NARRATIVE:

We continue to have a problem with the chemical reaction between the exhaust and the composite material. I have tried altering the exhaust gas temperature (EGT), but it has not affected the accumulation of sediment on the vertical stabilizer and trailing portions of the wings. The changes in the EGT have caused my WBS element to incur the variances noted above. I will continue with my plans and remain optimistic that the designed EGT is appropriate. However, I may have to modify other areas of the propulsion, hence my revised EAC is as previously submitted to you and noted above. The problem will be resolved when the AIRFRAME WBS Manager solves the chemical structure problem of the composite material. My discussion with Mr. Marshall signifies that the problem should be resolved by June.

JHA SYSTEMS
MANAGEMENT REPORT

AS OF: 2/24/89

☒ COST	☐ CURRENT PERIOD >+10%
☐ SCHEDULE	☒ CURRENT PERIOD >-10%
☐ TECHNICAL	☐ CUMULATIVE >+5% & $250K
☐ CONTRACTS	☒ CUMULATIVE >-5% & $250K

WBS ELEMENT: SYS TEST & EVAL MANAGER: D. KYOTO

	CURRENT/(%)	CUM/(%)	BAC: $27223K
COST VAR	($154K)/(24.5%)	($1811K)/(9.7%)	EAC: $29893K
SCHED VAR	($145K)/(23.1%)	($2620K)/(14.1%)	

NARRATIVE:

The most recent test suggests that either the chemical composition of the lifting surfaces needs to change or the propulsion exhaust gas temperature (EGT) must change. Both WBS managers are aware of the recurring problem. It has set me back as noted above. The next systems test is in July. Both managers have assured me that the problem will be fixed by then and that the system will pass the test. No further impacts are expected, except for the unfavorable cost variance at completion as already recorded by the Cost Accounting System.

UNCLASSIFIED

DAGGER F-26 March, 1989
Format 11 - Program Director's Comments PREPARED: 02/27/89

Explanation of Y* in Cost Performance

** -PROBLEM:
JHA Systems is experiencing problems in the airframe. The specific problem is unknown, but it seems to be centered on the shaping of the composite materials. JHA also has problems with the Propulsion WBS element. The specific problem is unknown. Finally, JHA is falling behind in System Test and Evaluation.

** -IMPACT:
There is no indication that JHA will be able to recover the cost variance satisfactorily. JHA has not specifically identified the problem and does not really know the impact of the problem. JHA estimates a cost overrun of $7.3 million, but our estimate is a $15.6 million overrun.

** -ACTION TAKEN:
The AFPRO and DCAS personnel have been asked to look into the airframe problem to help determine the extent of the design shortcomings. The program director will meet the JHA program manager to discuss the cost situation.

** -GET WELL:
With AFPRO, DCAS, and JHA management attention, trend reversal expected Apr 89.

* Ms Lee: Y refers to a "YELLOW" cost condition which indicates a potential problem.

** Note the reporting structure. I am sure that you have this information available. However, it is not getting into the variance analysis in FORMAT 5 of the CPR.

Please remember that level 1 refers to the top level and all lower levels which drive the variance I Hope This Helps! Capt Hoyt

JHA SYSTEMS

AS OF: 2/24/89

VARIANCE ANALYSIS REPORT

☒ COST	☐ CURRENT PERIOD >+10%
☐ SCHEDULE	☐ CURRENT PERIOD >-10%
☐ TECHNICAL	☐ CUMULATIVE >+5% & $250K
☐ CONTRACTS	☒ CUMULATIVE >-5% & $250K

WBS ELEMENT: TOTAL CONTRACT | MANAGER: R. JONES

	CURRENT/(%)	CUM/(%)	BAC: $351692K
COST VAR	($788K)/(8.2%)	($11759K)/(5.4%)	EAC: $370572K
SCHED VAR	($649K)/(6.8%)	($9563K)/(4.4%)	

NARRATIVE:

SURVEY QUESTIONNAIRE

Please circle the most appropriate responses.

1. What is your level of education?

   A. High School Graduate
   B. Some College
   C. 4 Year College Graduate
   D. Masters
   E. Post-Masters

2. What is your level of familiarity with Department of Defense Contracts?

   A. Never worked on one.
   B. Some experience working with DoD.
   C. Moderate knowledge of DoD practices.
   D. Extensive familiarity with DoD practices.

3. What is your level of experience with Cost/Schedule Control Systems Criteria?

   A. None.
   B. Some knowledge of C/SCSC.
   C. Moderate knowledge.
   D. Extensive familiarity with C/SCSC.

4. What is your level of experience with the Cost Performance Report?

   A. None.
   B. Some knowledge of the CPR.
   C. Moderate knowledge of the CPR.
   D. Extensive knowledge of the CPR.

5. What experience do you have writing Variance Analyses?

   A. None.
   B. Some experience.
   C. Moderate experience.
   D. Extensive experience.

6. What is your level of familiarity with the Program Director's Assessment Report?

   A. I don't know what it is.
   B. Some familiarity with the PDAR.
   C. I have moderate familiarity with the PDAR.
   D. I have extensive familiarity with the PDAR.

Appendix B: C/SCSC Survey (Page 1 of 18)

Cost/Schedule Control Systems Criteria Survey
Wright-Patterson Air Force Base
May 16, 1989

Subjects: Students of the Cost/Schedule Control Systems Criteria (C/SCSC) course, SYS 362-89C, at the Air Force Institute of Technology. Thirty-seven of the students were government employees and three were contractor personnel. The contractor responses will be included as part of the National Security Industrial Association Survey results for purposes of the thesis analysis. There was a mix in the level of knowledge of C/SCSC among the students. Most had at least a moderate level of working with the Cost Performance Report and a moderate level of writing variance analysis reports.

Statistics: 40 Administered
40 Returned
32 Usable
16 Control Group (1 Contractor)
16 Experimental Group (2 Contractors)

Error: I became aware of one error in the instrument. It involved the restating of the Propulsion work breakdown structure element Budget At Completion (BAC) and Estimate At Completion (EAC) numbers on the Systems Test & Evaluation "JHA Systems Management Report." This error was briefed to the students prior to administering the experiment. (Though it was inconsequential, this paragraph was added to note that the error had been noticed.)

MAY 17, 1989

COST/SCHEDULE CONTROL SYSTEMS CRITERIA (SYS 362-89C) SURVEY

TO BE USED IN

"THE EFFECT OF FEEDBACK ON COST PERFORMANCE REPORT QUALITY"
MASTERS THESIS - AFIT/GCA/LSY/89S-2
AIR FORCE INSTITUTE OF TECHNOLOGY

CAPTAIN JUAN H. AMARAL

****

Table of Contents

INTRODUCTION

Scenario: Ms. Lee, the JHA SYSTEMS Program Control Manager on the DAGGER F-26 program, is away on an emergency. Although you are very busy as a Program Control Manager on another program, the F-26 Program Manager, Mr. Jones, has requested your help since it appears Ms. Lee will be unavailable for a few weeks. Today is the thirteenth working day after the April accounting close. The CPR is due to the customer on the 17th working day following the accounting close. In order to meet your deadline, you must finish the CPR today. The data is in, but the variance analysis is yet to be completed.

Information Available: Mr. Phillips, the F-26 Assistant Program Control Manager, has brought you the JHA Systems Management Reports which help explain the cost situation. These reports are required by Mr. Jones for all work breakdown structure elements which have a cost variance in excess of 10% for current month or in excess of 5% and $250,000 at cumulative.

Task: Your immediate task is to use the information in the CPR and JHA Management Reports to write up a variance analysis report (included as page 7 of this package) for the total contract cost variance only. Mr. Phillips is handling all the schedule variance analyses as well as the level 2 and lower (if required) cost variance analyses. The variance analysis report you write should meet with approval from Mr. Jones and the government. You have a meeting with Mr. Jones in 15 minutes to discuss the overall status of the F-26 contract cost variance. Good luck!

Note: Format 5 variance analysis guidance states the following for total contract reporting:

"Provide a summary analysis, identifying significant problems affecting performance. Indicate corrective actions required, including Government action where applicable."

CONTRACTOR: JHA SYSTEMS
LOCATION: DAYTON OHIO
NOISE ☑ PRODUCTION ☐

COST PERFORMANCE REPORT – WORK BREAKDOWN STRUCTURE

CONTRACT TYPE/NO.: FPIF/F33651-89-C-0000
PROGRAM NAME/NUMBER: DAGGER F-26
REPORT PERIOD: 03/30/89 TO 04/21/89

SIGNATURE, TITLE & DATE: R. JONES, PROGRAM MANAGER

FORM APPROVED OMB NUMBER 22150260

QUANTITY	NEGOTIATED COST	EST COST AUTH. UNPRICED WORK	TGT PROFIT/FEE %	TGT PRICE	EST PRICE	SHARE RATIO	CONTRACT CEILING	EST CEILING
1	363312	0	10%	399643	401240	80/20	439607	441364

ITEM	CURRENT PERIOD					CUMULATIVE TO DATE					AT COMPLETION		
	BUDGETED COST		ACTUAL COST WORK PERFORMED	VARIANCE		BUDGETED COST		ACTUAL COST WORK PERFORMED	VARIANCE		BUDGETED	LATEST REVISED ESTIMATED	VARIANCE
	Work Scheduled	Work Performed		Schedule	Cost	Work Scheduled	Work Performed		Schedule	Cost			
(1) WORK BREAKDOWN STRUCTURE	(2)	(3)	(4)	(6)	(8)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
2 AIR VEHICLE													
3 AIRFRAME	1176	1173	1372	(403)	(599)	81181	83261	85900	(4223)	(8416)	139469	153893	(14424)
3 PROPULSION	1268	1102	1218	(166)	(116)	31679	29618	33181	(2061)	(1802)	49233	52216	(2983)
3 COMMUNICATIONS	326	338	322	12	16	6790	6613	6574	(177)	216	11262	10628	634
3 NAVIGATION & GUIDANCE	606	616	589	10	27	11818	11638	11416	(180)	402	19628	18634	994
3 AUTOMATIC FLIGHT CONTROL	423	451	440	28	11	9386	9216	9496	(170)	(110)	16624	16816	(192)
2 TRAINING	71	76	71	5	5	1413	1365	1540	(78)	(67)	2216	2308	(92)
2 PECULIAR SUPPORT EQUIPMENT	158	168	152	10	16	3326	3442	3156	116	170	5714	5398	316
2 SYSTEM TEST & EVALUATION	773	628	782	(145)	(154)	18506	15986	20417	(2620)	(1811)	27223	29693	(2570)
2 SYSTEM/PROJECT MANAGEMENT	767	738	761	(29)	(23)	15827	15666	16097	(161)	(270)	25467	25898	(411)
2 DATA	77	79	72	2	7	1306	1300	1308	(6)	(2)	2172	2179	(7)
2 OPERATIONAL/SITE ACTIVATION	56	61	58	5	3	1155	1103	1231	(52)	(76)	1814	1928	(114)
2 COMMON SUPPORT EQUIPMENT	96	99	92	3	7	1792	1882	1693	90	99	3122	2963	159
2 INDUSTRIAL FACILITIES	61	61	60	0	1	986	1028	960	42	26	1729	1658	41
2 INITIAL SPARES	0	0	0	0	0	0	0	0	0	0	0	0	0
COST OF MONEY	161	162	162	1	0	3128	3111	3144	(17)	(16)	5162	5182	(20)
GEN AND ADM	1202	1220	1209	18	11	22557	22691	23029	(66)	(72)	38151	38262	(111)
UNDISTRIBUTED BUDGET											2686	2686	
SUBTOTAL	10221	9572	10360	(649)	(788)	211693	208120	229442	(9563)	(11759)	351692	370572	(18880)
MANAGEMENT RESERVE											11620	0	11620
TOTAL	10221	9572	10360	(649)	(788)	211693	208120	229442	(9563)	(11759)	363312	370572	(7260)
RECONCILIATION TO CONTRACT BUDGET BASELINE													
VARIANCE ADJUSTMENT													
TOTAL CONTRACT VARIANCE													

(ALL ENTRIES IN THOUSANDS OF DOLLARS)

JHA SYSTEMS
MANAGEMENT REPORT

AS OF: 4/24/89

☒ COST	☐ CURRENT PERIOD >+10%
☐ SCHEDULE	☒ CURRENT PERIOD >-10%
☐ TECHNICAL	☐ CUMULATIVE >+5% & $250K
☐ CONTRACTS	☒ CUMULATIVE >-5% & $250K

WBS ELEMENT: AIRFRAME | MANAGER: R. MARSHALL

	CURRENT/(%)	CUM/(%)	BAC: $139469K
COST VAR	($599K)/(15.9%)	($8416K)/(9.6%)	EAC: $153893K
SCHED VAR	($403K)/(10.7%)	($4223K)/(4.8%)	

NARRATIVE:

We are still having difficulty with the chemical structure of the composite material. The problem surfaces are the vertical stabilizer and the trailing portions of the wings. The problem is that the exhaust from the engines is reacting with the chemical composition of the lifting surfaces, forming a thin coating on the surfaces. This residue is affecting the flight characteristics of the lifting surfaces. I have discussed the problem with Mr. Andersen and he is looking into possibly altering the exhaust heat. We have been analyzing the residue to see how we can alter the chemical structure of the composite material and are close to uncovering the problem. I expect resolution of this problem by June with minimal impact to the program.

JHA SYSTEMS
MANAGEMENT REPORT

AS OF: 4/24/89

☒ COST	☐ CURRENT PERIOD >+10%
☐ SCHEDULE	☒ CURRENT PERIOD >-10%
☐ TECHNICAL	☐ CUMULATIVE >+5% & $250K
☐ CONTRACTS	☒ CUMULATIVE >-5% & $250K

WBS ELEMENT: PROPULSION | MANAGER: C. ANDERSEN

	CURRENT/(%)	CUM/(%)	BAC: $49233K
COST VAR	($116K)/(10.5%)	($1802K)/(5.7%)	EAC: $52216K
SCHED VAR	($166K)/(15.1%)	($2061K)/(6.5%)	

NARRATIVE:

We continue to have a problem with the chemical reaction between the exhaust and the composite material. I have tried altering the exhaust gas temperature (EGT), but it has not affected the accumulation of sediment on the vertical stabilizer and trailing portions of the wings. The changes in the EGT have caused my WBS element to incur the variances noted above. I will continue with my plans and remain optimistic that the designed EGT is appropriate. However, I may have to modify other areas of the propulsion, hence my revised EAC is as previously submitted to you and noted above. The problem will be resolved when the AIRFRAME WBS Manager solves the chemical structure problem of the composite material. My discussion with Mr. Marshall signifies that the problem should be resolved by June.

JHA SYSTEMS MANAGEMENT REPORT

AS OF: 4/24/89

☒ COST	☐ CURRENT PERIOD >+10%
☐ SCHEDULE	☒ CURRENT PERIOD >-10%
☐ TECHNICAL	☐ CUMULATIVE >+5% & $250K
☐ CONTRACTS	☒ CUMULATIVE >-5% & $250K

WBS ELEMENT: SYS TEST & EVAL MANAGER: D. KYOTO

	CURRENT/(%)	CUM/(%)	BAC: $27223K
COST VAR	($154K)/(24.5%)	($1811K)/(9.7%)	EAC: $29893K
SCHED VAR	($145K)/(23.1%)	($2620K)/(14.1%)	

NARRATIVE:

The most recent test suggests that either the chemical composition of the lifting surfaces needs to change or the propulsion exhaust gas temperature (EGT) must change. Both WBS managers are aware of the recurring problem. It has set me back as noted above. The next systems test is in July. Both managers have assured me that the problem will be fixed by then and that the system will pass the test. No further impacts are expected, except for the unfavorable cost variance at completion as already recorded by the Cost Accounting System.

JHA SYSTEMS

AS OF: 4/24/89

VARIANCE ANALYSIS REPORT

☒ COST	☐ CURRENT PERIOD >+10%
☐ SCHEDULE	☐ CURRENT PERIOD >-10%
☐ TECHNICAL	☐ CUMULATIVE >+5% & $250K
☐ CONTRACTS	☒ CUMULATIVE >-5% & $250K

WBS ELEMENT: TOTAL CONTRACT | MANAGER: R. JONES

	CURRENT/(%)	CUM/(%)	
			BAC: $351692K
COST VAR	($788K)/(8.2%)	($11759K)/(5.4%)	EAC: $370572K
SCHED VAR	($649K)/(6.8%)	($9563K)/(4.4%)	

NARRATIVE:

SURVEY QUESTIONNAIRE

Please circle the most appropriate responses.

1. What is your level of education?

   A. High School Graduate.
   B. Some College.
   C. 4 Year College Graduate.
   D. Masters.
   E. Post-Masters.

2. What is your level of familiarity with Department of Defense Contracts?

   A. Never worked on one.
   B. Some experience working with DoD.
   C. Moderate knowledge of DoD practices.
   D. Extensive familiarity with DoD practices.

3. What is your level of experience with Cost/Schedule Control Systems Criteria?

   A. None.
   B. Some knowledge of C/SCSC.
   C. Moderate knowledge.
   D. Extensive familiarity with C/SCSC.

4. What is your level of experience with the Cost Performance Report?

   A. None.
   B. Some knowledge of the CPR.
   C. Moderate knowledge of the CPR.
   D. Extensive knowledge of the CPR.

5. What experience do you have writing Variance Analyses?

   A. None.
   B. Some experience.
   C. Moderate experience.
   D. Extensive experience.

6. What is your level of familiarity with the Program Director's Assessment Report?

   A. I don't know what it is.
   B. Some familiarity with the PDAR.
   C. I have moderate familiarity with the PDAR.
   D. I have extensive familiarity with the PDAR.

MAY 17, 1989

COST/SCHEDULE CONTROL SYSTEMS CRITERIA (SYS 362-89C) SURVEY

TO BE USED IN

"THE EFFECT OF FEEDBACK ON COST PERFORMANCE REPORT QUALITY"
MASTERS THESIS - AFIT/GCA/LSY/89S-2
AIR FORCE INSTITUTE OF TECHNOLOGY

CAPTAIN JUAN H. AMARAL

****

Table of Contents

INTRODUCTION

Scenario: Ms. Lee, the JHA SYSTEMS Program Control Manager on the DAGGER F-26 program, is away on an emergency. Although you are very busy as a Program Control Manager on another program, the F-26 Program Manager, Mr. Jones, has requested your help since it appears Ms. Lee will be unavailable for a few weeks. Today is the thirteenth working day after the April accounting close. The CPR is due to the customer on the 17th working day following the accounting close. In order to meet your deadline, you must finish the CPR today. The data is in, but the variance analysis is yet to be completed.

Information Available: Mr. Phillips, the F-26 Assistant Program Control Manager, has brought you the JHA Systems Management Reports which help explain the cost situation. These reports are required by Mr. Jones for all work breakdown structure elements which have a cost variance in excess of 10% for current month or in excess of 5% and $250,000 at cumulative. Additionally, Mr. Phillips has brought you a copy of the customer's report, based on last month's data, which the customer sends to its headquarters. Ms. Lee requested a copy of the customer report to understand what the government does with the data it receives in the CPR. The feedback Ms. Lee has received from the government centers on the lack of a complete explanation of the problem areas. Capt Hoyt, the customer F-26 program control analyst, thought that sending Ms. Lee a copy of the previous Program Director's Comments would show her just how much detail was actually missing in the variance analysis. He included handwritten comments on the copy he sent Ms. Lee to point out that the information the government requests "up the chain" was not making its way into the variance analysis reports, especially at total contract level.

Task: Your immediate task is to use the information in the CPR and JHA Management Reports to write up a variance analysis report (included as page 7 of this package) for the total contract cost variance only. Mr. Phillips is handling all the schedule variance analyses as well as the level 2 and lower (if required) cost variance analyses. The variance analysis report you write should meet with approval from Mr. Jones and the government. You have a meeting with Mr. Jones in 15 minutes to discuss the overall status of the F-26 contract cost variance. Good luck!

Note: Format 5 variance analysis guidance states the following for total contract reporting: "Provide a summary analysis, identifying significant problems affecting performance. Indicate corrective actions required, including Government action where applicable."

CONTRACTOR: JHA SYSTEMS
LOCATION: DAYTON OHIO
ROTOR ☒ PROPULSION ☐

COST PERFORMANCE REPORT – WORK BREAKOOWN STRUCTURE

CONTRACT TYPE/NO.: PPIP/P33657-89-C-0000
PROGRAM NAME/NUMBER: DAGGER F-26
REPORT PERIOD: 9/30/89 TO 10/24/89

SIGNATURE, TITLE & DATE: R. JONES, PROGRAM MANAGER

FORM APPROVED OMB NUMBER 22110260

QUANTITY	NEGOTIATED COST	EST COST AUTH. UNPRICED WORK	TGT PROFIT/FEE %	TGT PRICE	EST PRICE	SHARE RATIO	CONTRACT CEILING	EST CEILING
1	363312	0	10%	399643	401240	80/20	439607	441364

ITEM	CURRENT PERIOD					CUMULATIVE TO DATE					AT COMPLETION		
	BUDGETED COST		ACTUAL COST WORK PERFORMED	VARIANCE		BUDGETED COST		ACTUAL COST WORK PERFORMED	VARIANCE		BUDGETED	LATEST REVISED ESTIMATED	VARIANCE
	Work Scheduled	Work Performed		Schedule	Cost	Work Scheduled	Work Performed		Schedule	Cost			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
WORK BREAKDOWN STRUCTURE													
2 AIR VEHICLE													
3 AIRFRAME	1176	1773	1372	(403)	(599)	87181	83261	85900	(4223)	(8416)	139469	153893	(14424)
3 PROPULSION	1268	1102	1218	(166)	(116)	31679	29618	33681	(2061)	(1802)	49233	52216	(2983)
3 COMMUNICATIONS	326	338	322	12	16	6790	6613	6574	(177)	216	11262	10628	634
3 NAVIGATION & GUIDANCE	606	616	589	10	27	11818	11638	11416	(180)	402	19628	18634	994
3 AUTOMATIC FLIGHT CONTROL	423	451	440	28	11	9386	9216	9496	(170)	(110)	16623	16816	(192)
2 TRAINING	71	76	71	5	5	1413	1365	1540	(72)	(67)	2216	2308	(92)
2 PECULIAR SUPPORT EQUIPMENT	158	168	152	10	16	3326	3442	3156	116	170	5714	5398	316
2 SYSTEM TEST & EVALUATION	773	638	782	(145)	(154)	18506	15986	20417	(2620)	(1811)	27223	29693	(2570)
2 SYSTEM/PROJECT MANAGEMENT	767	738	761	(29)	(23)	15827	15666	16097	(161)	(270)	25487	25898	(411)
2 DATA	77	79	72	2	7	1306	1300	1308	(6)	(2)	2172	2179	(7)
2 OPERATIONAL/SITE ACTIVATION	56	61	58	5	3	1155	1103	1231	(52)	(76)	1814	1928	(114)
2 COMMON SUPPORT EQUIPMENT	96	99	92	3	7	1792	1882	1693	90	99	3122	2963	159
2 INDUSTRIAL FACILITIES	61	61	60	0	1	986	1028	960	42	26	1729	1658	41
2 INITIAL SPARES	0	0	0	0	0	0	0	0	0	0	0	0	0
COST OF MONEY	161	162	162	1	0	3128	3111	3144	(17)	(16)	5162	5182	(20)
GEN AND ADM	1202	1220	1209	18	11	22557	22691	23029	(66)	(72)	38151	38262	(111)
UNDISTRIBUTED BUDGET											2686	2686	
SUBTOTAL	10221	9572	10360	(649)	(788)	211683	208120	229442	(9563)	(11759)	351692	370572	(18880)
MANAGEMENT RESERVE											11620	0	11620
TOTAL	10221	9572	10360	(649)	(788)	211683	208120	229442	(9563)	(11759)	363312	370572	(7260)
RECONCILIATION TO CONTRACT BUDGET BASELINE													
VARIANCE ADJUSTMENT													
TOTAL CONTRACT VARIANCE													

(ALL ENTRIES IN THOUSANDS OF DOLLARS)

JHA SYSTEMS
MANAGEMENT REPORT

AS OF: 4/24/89

☒ COST	☐ CURRENT PERIOD >+10%
☐ SCHEDULE	☒ CURRENT PERIOD >-10%
☐ TECHNICAL	☐ CUMULATIVE >+5% & $250K
☐ CONTRACTS	☒ CUMULATIVE >-5% & $250K

WBS ELEMENT: AIRFRAME | MANAGER: R. MARSHALL

	CURRENT/(%)	CUM/(%)	BAC: $139469K
COST VAR	($599K)/(15.9%)	($8416K)/(9.6%)	EAC: $153893K
SCHED VAR	($403K)/(10.7%)	($4223K)/(4.8%)	

NARRATIVE:

We are still having difficulty with the chemical structure of the composite material. The problem surfaces are the vertical stabilizer and the trailing portions of the wings. The problem is that the exhaust from the engines is reacting with the chemical composition of the lifting surfaces, forming a thin coating on the surfaces. This residue is affecting the flight characteristics of the lifting surfaces. I have discussed the problem with Mr. Andersen and he is looking into possibly altering the exhaust heat. We have been analyzing the residue to see how we can alter the chemical structure of the composite material and are close to uncovering the problem. I expect resolution of this problem by June with minimal impact to the program.

JHA SYSTEMS
MANAGEMENT REPORT

AS OF: 4/24/89

☒ COST	☐ CURRENT PERIOD >+10%
☐ SCHEDULE	☒ CURRENT PERIOD >-10%
☐ TECHNICAL	☐ CUMULATIVE >+5% & $250K
☐ CONTRACTS	☒ CUMULATIVE >-5% & $250K

WBS ELEMENT: PROPULSION | MANAGER: C. ANDERSEN

	CURRENT/(%)	CUM/(%)	BAC: $49233K
COST VAR	($116K)/(10.5%)	($1802K)/(5.7%)	EAC: $52216K
SCHED VAR	($166K)/(15.1%)	($2061K)/(6.5%)	

NARRATIVE:

We continue to have a problem with the chemical reaction between the exhaust and the composite material. I have tried altering the exhaust gas temperature (EGT), but it has not affected the accumulation of sediment on the vertical stabilizer and trailing portions of the wings. The changes in the EGT have caused my WBS element to incur the variances noted above. I will continue with my plans and remain optimistic that the designed EGT is appropriate. However, I may have to modify other areas of the propulsion, hence my revised EAC is as previously submitted to you and noted above. The problem will be resolved when the AIRFRAME WBS Manager solves the chemical structure problem of the composite material. My discussion with Mr. Marshall signifies that the problem should be resolved by June.

JHA SYSTEMS
MANAGEMENT REPORT

AS OF: 4/24/89

☒ COST	☐ CURRENT PERIOD >+10%
☐ SCHEDULE	☒ CURRENT PERIOD >-10%
☐ TECHNICAL	☐ CUMULATIVE >+5% & $250K
☐ CONTRACTS	☒ CUMULATIVE >-5% & $250K

WBS ELEMENT: SYS TEST & EVAL MANAGER: D. KYOTO

	CURRENT/(%)	CUM/(%)	BAC: $27223K
COST VAR	($154K)/(24.5%)	($1811K)/(9.7%)	EAC: $29893K
SCHED VAR	($145K)/(23.1%)	($2620K)/(14.1%)	

NARRATIVE:

The most recent test suggests that either the chemical composition of the lifting surfaces needs to change or the propulsion exhaust gas temperature (EGT) must change. Both WBS managers are aware of the recurring problem. It has set me back as noted above. The next systems test is in July. Both managers have assured me that the problem will be fixed by then and that the system will pass the test. No further impacts are expected, except for the unfavorable cost variance at completion as already recorded by the Cost Accounting System.

UNCLASSIFIED

DAGGER F-26 May, 1989
Format 11 - Program Director's Comments PREPARED: 04/27/89

Explanation of Y* in Cost Performance

-PROBLEM:**
JHA Systems is experiencing problems in the airframe. The specific problem is unknown, but it seems to be centered on the shaping of the composite materials. JHA also has problems with the Propulsion WBS element. The specific problem is unknown. Finally, JHA is falling behind in System Test and Evaluation.

-IMPACT:**
There is no indication that JHA will be able to recover the cost variance satisfactorily. JHA has not specifically identified the problem and does not really know the impact of the problem. JHA estimates a cost overrun of $7.3 million, but our estimate is a $15.6 million overrun.

-ACTION TAKEN:**
The AFPRO and DCAS personnel have been asked to look into the airframe problem to help determine the extent of the design shortcomings. The program director will meet the JHA program manager to discuss the cost situation.

-GET WELL:**
With AFPRO, DCAS, and JHA management attention, trend reversal expected Jun 89.

* Ms Lee: Y refers to a "YELLOW" cost condition which indicates a potential problem.

** Note the reporting structure. I am sure that you have this information available. However, it is not getting into the variance analysis in FORMAT 5 of the CPR

Please remember that Level 1 refers to the top level and all lower levels which drive the variance.

I Hope This Helps!
Capt Hoyt

JHA SYSTEMS

AS OF: 4/24/89

VARIANCE ANALYSIS REPORT

☒ COST	☐ CURRENT PERIOD >+10%
☐ SCHEDULE	☐ CURRENT PERIOD >-10%
☐ TECHNICAL	☐ CUMULATIVE >+5% & $250K
☐ CONTRACTS	☒ CUMULATIVE >-5% & $250K

WBS ELEMENT: TOTAL CONTRACT | MANAGER: R. JONES

	CURRENT/(%)	CUM/(%)	BAC: $351692K
COST VAR	($788K)/(8.2%)	($11759K)/(5.4%)	EAC: $370572K
SCHED VAR	($649K)/(6.8%)	($9563K)/(4.4%)	

NARRATIVE:

SURVEY QUESTIONNAIRE

Please circle the most appropriate responses.

1. What is your level of education?

   A. High School Graduate
   B. Some College
   C. 4 Year College Graduate
   D. Masters
   E. Post-Masters

2. What is your level of familiarity with Department of Defense Contracts?

   A. Never worked on one.
   B. Some experience working with DoD.
   C. Moderate knowledge of DoD practices.
   D. Extensive familiarity with DoD practices.

3. What is your level of experience with Cost/Schedule Control Systems Criteria?

   A. None.
   B. Some knowledge of C/SCSC.
   C. Moderate knowledge.
   D. Extensive familiarity with C/SCSC.

4. What is your level of experience with the Cost Performance Report?

   A. None.
   B. Some knowledge of the CPR.
   C. Moderate knowledge of the CPR.
   D. Extensive knowledge of the CPR.

5. What experience do you have writing Variance Analyses?

   A. None.
   B. Some experience.
   C. Moderate experience.
   D. Extensive experience.

6. What is your level of familiarity with the Program Director's Assessment Report?

   A. I don't know what it is.
   B. Some familiarity with the PDAR.
   C. I have moderate familiarity with the PDAR.
   D. I have extensive familiarity with the PDAR.

Appendix C: Rater Calibration Package (Page 1 of 3)

LSG (Capt Juan Amaral, AV 255-4437) 12 May 89

Expert Evaluation of Thesis Results

To: Lt Col Bowman, ASD/ACCM, Wright-Patterson AFB OH 45433
Major Cohen, SSD/ACCI, Los Angeles AFB CA 90009
Mr Gardella, ESD/ACCI, Hanscom AFB MA 01731

1. As Capt Amaral discussed with you, attached is the first phase of the expert evaluation of results obtained from the two experiments he conducted. During phase one, he needs to calibrate the judges (you are one of them) for his experiments. The package should be self-explanatory. Please return attachment three in return envelope.

2. Upon completion of this phase, Capt Amaral will send you a package of instructions for phase two of the evaluation process. During phase two you will be rating the actual responses he received as a result of administering the experiment to two groups, contractor personnel at a National Security Industrial Association Meeting and government personnel at an AFIT Professional Continuing Education Course.

3. Thank you for your support of this academic endeavor.

SIGNED BY

ANTHONY H. PRESUTTI, Lt Col, USAF
Head, Dept of Quantitative Management
School of Systems and Logistics

3 Atch
1. Background Information
2. Copy of Survey
3. Response Evaluation

Appendix C: Rater Calibration Package (Page 2 of 3)

Atch 1

Evaluation of Thesis Survey Results
Phase I - Rater Calibration

INTRODUCTION: During the first phase of the survey results evaluation, the raters are to rank-order the following sample variance analyses (Attachment 3) according to their quality. This initial rating will be compared to the other two raters' evaluations to establish if a consistent assessment of variance analysis quality exists among expert raters.

SCENARIO: The attached survey (Atch 2) has been administered to approximately 45 contractor and 45 government personnel. As stated on page 2 of the survey, the task involved the preparation of a variance analysis report for Level 1 of the fictional JHA Systems Dagger F-26 contract. Page 3, the Dagger F-26 Cost Performance Report, was provided to the participants as back-up information. Each participant was verbally instructed to concentrate on the information provided on the JHA Systems Management Reports (pages 4-6). These three reports are the only ones required by JHA management and provide information on the three elements exceeding reportable thresholds. As you might expect, they form the basis for the CPR Format 5 JHA provides to the government. Each participant wrote his or her answer on page 7 of the survey. Page 8 was given to obtain demographic information on the participants.

EVALUATION: Attachment 3 contains three sample responses to the task described above. Each response would have been written on page 7 of the survey and would have supported the financial data found on that page. Please evaluate these three variance analyses and return them in the enclosed envelope. Each response has a blank line towards the bottom where you are to place either a 1, 2, or 3. For the variance analysis you find as the best, place a "1" on the line. The second best variance analysis should be rated "2" on the line. Finally, place a "3" on the line corresponding to the remaining variance analysis. Please do not assign any other ratings to the variance analyses.

CRITERIA FOR EVALUATION: In evaluating the three variance analyses, please consider their quality on the basis of general guidelines for variance analysis. Additionally, and most important for this thesis, keep in mind the limited information presented. The guiding principle in assessing the quality of each variance should be, "How good is this variance analysis, given the limited information?"

Atch 3

Sample Survey Responses

Sample Response #1:

The overall contract variance deals with minor design and implementation problems in the contract. Because of these setbacks, we are not meeting our schedule and cost budgets. The financial impact of this variance is noted above. We have personnel from every level of the company working on these minor problems and we expect them to be resolved soon, with no impact to the overall contract.

Sample Response #1 Rating: 3

Sample Response #2:

The overall contract variance is a direct result of residue forming on the surfaces of the wings and similar areas. Since we did not anticipate these problems, our schedule position is worse than expected (BCWS > BCWP) and our cost position is also worse than expected (ACWP > BCWP). The exact values are noted above. The responsible WBS managers are handling their individual areas and there does not seem to be any further problem anticipated. The remaining schedule milestones will be met with no impact to the overall contract.

Sample Response #2 Rating: 2

Sample Response #3:

The overall contract variance is driven by three key areas: Airframe, Propulsion, and Systems Test and Evaluation. The main problem is that exhaust gases are causing a chemical reaction with the composite material on the lifting surfaces of the aircraft. Changes to the Exhaust Gas Temperature (EGT) have not resolved the problem. Although these changes have resulted in increased costs in the Propulsion and ST&E WBS elements, they have provided clues to the anomalies in the chemical structure of the composite material. The Airframe WBS manager is close to resolving the composite material problem and expects to have it solved by June. The current and at completion variances are noted above. There is no impact expected on the July Systems Test and no impact to the overall contract.

Sample Response #3 Rating: 1

Appendix D: Response Evaluation Package (Page 1 of 37)

LSG (Capt Juan Amaral, AV 255-4437) 12 Jun 89

Expert Evaluation of Thesis Results

To: Lt Col Bowman, ASD/ACCM
Major Cohen, SSD/ACCI
Mr Gardella, ESD/ACCI

1. Thank you for your prompt response to the first phase of the thesis results rating process. The results of the rater calibration suggest that there is a consistent rating process between the three raters.

2. As Capt Amaral has discussed with you, attached you will find the results he obtained from administering his experiment to two different groups. The second phase of the thesis results evaluation involves the rating of these actual results.

3. Attachment 1 is a set of instructions concerning the evaluation process and provides you with guidance on how to rate the responses. Attachment 2, enclosed for your information, is a copy of the instrument Capt Amaral administered to the subjects. Attachment 3 contains one-third of the usable results he obtained. Please evaluate each response and return Attachment 3 in the enclosed envelope.

4. Once again, thank you for your support of this academic endeavor.

SIGNED BY

ANTHONY H. PRESUTTI, Lt Col, USAF
Head, Dept of Quantitative Management
School of Systems and Logistics

3 Atch
1. Background Information
2. Copy of Survey
3. Response Evaluation

Atch 1 (1 of 2)

Evaluation of Thesis Survey Results
Phase II - Response Evaluation

INTRODUCTION: During the first phase, the expert raters were given three sample responses to rank-order. The responses received from the three raters indicate that there is, in fact, consistent rating among the three raters. During the second phase of the survey results evaluation, the raters are to provide a score for each of the actual responses received during the two experiments. Each rater will be randomly assigned one-third of the total usable responses accumulated during the experiments.

SCENARIO: The attached survey (Atch 2) has been administered to 46 contractor and 40 government personnel. As stated on page 2 of the survey, the task involved the preparation of a variance analysis report for Level 1 of the fictional JHA Systems Dagger F-26 contract. Page 3, the Dagger F-26 Cost Performance Report, was provided to the participants as back-up information. Each participant was verbally instructed to concentrate on the information provided on the JHA Systems Management Reports (pages 4-6). These three reports are the only ones currently required by JHA management and provide information on the three elements exceeding reportable thresholds. As you might expect, they form the basis for the CPR Format 5 JHA provides to the government.

Each participant was randomly given either an 8-page or 9-page version of the instrument. Attachment 2 is a copy of the 8-page non-feedback version. The feedback version contains an additional page which provides feedback to the subjects. To maintain the integrity of the response evaluations, the raters will receive a copy of the feedback version upon rating the responses. It is possible that providing a copy of the feedback version to the raters prior to their rating of the responses may bias the evaluation process.

EVALUATION: A Likert Scale appears at the top of each page of Attachment 3. Please evaluate each of the responses in accordance with the information shown at the top of each page. Each response would have supported the financial data found on the appropriate response page of the experiment. Each response has a blank line towards the bottom where you are to place your evaluation. Please keep the evaluations in whole numbers; in other words, only the values 1, 2, 3, 4, 5, 6, or 7 may appear as evaluations. Please do not assign any other ratings to the variance analyses.

CRITERIA FOR EVALUATION: In evaluating the responses, please consider their quality on the basis of general guidelines for variance analysis. Additionally, and most important for this thesis, consider the limited information presented. The guiding principle in assessing the quality of each variance should be, "How good is this variance analysis, given the limited information?"

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

001

The drivers for the above cost variance are primarily in the Airframe, Propulsion, and System Test and Evaluation WBS elements. The cause for these variances is a problem with the chemical structure of the composite material on the airframe vertical stabilizer and trailing portions of the wings. Engine exhaust is causing a reaction with the chemical which forms a residue on the surfaces affecting the flight characteristics of the surfaces.

Possible solutions such as changing the chemical structure of the material and/or changing the temperature of the exhaust are being examined.

We expect the problem will be solved by June. This will be prior to the next System Test and Evaluation. Impact to the program to be minimal.

Response Rating 4

002

The negative cost variance situation is the result of negative reaction of the chemical structure of the composite material used in the vertical stabilizer and trailing portions of the wings and the exhaust from the engine. This results in a buildup of residue on the stabilizer and wings which affects the flight characteristics of the aircraft. Additional costs were incurred because of retest and experimentation. The corrective action is to modify the chemical composition of the material used on the wings and vertical stabilizers. This will result in additional cost to the overall program.

Response Rating 3

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

003

The 5.4% cost variance as noted above is a result of problems encountered in the airframe and propulsion systems. Either the composite material will be restructured, or the exhaust heat will be changed to correct the problem. Systems Test will then be conducted in July to finalize the results. The projected EAC appears in light of the problems encountered based on a CPI of .85 in the airframe and propulsion and a TCPI of .90 on the airframe and propulsion systems.

Response Rating 5

004

The current unfavorable cost and schedule variance are related to problems dealing with the chemical reaction between the exhaust and the composite material (WBS 3 Airframe and WBS 3 Propulsion). These problems have adversely impacted System Test and Evaluation. It is anticipated that management reserve will be used to provide the required funds to meet the above problems.

Response Rating 4

Appendix D: Response Evaluation Package (Page 6 of 37)

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

005

The <11,759K> cost variance is due to WBS elements as follows:

- Airframe <8,416K>
- Propulsion <1,802K>
- Systems Test & Eval <1,811K>

The principle causes of this variance are due to difficulty with the chemical structure of the composite material (in the airframe WBS). The exhaust from the engines is reacting with the chemical composition of the lifting surfaces, forming a coating. This residue is affecting the flight characteristics of the lifting surfaces. This accounts for 74% of the total variance. The propulsion WBS has an impact from the chemical reaction between the exhaust and the composite material. This contributes 20% of the variance. Systems Test and Evaluation is impacted due to failures incurred as a result of the above mentioned airframe and propulsion WBS problems.

Impact: A one month slip is projected to resolve airframe problem. Expected completion date is June. Once airframe is resolved, propulsion will regain schedule. No impact to test is projected pending adequate resolution of airframe and propulsion activity. Expected completion date for next Systems Test is July.

Corrective Action: Analysis of residue to alter chemical structure of the composite material. Coordinate with propulsion to incorporate design changes and monitor Systems Test and Evaluation.

Response Rating 6

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

006

There does not seem to be sufficient communication between the parties to establish true cause of the problem, therefore, it may be expected to continue. On this basis, the overrun will grow. There is no indication that problem will be resolved in the near term.

Response Rating 1

007

The air vehicle is encountering problems in the area of the flight characteristics of the lifting surfaces. This is due to the surface of the vertical stabilizer and trailing portions of the wings accumulating sediment.

Corrective action: Investigations are underway to determine if the problems are created by the chemical structure of the composite material or the exhaust gas temperature of the propulsion subsystem. Once determined, testing will continue as planned in July.

Impact: Costs as reflected in the EAC should be recognized as reported, but no additional impacts to the EAC are anticipated. This problem will be fixed in June as reflected in the current EAC and testing will be continued as scheduled.

Response Rating 3

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

008

Problem: Chemical reaction between the exhaust and composite material. Unfavorable variance due to resolving this issue.

Impact: Currently project variance stated above based on current data.

Action: WBS element managers are coordinating resolution and expect to resolve the issue by June.

Response Rating 2

009

The causes of the variances have been identified. These are the problems associated with the engine exhaust and the composition of the lifting surface material. The exhaust reacts with the material to produce an undesirable condition that affects performance. This accounts for the System Test and Evaluation variance also. The managers of the Airframe (R. Marshall) and Propulsion (C. Andersen) WBS elements are aware of the problem and are taking corrective actions to correct the problem. The managers assure that the problem will be corrected by adjusting the material of the lifting surface or the exhaust temperature of the engine. This corrective action should be completed by June. No further impacts are expected except for the unfavorable cost variance at completion as already recorded by the Cost Accounting System.

Response Rating 3

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

010

The major contribution to the current and cumulative cost variance is the difficulties with the chemical structure of the composite material. Resolution of the problem is expected by June, with the next system test in July. Resolution of this problem will impact cost performance of the three major contributors to the current cost overrun. Impact to the program at this point is expected to be minimal. Government will monitor both cost and schedule performance closely through the expected corrective action date.

Response Rating 3

011

The program is scheduled for Systems Test in May and the current outlook is optimistic. The cost estimate at completion assumes June resolution of an exhaust sediment problem. Special attention will be put in place to maximize the April solution of the exhaust sediment problem and a July Systems Test. The program EAC will be reassessed if the June or July checkpoints become unachievable.

Response Rating 3

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

012

Cum cost variance continues to be caused by design problems involving the vertical stabilizer and the exhaust heat impact on it. Major redesign of engine placement is being evaluated and reported. EAC and projected VAC may change drastically following the design meeting later this month.

Response Rating 3

013

We continue to have a problem with the chemical reaction between the exhaust from the propulsion units and the composite materials of the vertical stabilizer and wing trailing edges. The EGT has been adjusted without any improvement shown during testing. The makeup of the composite is being altered and tested to find a non-oxidizing formula. The airframe design team is confident of a quick resolution, but a high degree of risk is involved. Each month of slippage is costing us $5,000 and our management reserve will not cover current and potential overruns. The current $7,000 overrun will go as high as $20,000.

Response Rating 4

014

The total cost variance of 5.4% exceeds a desireable variance. The current period percentage of 8.2% is increasing from the cumulative 5.4%. If the problem is cleared up by June, we will have a much more favorable position at completion.

Response Rating 2

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

015

There is an unresolved issue between the airframe and the propulsion systems segments. We are establishing an independent group to study the evidence and propose a corrective action for whether it is EGT or composite related. Final impact is unknown at this time and will be reported, with the corrective action plan, next reporting period.

Response Rating 2

016

There is a problem with a chemical reaction in the composite material structure. The corrective action centers around either changing the exhaust gas temperature or revising the chemical composition of the composite material. We have a plan to identify the correct chemical composition of the composite material and the specification for EGT prior to the scheduled systems test in July.

Current cost overruns appear to be unrecoverable. However, the impact on the EAC should not reflect a severe deterioration beyond that experienced cum tc date.

Response Rating 3

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

017

The project major cost drivers are the difficulties with the chemical structure of the composite material. The problem may be alleviated by changes to the EGT. Up-to-date changes have not materialized and further studies are warranted in the chemical composite material. Projected solutions to either change in chemical nature of material and EGT are expected in June. At that time, the reported cost variance could be stabilized. If no solution is reached by June, other solutions may be necessary.

Response Rating 2

018

The total contract at completion cost variance is due to a combination of problems in the airframe and propulsion areas. The problems will be resolved, but there is no indication that the overrun to date will be compensated for with future efficiencies.

The program will be back on schedule as of July testing, assuming no further technical problems arise. This EAC variance reflects only technical problems to date, and does not assume additional technical problems.

Response Rating 3

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

019

This project is behind schedule and overrunning cost due to unexpected difficulties with the chemical structure of the composite material on the vertical stabilizer and the trailing portions of the wing. To date we are analyzing the residue forming on these surfaces (caused by the engine exhaust) to determine whether if it will be possible to alter the chemical composition of the composite material to improve flight characteristics. This analysis will be completed by June. Management reserve will be applied to cost overrun and the addition of personnel to make up for schedule slippage.

Response Rating 3

020

We are continuing to have the problem in the area of the chemical composition of the composite material on the aircraft. Exhaust from the engines creates a thin coating on the surfaces, which negatively affects aircraft performance. The anticipated solutions involve either redirecting exhaust gas or changing the chemical composition. The cost variances experienced are related to the corrective action investigations and testing we have encountered to remedy this situation. Corrective action will take place in July, at which time we expect to regain performance with no current period CV, but not being able to recover the cumulative CV. This is reflected in the revised EAC.

Response Rating 3

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

021

Problem Definition: Chemical residue buildup on airframe control surfaces due to reaction between composite material and exhaust gas is causing altered flight characteristics and product retest.

Corrective Action: Propulsion is studying ways of mitigating exhaust action by varying exhaust gas temperature. Structures is reviewing the composite material for a possible change in chemical structure. Results are expected by June - in time for the July retest. Progress indicates the June date will be met.

Program Impact: Unrecoverable cost overrun.

Response Rating 3

022

The total program cost variance results from problems with the airframe activities and propulsion activities. The resolution of these problems are ongoing and are expected to be resolved by June. There is an anticipated cost impact at completion of $7,260K.

Response Rating 4

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

023

There is a significant cost variance for June in the Propulsion/Airframe areas: The issue is also affecting test.

Technical Background: Integration issue revolving around wing trailing edge and propulsion exhaust interaction affecting stability and control of the air vehicle. Changes to propulsion do not appear feasible. Modification of wing trailing edge structure composition appears to be best or quickest fix. Fix will be defined by June. Testing complete by July.

Cost Analysis: Because of the nature of this problem, it does not appear that we will be able to recover this variance. Contractor's assessment of damage limits variance to 7.3M$. This assumes no problems in fix incorporation or in testing. Our assessment is that this problem will require an alternative approach, with a total variance anticipated of 15M$.

Response Rating 5

024

The contract level variances consist of (in $K)

	Schedule		Cost	
	Cur	Cum	Cur	Cum
1. Airframe (Level 13)	599	4,023	599	8,416
2. Propulsion (Level 3)	166	2,061	116	1,802
3. Test & Evaluation (Level 12)	145	2,620	154	1,811

We are having problems with the chemical structure in the airframe. In Propulsion, a problem with chemical reaction between exhaust and composite material. These two are causing a problem in Systems Test and Evaluation.

Response Rating 2

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

025

Problem Definition: Test failure of the performance on the F-26 airframe.

Problem Cause: Exhaust gas temperature is deteriorating the lift performance of the wings and vertical stabilizer.

Corrective Action: Test to be rerun after both composition of the airframe (wings and vertical stabilizer) has been changed and possible lowering of EGT. Test to be rerun in July.

Program Impact: Additional costs on composition change is expected. Additionally, costs for retesting have driven the program EAC to $370,572K. No further costs are expected if composition change meets test specifications.

Response Rating 4

026

We are experiencing residue collection on the lifting surfaces due to the exhaust from the engines. We are currently analyzing the residue to possibly alter the chemical structure of the composite material. We are close to resolving the problem. Get well date in June.

Response Rating 3

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

027

The Negative Cost Variance is driven by the Air Vehicle, Systems Test and Evaluation, and Propulsion. This negative variance is attributed to chemical reactions with material on the vertical stabilizer and trailing portions of the wings. Solution by changing exhaust temperature or the composition of lifter surfaces. This problem should be corrected by June with minimal impact. The AFPRO and DCAS are both involved in the effort to correct this problem in a timely manner.

Response Rating 3

028

A problem with the exhaust gas residue buildup on lift surfaces continues to plague completion of design change and flight test. A several-pronged attack has been mounted to determine if 1) either exhaust gas chemical or temperature changes can be affected, 2) exhausted gases can be deflected and 3) composite part chemical composition can be changed. We are making good headway in the chemical composition area. We expect to expend an additional $6 million to correct this problem and have the fix in place by the end of June.

Response Rating 2

029

We continue to have a chemical problem in the airframe area, but anticipate resolution of the problem by July. The latest EAC reflects the associated cost growth, but we believe the technical problems are containable within the stated EAC. The cost growth displayed in the Propulsion and Systems Test areas will also be contained within the stated EAC.

Response Rating 2

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

030

Interface problems between the Airframe and Propulsion subsystems are causing cost growth in both areas. The problem centers around interactions between the Propulsion system exhaust gases reacting with and collecting on airframe surfaces (specifically, vertical stabilizer and trailing portions of the wings). Both aspects of the problem are being worked aggressively with resolution expected by July. Furthermore, Systems Test and Evaluation is being adversely impacted due to the uncertainties indicated above.

Response Rating 5

031

Test results to date clearly identify a potential material's problem which, if not corrected in a timely manner, could lead to larger investment in coatings than anticipated.

Please refer to Airframe, Propulsion, and Systems Test, and Evaluation VARs for cause, impact, and current corrective action plans. We would encourage technical coordination with Air Force labs should the SPO have access to materials data that would be useful in resolving this issue.

Response Rating 3

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

032

The chemical structure of the composite material is causing a chemical reaction between the exhaust and the composite material. The problem surfaces in the vertical stabilizer and the trailing portions of the wings. Our corrective action plan was to alter the exhaust gas temperature, but it has not affected the accumulation of the sediment on the vertical stabilizer and trailing portions of the wings.

Response Rating 2

033

Difficulties have been experienced with the chemical reaction between exhaust gas and certain composite materials. Management is closely monitoring the situation. Though tests are scheduled for July, we anticipate no further deterioration in cost other than those experienced cum to date.

Response Rating 2

034

Significant Problems: 1) Chemical interaction between propulsion and airframe composites have required additional study and analysis, 2) the problem has to be resolved prior to Systems Test in July, and, 3) it has resulted in the stated cost growth and approximately 1 month schedule slip for completing Systems Test and Evaluation.

Corrective Action: 1) Change chemical structure of composite, and, 2) alter exhaust heat profile.

Response Rating 5

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

035

The current cost variance and cumulative cost variance are due to problems with the interaction of the Exhaust Gas Temperatures and the composite materials they are passing over. Solutions are being tried and it is expected the problems will be resolved without further impact. No government action required.

Response Rating 2

036

According to Mr. Marshall, a resolution to the composite material problem will be found by June with minimal impact to the program. Mr. Anderson is supposed to be working this problem by altering the EGT. However, this is causing other problems which in turn is causing T & E problems.

At this point, there seems to be no way this problem can be resolved by June without additional impacts to the program in other areas. I feel the cost and schedule variances will continue to break the threshold by an even bigger variance.

Response Rating 3

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

037

The cumulative cost variance of $1,759 is primarily driven by technical chemical reaction problems associated with WBS elements 2.3, Airframe, 2.4, Propulsion, and System Test and Evaluation. The technical problem is associated with either a change to the chemical composition of the lifting surfaces, or a change to the propulsion gas temperature.

The EAC on the program is impacted because a change to the airframe or the propulsion must be made. The total EAC of $370,572K will increase by an amount to be determined when the technical solution is identified.

The problem is being worked under the direction of the program manager and the managers for Airframe and Propulsion.

Response Rating 2

038

Analysis: Cumulative cost variances is the result of a problem with the composite material used in the vertical stabilizer and trailing portion of the wings. The exhaust reacts with this material, which results in a buildup of residue which impacts the flight characteristics.

Corrective Action: Current plans are to alter the composite material which will be unaffected by the exhaust. This will be corrected by June.

Program Impact: Cost impact noted thus far will remain. If, however, this fix does not solve the problem, additional cost will be incurred on the EAC.

Response Rating 2

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

039

Chemical structure of composite material continues to present problems in achieving the contract cost and performance goals. We are working the concerns as a team, but it appears some modifications are necessary to accomplish our required targets. This has been a recurring problem and we have been working on our significant concerns. In order to correct the problem and bring the program back on line, I am going to revisit the requirements and recommend a possible replanning of the budget.

Response Rating 2

040

Both the cost and schedule variances are caused by airframe and propulsion problems. Of the total cost variance, 75% is airframe related and deals with chemical structure of the composite material reacting with depositing residue on the lifting structures. We are working the problem in changing the chemical structure and also modifying the position of the airframe surfaces.

Both the managers responsible for correction of the anomalies have established corrective action plans which will be complete month end July.

The EAC has been updated to accommodate these problems.

Response Rating 3

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

041

Total contract cost variance of 7,260K is largely due to the airframe and propulsion areas. Due to these problem areas and tests to be conducted in June, no make-up in cost is expected soon. Total contract will overrun by at least 7,260.

Response Rating 1

042

This project is currently experiencing problems which impact both the airframe and the propulsion WBS element significantly. There is a chemical reaction between the engine's exhaust gases and the composite material used in the wing trailing portions and the vertical stabilizer. Both element managers are showing variances due to the additional testing that each have done.

We feel that the most feasible change will be to the chemical makeup of the composite elements, and we are close to isolating the problem. We feel that the problem will be solved by June with minimal program impact.

Response Rating 4

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

043

The cost and schedule variance for the current period reflected in the airframe, propulsion, and system test and evaluation, WBS elements, are related. The variances are caused by problems we have encountered due to a reaction between the composite surface material and the exhaust gas from the engine. We are working to find a solution, and estimate establishing a successful work around plan by June. The government should monitor progress including reviewing the proposed work around plan we will submit for feasibility, and evaluate the reliability of the June estimate we will provide.

Response Rating 3

044

As M/E 4/89 the F26 contract has exceeded the cost variance as noticed above. The cost drivers of this variance are the WBS elements airframe, propulsion, and System Test and Evaluation. Within the airframe element, there seems to be some concern with the chemical structure of the composite material on the lifting surfaces reacting with the exhaust gas.. One solution to this is the possibility of altering the exhaust heat (EGt) in WBS propulsion. However, because of these changes in the propulsion element, the costs are exceeding the thresholds and causing variance. These 2 managers are in accord with each other and anticipate a solution by June. In addition to the WBS elements, Systems Test and Evaluation is subsequently exceeding its thresholds. All problems/concerns will be resolved by June, 1 month prior to Systems and Evaluation. I anticipate no further variance at completion!

Response Rating 3

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

045

The major problem areas in the total program cost are Test and Evaluation, Propulsion, and Airframe. These are related problems in that there is a chemical reaction between the exhaust and composite material affecting the vertical stabilizer and trailing portion of the wings.

The problem is being worked by running additional tests and analyzing the residue to see how the chemical structure can be altered. A solution is expected in June, with minimal impact to the program.

Response Rating 2

046

The significant problem resulting in the current cost overrun is the effect of the gas exhaust on the composite materials of the wings and vertical stabilizer. Corrective actions are being formulated in the airframe organization which is reviewing composite material alternatives. The propulsion group is reviewing alternatives to reduce gas residues on the composites. A determination of the best alternative should be accomplished by June. At this time, there is no government action requested.

Response Rating 3

047

The problem of the engine exhaust reaction with the composite material has been investigated but clear responsibility has not been set. Mr. Anderson may notify other areas of propulsion.

Response Rating 1

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

048

Problem: The major problem encountered is that the exhaust from the engines is causing sediment buildup affecting flight performance. Based on the EGT, chemical reactions are occurring with the composite material on the vertical stabilizer and trailing wing sections. Added costs associated with varying the EGT and unanticipated testing have resulted in the majority of the overrun.

Impact: Cost impact is reflected in the EAC above.

Action Taken: We have evaluated the chemical composition of the lifting surfaces and varied the EGT to resolve the problem and reduce the impact.

Get Well: Problem should be resolved by June, and thus, will not impact the next test.

Response Rating 4

049

Main problem is due to need for redesign of airframe composite materials due to reaction of current composite structure with engine heat. New composite to be selected by end of June, with minimal cost impact.

The problem of airframe structure reacting to engine heat considered lowering EGT as an alternative, causing current period CV for propulsion. This alternative was rejected when redesign of composites for airframe was determined to be the correct solution.

System Test and Evaluation was delayed as result of the Airframe and Propulsion problems.

Response Rating 3

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

050

JHA continues to experience a cost variance due mainly to System Test and Evaluation and propulsion WBS element. Exact problem is unknown, however, problem is being assessed by Airframe Manager with indications that a solution will be available by June. Cost Variance continues to increase.

Response Rating 1

051

The problem being experienced is cause by the chemical reaction between the exhaust and the composite material. Once the airframe WBS Manager solves the structure problem, no further impact is expected after June.

Response Rating 2

052

A chemical reaction problem between exhaust gas and composite material continues with little success in solely changing exhaust gas temperature. Other areas of the propulsion system may require modification. The chemical composition of composite materials is also being investigated. Problems should be resolved by next Systems Test in July. No further impacts are expected on the at-completion costs as a result of these problems.

Response Rating 3

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

053

The cost and schedule variances for period ending 4/29/89 level 03 Airframe and Propulsion are noted above. System Test and Evaluation should also be considered.

Detail analysis of the above cost drivers is being performed by the responsible managers.

The cost variances are within the assigned thresholds for current month and .4% over for cumulative date.

Response Rating 1

054

The major contributors to the program's cost variance are the Airframe and Propulsion WBS elements, which in turn, are affecting the Systems Test and Evaluation WBS element.

Response Rating 1

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

055

- PROBLEM:
JHA Systems is experiencing problems with the interaction between the engine exhaust temperature and the composite material used in wing and vertical stabilizer control surfaces.

- IMPACT:
JHA is reviewing the problem two ways. We are attempting to find a less reactive chemical composite material for the control surfaces. We are also attempting to lower the temperature of the exhaust gases. Our estimate is that a solution will be found by June.

- ACTION TAKEN:
Responsible managers are looking into the problem for further details to suggest a corrective action.

- GET WELL:
Trend reversal: June, 1989

Response Rating 4

056

The total cost for JHA is driven by Airframe ($8.4M to date, $14.4M at completion) and Propulsion ($1.8M to date, $2.7 at completion). The problems arise from the chemical reactions of the exhaust system with the composite materials of the airframe wings and empennage. No solution to the problem has been found although tests are still underway. These problems are driving test delays. Ineffective identification will cost more than projected to date, but further analysis of EAC cannot be completed until problem is identified.

Response Rating 4

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

057

Problem: Exhaust from the engines is reacting with the chemical composition of the lifting surfaces.

Impact: The problem affects the flight characteristics of the lifting surfaces. Some cost growth has emerged, but this is not critical.

Action Taken: We are trying to alter the EGT and/or to change the chemical composition of the composite material.

Completion Date: June 1989.

Response Rating 3

058

Continued problem of chemical reaction between exhaust and composite material of lifting surfaces. Corrective action is underway to alter the chemical structure of the composite material by the end of June. This problem has resulted in increased cost as reflected in new contract EAC.

The effectiveness of the problem resolution will be unknown until tests are conducted in July. There has been no provision made in EAC for additional cost impact due to test failure or further corrective action on this problem.

Response Rating 4

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

059

In summary, the composite material problems identified in WBS areas for Airframe, Propulsion and System Test and Evaluation will be resolved by contract end with a $1.1759M overrun representing a 5.4% negative cost variance. Extensive meetings with middle and upper management's attention will raise the visibility within the company. We also expect closer coordination with the government's program manager and PLO to ensure your visibility into solution methodology.

Response Rating 3

060

Current total contract cost variance cumulative at present is 5.4% or $11,759K. This is an increase over prior month cumulative data. Current month cost variance is 8.2% and $788K. This cost problem is primarily located in the airframe which at present is 9.6% (8.4 million) over cost and is related to the difficulty with the chemical structure of the composite materials being used. The problem primarily affects the vertical stabilizer and trailing portion of the wings. The problem is the result of coating forming on these surfaces as a result of the exhaust transfer. We are at present exploring 2 primary alternatives, 1) altering the exhaust heat or 2) altering the chemical structure of the composite material. We expect resolution by June and do not expect any significant impact to the overall program.

Response Rating 4

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

061

Three areas are of major concern for BAC:
1. Airframe the greatest variance (14,424) with final and future problems being unknown.
2. Propulsion the next greatest variance (2,983) will be solved when the airframe is solved so it is a dependent variable.
3. Systems & Test is the third highest variance (2,670) and is assumed to be able to be passed and come up to speed.

The greatest impact is the airframe which will also affect the propulsion therefore, more emphasis needs to be placed in this area. Reprogramming may be necessary to get it on track.

Response Rating 1

062

Corrective action is underway to resolve the airframe chemical structure problem of the composite material. This will involve possible modifications to the propulsion which will require possible participation in design change. The present impact on program performance is noted above.

Response Rating 1

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

063

After careful review of the CPR it is evident that the drivers of unfavorable cost variances are in the area of the Air Vehicle. The problem lies in the level 3 production area, namely the airframe and the propulsion system. Regarding the airframe, the problem is the chemical structure of the composite material. When the exhaust from the engines interacts with the composite material, a thin coating of residue is formed on the surface affecting the flight characteristics of the lifting surfaces. The propulsion variance is essentially due to the airframe problem and will be resolved when the corrective action of the airframe is in place by June. The System Test and Evaluation shows an unfavorable variance due to the airframe and propulsion problems. The next System Test is in July. No problems are anticipated due to proposed corrective action if both systems are to be in place by June.

Response Rating 3

064

We continue to have problems with the chemical composition of the lifting surfaces and the propulsion exhaust heat temperature. We will continue to take the necessary actions to resolve the problems from both points of view. Both Managers are certain that the problems can, and will, be resolved in time to have a successful systems test in July. I personally will work with each of the Managers involved to assure that the July deadline is met.

Response Rating 2

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

065

Technical problems with the Airframe and Propulsion continue to retard progress. These problems have been narrowed and technical solutions are being addressed. Solutions are expected by June allowing no further impact on the program. We now estimate exceeding our BAC by $18M but $11M remains in MR to cover a portion of the excess over contract target cost.

Response Rating 3

066

Design of EGT now appears to be appropriate. The Propulsion EAC reflects the redesign effort completed. Other Propulsion areas may require modification which will probably further increase the Propulsion EAC. These impacts should be defined and quantified by June and will be correspondingly reflected in the Propulsion EAC at that time period. The Propulsion impact should have little or no impact to the Airframe design or EAC. It is anticipated that testing will start in July with no further impact to testing. In summary, the current cost variances and program EAC variances are expected to increase and must be quantified in the June month-end CPR.

Response Rating 2

067

We are experiencing a technical problem with the chemical structure of the composite material on the lifting surfaces. This problem has affected the Airframe Propulsion and System, Test and Evaluation. WBS elements representing significant portion of the cost variance (12,029). It is anticipated that the problem will be resolved by June, however, it is doubtful that the variance in cost can/will be recovered.

Response Rating 2

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

068

Problem: Program director states problem specifics are unknown and has asked for his managers to look into the problems.

Impact: Recovery not expected.

Response Rating 1

069

Cost variance has exceeded the scheduled variance by 1% as a result of WBS element 2 (airframe) due to material chemical structure problems. Also WBS element 2 (System Test and Evaluation) also (Propulsion) WBS element have contributed to the overall effort of the CWBS variance. Measures to correct these problems are being undertaken and should be resolved by June.

Response Rating 1

070

Cost variance results from a design problem with the interaction of exhaust heat and the composite structure of the airframe. The redesign of composite material should solve the problem by June allowing the Systems Test to take place in July. If the redesign is successful, the total impact should not exceed 5% of the baseline (w/o MR).

If the design is unsuccessful, the program is likely to suffer schedule and cost impacts that are undeterminable at this time.

Response Rating 4

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

071

We are continuing to have problems with the chemical composition of the lifting surfaces and the exhaust gas temperature. Will task Mr. Marshall and C. Anderson to rectify this problem within 30 days. The contract will see a significant increase in the EAC for the May CPR. This will be due to either changes in the chemical composition and/or exhaust gas temperature. System Test and Evaluation will need an increase in budget to ensure the fix is acceptable and pass all safety requirements.

Response Rating 3

072

The significant problems being experienced are due to a chemical reaction between the engine exhaust and the lifting surface composite material. The Airframe Manager is investigating the alteration of the chemical structure of the composite material as a solution to the problem and if successful, will resolve the problem by June with no further impact to the cost variance. The Propulsion Manager is awaiting the results of the investigation prior to the modification of the propulsion system, but has included potential costs of the investigation in the current EAC. No additional cost degradation is expected.

Response Rating 4

073

Although there are still problems in the Airframe and Propulsion WBSs, these should be satisfactorily resolved in June with minimum impact to the program. The additional costs and schedule impacts to the program are considered to be minimal.

Response Rating 1

Given the limited information provided and general variance analysis guidelines, each of the following responses:

1 - Contains no variance analysis value.
2 - Contains a very limited amount of variance analysis value.
3 - Contains a limited amount of variance analysis value.
4 - Contains some variance analysis value.
5 - Contains a moderate amount of variance analysis value.
6 - Contains a large amount of variance analysis value.
7 - Contains a variance analysis of all available information.

074

Problem: Unanticipated chemical reaction of the engine exhaust with the composite material of the airframe structure. This causes the Airframe, Propulsion, and Systems Test and Evaluation variances.

Impact: These reactions reduce the air-worthiness of the aircraft to an unacceptable degree. The program is behind schedule and will overrun until the chemistry is solved. Management reserve will be distributed for the unanticipated work so the overall contract VAC will not change.

Action Taken: The Airframe, Propulsion, and Systems Test and Evaluation managers are cooperating towards a solution. It is presently anticipated that the chemistry will be solved in June.

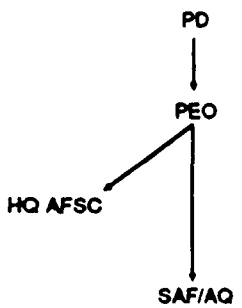
Get Well: JHA will allocate additional resources to solve the chemistry.

Response Rating 5

Appendix E: ASD Program Reporting Matrix (Page 1 of 3)

ASD PROGRAM REPORTING MATRIX		
REPORTING SYSTEM	SAR	UCR
OPR	ACB	ACB
ORIGINATOR	PROGRAM DIRECTOR (PD)	PROGRAM DIRECTOR (PD)
HIGHEST LEVEL RECIPIENT	CONGRESS	SAF (MR ALDRIDGE)
CONTENTS	PROGRAM DESCRIPTION, PROGRAM HIGHLIGHTS, THRESHOLD BREACHES, SCHEDULE MILESTONES, TECHNICAL AND OPERATIONAL REQUIREMENTS, UNIT COST SUMMARY, COST VARIANCE ANALYSIS, CONTRACT COST INFORMATION, PROGRAM FUNDING, PRODUCTION RATE DATA, AND O&S COSTS	UNIT COST SUMMARY, CONTRACT COST INFORMATION, TECHNICAL AND OPERATIONAL REQUIREMENTS, AND SCHEDULE CHANGES
FREQUENCY	ANNUALLY WITH QUARTERLY UPDATES AS NEEDED	QUARTERLY
PROGRAMS	ACM, ATARS, ATF, B-1B, B-2, C-17, C-5, CIS (MK XV), F-15, F-16, LANTIRN, MAVERICK, SRAM II, TACIT RAINBOW	ACM, ATARS, ATF, B-1B, B-2, C-17, C-5, CIS (MK XV), F-15, F-16, LANTIRN, MAVERICK, SRAM II, TACIT RAINBOW
ROUTING	PD ↓ AC ↓ HQ AFSC/ACX ↓ SAF ↓ USD/A ↓ CONGRESS	PD ↓ AC ↓ HQ AFSC/ACX ↓ SAF

Appendix E: ASD Program Reporting Matrix (Page 2 of 3)

ASD PROGRAM REPORTING MATRIX		
REPORTING SYSTEM	DAES REPORT	ACQUISITION INFORMATION MONTHLY REPORT
OPR	ACB	CCX
ORIGINATOR	PROGRAM DIRECTOR (PD)	PROGRAM DIRECTOR (PD)
HIGHEST LEVEL RECIPIENT	USD/A (DR COSTELLO)	SAF/AQ (MR WELCH)
CONTENTS	PROGRAM DESCRIPTION, UNIT COST SUMMARY, PROGRAM FUNDING, COST ESTIMATE, CONTRACT COST INFORMATION, TECHNICAL AND OPERATIONAL REQUIREMENTS, SCHEDULE MILESTONES, DELIVERIES, PROGRAM MANAGERS ASSESSMENT, AND PEO COMMENTS	PROGRAM MANAGERS ASSESSMENT, AND PEO COMMENTS
FREQUENCY	QUARTERLY	MONTHLY
PROGRAMS	ACM, ATARS, ATF, B-1B, B-2, C-17, CIS (MK XV), CSRL, F-15 F-16, LANTIRN, MAVERICK, SRAM II, TACIT RAINBOW	ACM, AF-1, ATARS, ATF, B-1B, B-2, C-17, CIS (MK XV), CSRL, F-15, F-16, LANTIRN, MAVERICK, SRAM II, TACIT RAINBOW
ROUTING		

Appendix E: ASD Program Reporting Matrix (Page 3 of 3)

ASD PROGRAM REPORTING MATRIX		
REPORTING SYSTEM	APB	PDAR
OPR	ACP	ACP
ORIGINATOR	PROGRAM DIRECTOR (PD)	PROGRAM DIRECTOR (PD)
HIGHEST LEVEL RECIPIENT	EXECUTIVE PROGRAMS - USD/A DESIGNATED PROGRAMS - HQ AFSC/CC FIELD PROGRAMS - ASD/CC	HQ AFSC/CC
CONTENTS	CONTROL LOG, TECHNICAL AND OPERATIONAL REQUIREMENTS, PROGRAM DESCRIPTION, SCHEDULE MILESTONES, PROGRAM FUNDING AND DEFERRED CONTENT	PROGRAM MANAGERS ASSESSMENT, AND PEO COMMENTS
FREQUENCY	ANNUALLY WITH UPDATES AS NEEDED	MONTHLY
PROGRAMS	ALL EXECUTIVE AND DESIGNATED PROGRAMS PLUS ALL FIELD PROGRAMS THAT FIT THE AFSC ACQUISITION PROGRAM DEFINITION	SEE ATTACHED LIST
ROUTING	EXECUTIVE: PD → PEO → HQ AFSC → PEO → SAF/AQ → USD/A DESIGNATED: PD → PEO → HQ AFSC FIELD: PD → PEO	PD → AC → PEO → HQ AFSC

Appendix F: Tabulation of Response Evaluations By Rater

Instrument Codes

KF = Contractor Feedback
KN = Contractor Non-Feedback
GF = Government Feedback
GN = Government Non-Feedback

Rater A			Rater B			Rater C		
Number	Code	Score	Number	Code	Score	Number	Code	Score
1	GN	4	26	GN	3	50	GF	1
2	KN	3	27	GF	3	51	GF	2
3	KN	5	28	KF	2	52	KF	3
4	GN	4	29	KN	2	53	GN	1
5	KN	6	30	KF	5	54	KF	1
6	KF	1	31	KF	3	55	GF	4
7	KN	3	32	KN	2	56	KF	4
8	KF	2	33	KN	2	57	KF	3
9	GN	3	34	KF	5	58	KN	4
10	GN	3	35	KN	2	59	GN	3
11	KN	3	36	GF	3	60	KF	4
12	KF	3	37	KN	2	61	GF	1
13	KF	4	38	KN	2	62	KN	1
14	GN	2	39	GN	2	63	GN	3
15	KN	2	40	KN	3	64	GN	2
16	KF	3	41	GF	1	65	GN	3
17	KN	2	42	GN	4	66	KF	2
18	KN	3	43	GN	3	67	GF	2
19	GF	3	44	KF	3	68	GF	1
20	KN	3	45	KN	2	69	GF	1
21	KF	3	46	KN	3	70	KN	4
22	KF	4	47	GF	1	71	GN	3
23	GF	5	48	KF	4	72	KN	4
24	KF	2	49	GF	3	73	KF	1
25	KF	4				74	KF	5

Appendix G: Feedback vs. Non-Feedback Test Results

Statistics:

	Total Score	Sample Size	Mean	Variance
Feedback	102	37	2.757	1.745
Non-Feedback	106	37	2.865	1.065

Hypothesis Test for Equality of the Sample Means:

H_0: $\mu_X - \mu_Y = 0$ There is no statistical difference between feedback and non-feedback.

H_1: $\mu_X - \mu_Y \neq 0$ There is a statistical difference between feedback and non-feedback.

Decision Rule:

For $\alpha = .10$, Reject H_0 if:

$$\frac{\bar{X} - \bar{Y}}{\left[\frac{\sigma_X^2}{n_X} + \frac{\sigma_Y^2}{n_Y}\right]^{\frac{1}{2}}} > Z_{\alpha/2} \quad \text{or} \quad \frac{\bar{X} - \bar{Y}}{\left[\frac{\sigma_X^2}{n_X} + \frac{\sigma_Y^2}{n_Y}\right]^{\frac{1}{2}}} < -Z_{\alpha/2}$$

Results:

$Z_{CALC} = -.3918$ and $-Z_{TABLE} = -1.6450$,

Therefore, The Null Hypothesis cannot be rejected and there is no statistical difference between the Feedback and Non-Feedback scores.

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Vita

Captain Juan Amaral was accepted into the Air Force Academy in 1980. He graduated from the Academy in 1984 with a Bachelor of Science in Human Factors Engineering. Capt Amaral worked as a program control analyst for three years with the Defense Support Program at Space Division, Los Angeles AFB, prior to his assignment at AFIT in the Cost Analysis program. He is married to the former Maria Elena Vera.

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REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

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2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) AFIT/GCA/LSY/89S-2	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION School of Systems and Logistics 6b. OFFICE SYMBOL (If applicable) AFIT/LSQ	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code) Air Force Institute of Technology (AU Wright-Patterson AFB OH 45433-6583	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO / WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)
THE EFFECT OF FEEDBACK ON COST PERFORMANCE REPORT UTILITY

12. PERSONAL AUTHOR(S)
Juan H. Amaral, B.S., Captain, USAF

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
MS Thesis	FROM _____ TO _____	1989 September	140

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Cost Analysis Contracting Procurement Cost/Schedule Control Systems Criteria
05	03		

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Thesis Advisor: Anthony H. Presutti
Assistant Professor of Accounting

Approved for public release: IAW AFR 190-1.

Larry W. Emmelhainz

LARRY W. EMMELHAINZ, Lt Col, USAF 11 Oct 89
Director of Research and Consultation
Air Force Institute of Technology (AU)
Wright-Patterson AFB OH 45433-6583

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS	UNCLASSIFIED

22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE (Include Area Code)	22c. OFFICE SYMBOL
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DD Form 1473, JUN 86 *Previous editions are obsolete.*

The purpose of this thesis was to assess the effect of feedback on the utility of the Cost Performance Report (CPR). The effort consisted of administering a controlled experiment to two groups: a gathering of contractor personnel and a group of Government employees. Both groups had some degree of knowledge in the area of variance analysis reporting.

Each experiment consisted of two randomly assigned instruments, the feedback instrument (given to the experimental group) and the non-feedback instrument (given to the control group).

The feedback used in this experiment was similar in structure to the Defense Acquisition Executive Summary Format 11, specifically as formatted in the Program Director's Assessment Review. Both of these reports are used by government program offices to report contract cost and schedule information to higher levels of the government procurement community.

The experiment required the subjects to perform a task similar to that performed during the preparation of a CPR and to provide a response in the form of a variance analysis. The responses were rated by three experts and the mean values of the feedback responses and non-feedback responses were tested to determine if a statistically significant difference existed between the two means. Theses. (SLW)

No statistically significant difference was found to exist between the two means suggesting that providing feedback to subjects, as given in this experiment, has no effect on the quality of the variance analyses they prepare.

Although supporting the fact that feedback as a whole is beneficial, the results of this thesis suggest that in order to produce a statistically significant difference in the quality of variance analyses, the feedback given in these experiments needs to be reevaluated.

A recommendation was made to conduct a follow-on thesis with an improved feedback measure possibly involving a feedback briefing, an increase in time allotted to the experiment, or a change to the feedback vocabulary.