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13. ABSTRACT The expanding field of financial management in the Department of Defense requires increasing study to maintain currency. In this study, a case is developed to present an overview of the Selected Acquisition Information Management System (SAIMS) and Cost/Schedule Control System Criteria. In the case, performance measurement is explained and illustrated through the vehicle of a procurement officer being introduced to the topic in a series of briefings and discussions. The case introduces the reader to each subsystem of SAIMS, explains the purposes of each, and illustrates with examples drawn from the B-1 System Program Office.			

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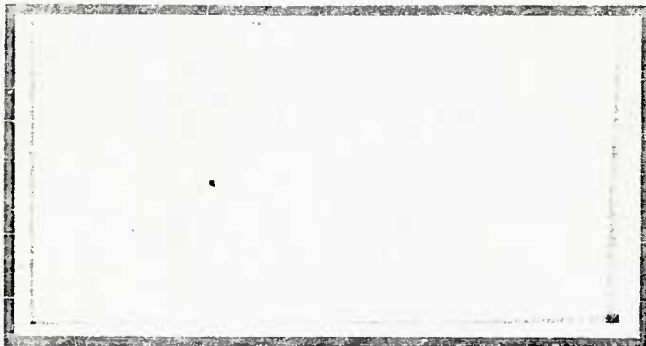


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THE COST/SCHEDULE CONTROL SYSTEM  
CRITERIA: A CASE STUDY

Captain Donald D. Wright

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THE COST/SCHEDULE CONTROL SYSTEM CRITERIA:  
A CASE STUDY.

*Thesis*

A Thesis

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

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

by

Donald D. Wright, B.S.  
Captain, USAF

August 1971

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This thesis, written by

Captain Donald D. Wright

Has been approved by the undersigned on behalf of the faculty  
of the School of Systems and Logistics in partial fulfillment  
of the requirements for the degree of

MASTER OF SCIENCE IN LOGISTICS MANAGEMENT

Date: 12 August 1971

A handwritten signature in cursive script, appearing to read "Clarence A. ...", is written above a horizontal line. Below the line, the words "Research Chairman" are printed in a serif font.

Research Chairman

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## TABLE OF CONTENTS

	Page
ACKNOWLEDGMENTS . . . . .	iii
LIST OF TABLES . . . . .	vi
LIST OF FIGURES . . . . .	vii
 Chapter	
1. INTRODUCTION . . . . .	1
Problem Statement . . . . .	1
Background . . . . .	2
Scope . . . . .	5
Objective . . . . .	7
Research Questions and Hypothesis . . . . .	7
Research Questions . . . . .	8
Hypothesis . . . . .	8
2. PROCEDURE . . . . .	9
Nature and Sources of Data . . . . .	9
Case Related Data . . . . .	9
Validation data . . . . .	14
Data Collection Techniques . . . . .	15
3. ANALYSIS AND HYPOTHESIS TESTING . . . . .	17
Selection of the Statistical Test . . . . .	19
Description of the Kolmogorov-Smirnov Test . . . . .	20
Analysis of the Examination Results . . . . .	21
4. CONCLUSIONS AND RECOMMENDATIONS . . . . .	24
Research Question #1 . . . . .	24
Research Question #2 . . . . .	25
Research Question #3 . . . . .	25
Recommendations . . . . .	26

	Page
BIBLIOGRAPHY . . . . .	27
APPENDIXES	
A. CASE STUDY OUTLINE . . . . .	31
B. THE B-1 MANNED BOMBER CASE . . . . .	34
C. VALIDATION EXAMINATION AND RELATED INSTRUCTIONS . . . . .	92
D. METHOD FOR CALCULATION OF CUMULATIVE STEP FUNCTION . . . . .	110

LIST OF TABLES

Table	Page
1. Ordered Scores of the Sample Groups . . . . .	21
2. Cumulative Step Functions for Scores of the Sample Groups . . . . .	23

LIST OF FIGURES

Figure	Page
1. Resource Management Systems . . . . .	40
2. Validation Process Milestones . . . . .	51
3. Work Breakdown Structure-Organization Matrix . . . . .	62
4. A Typical Work Breakdown Structure . . . . .	80

## Chapter 1

### INTRODUCTION

#### Problem Statement

*As present* The Department of Defense (DoD) Cost/Schedule Control System Criteria (C/SCSC) was, at this writing, still a relatively new concept for control of management information flow between DoD components and major defense contractors. Since it was new and represented a substantial departure in both philosophy and form from previously used systems, a serious lack of educational material existed. Specifically, there was no material available of the self-contained case study type which was of a length reasonable for use in a graduate level course, in which the intention was for the case to serve as an overview, rather than as a detailed study of C/SCSC. *This case study was developed. It is intended for use as an overview and is appropriate for use in a graduate course of Air Force officers in a course of management.* The case studies available were without exception fictitious, rather than having any basis in an actual application of C/SCSC, and were exceptionally lengthy, containing three-hundred to six-hundred written pages. This length was considered excessive for use as a one day overview of C/SCSC. Further, the available cases were not self-contained, but required substantial supplemental instructions and guidance from an instructor.

### Background

During the two decades subsequent to World War II rapid technological change combined with the requirement brought on by the Cold War to maintain a standing military force to produce a rapidly expanding defense industry. Contracts between DoD components and the defense industry soon began to run into the millions and hundreds of millions of dollars. This growth was accompanied by larger and larger defense budgets and by increasing demands for better management of the defense dollar, especially in those areas where a relatively small management error could cost the taxpayers millions of dollars.

In response to increased demands for better management and increased visibility into the uses of tax dollars on large contracts a number of management information systems were developed. Disastrous cost over-runs and schedule slippages were occurring with increasing regularity. Most embarrassing to DoD officials was the fact that many of these over-runs did not even become known until after the fact. By this time program development was often so far along that little choice remained but to obtain massive additional financing in order to receive some concrete return on dollars already invested.

Public criticism of DoD financial management placed increased emphasis on developing a management information system which would keep DoD informed of the status of major

programs but, at the same time, would not preempt the management prerogatives of contractors. In trying various systems, DoD had often imposed a system on contractors. Further, for lack of central control, contractors often ended up maintaining several costly and often overlapping systems on various DoD contracts.<sup>1</sup>

One of the many systems developed during this period was the Program Evaluation and Review Technique (PERT) which was developed by the Navy in 1958 for use on the Polaris Missile project. Associated with this system was a Work Breakdown Structure (WBS) that subdivided the contract work program through successive levels of detail. This subdivision was carried down to discrete work packages which could then be used as a basis for planning and controlling work effort (schedule) and the amount expended on each package (cost). This basic system was adopted by Air Force Systems Command (AFSC) in 1962 for use on the TFX program and was expanded to include an earned value concept. The major departure of the new Air Force system from previous ones was that it did not attempt to spell out in detail the management information system to be used by the contractor. Instead, it specified categories of information that were to be available from the system and left it to the contractor to design and implement an individual system that would

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<sup>1</sup>H. Ramford, "The Monterey Critique," Air Force Management, Vol 9, No 1 (October, 1962), pp. 42-50.

satisfy both the contractor's needs and those of the Government.

Based on the demonstrated success of these efforts the AFSC published its Cost/Schedule Planning and Control Specification in June 1966. This system incorporated the better techniques from both PERT and earned value and also included implementation of recommendations made after further studies by a management consultant firm.<sup>1</sup>

In December 1967, DoD Instruction 7000.2 was issued under the title "Cost/Schedule Control System Criteria." This instruction adopted AFSC's system for DoD-wide use to partially fulfill the Resource Management System requirement with respect to management of major capital acquisitions.

Resource Management Systems (RMS) is the name given to the program begun by Secretary of Defense Robert S. McNamara in August 1966 with the issuance of DoD Directive 7000.1. The basic objective of RMS was improved financial management throughout all phases of resource acquisitions, utilization, and retirement.<sup>2</sup> To accomplish this objective four major interlocking systems were created: (1) the Programming and Budgeting System, concerned with planning the resources needed to meet DoD objectives and with

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<sup>1</sup>J. Ronald Fox and W. E. Carter, "Cost Planning and Control in Weapons Acquisition," Armed Forces Controller, (June, 1965), pp. 9-11.

<sup>2</sup>U.S. Department of Defense, Directive Number 7000.1, Resource Management Systems of the Department of Defense, August 22, 1966, p. 3.

justifying those needs to Congress, (2) the Operations Management System, concerned with management of resources directly applied to, or in support of, the operating commands in DoD, (3) the Inventory Management System (IMS), concerned with management of items in the DoD supply system, and (4) the Acquisition Information and Management System, concerned with management of items/services from outside the DoD. Of the four, the latter two dealt specifically with management of assets. IMS represented the internal portion of the asset management structure and AIMS, the external.

AIMS is further divided into two major subsystems: Selected Acquisition Information Management System (SAIMS) and Other Capital Acquisitions. SAIMS, in turn, consists of the Economic Information System, Cost Information Reports, and Contract Fund Status Reports, each of which provide financial information by levying reporting requirements on the contractor, and, finally, the Performance Measurement System which integrates the cost, schedule, and technical progress under the contract. Of the three only cost and schedule are controlled by the C/SCSC Criteria.

#### Scope

The case study developed from this effort was specifically intended to be of use as an educational aid in presenting C/SCSC to a group composed primarily of Air Force officers. Further, the Financial Management

course in which the case was primarily intended to be used concentrated on Air Force applications throughout the RMS presentation. It was therefore determined that the case should be based on an Air Force application of C/SCSC.

In view of severe time and travel restrictions, it was further decided to limit the choice of possible programs to those in which the Systems Program Office (SPO) was physically located at Wright-Patterson AFB, Ohio. It was also considered desirable to choose a program in which the C/SCSC application had progressed beyond the validation stage to insure availability of as much factual background as possible.

It was also determined that the program chosen as the basis for the case should not have experienced unusually severe problems or delays due to the C/SCSC, since the case was intended to demonstrate how the system should work, based on a successful application.

The SPO which best met these qualifications was the B-1 Manned Bomber SPO. The B-1 Program was therefore chosen. To further limit the size and complexity of the resultant case it was determined it should be based solely on the major efforts and events involved in validation and surveillance of the C/SCSC effort of the prime contractor, North American Aviation Division of North American Rockwell.

### Objective

The primary objective of this paper was to develop a case study based on the C/SCSC experience of the B-1 SPO. The resultant case was designed to be a self-contained teaching aid appropriate for use as a one day overview of C/SCSC for Air Force officers with limited prior knowledge of the criteria.

To meet the overall objective, the following sub-objectives were identified:

1. To present, within the case context, sufficient discussion of C/SCSC and SATMS to impart a basic understanding of the Criteria and of the environment in which they are used.
2. To show through examples drawn from the experience of the B-1 SPO how one application of the Criteria has worked.
3. To develop a series of questions and suggested answers for them, each based on experiences related in the case and designed to generate discussion and thought on some specific aspect of C/SCSC.
4. To develop and administer a test application of the case to a selected sample of officers in order to verify its usefulness as a teaching aid.

### Research Questions and Hypothesis

The following research questions and hypothesis were addressed in accomplishing the stated objectives of this paper.

Research questions. Three research questions were developed:

1. Can the Cost/Schedule Control System Criteria be presented in a comprehensive, self-contained case study?
2. Can such a case study be developed based on an actual C/SCSC application?
3. Would such a case study be useful in imparting basic understanding of the C/SCSC system, methods, and procedures?

Hypothesis. In connection with research question number three the following hypothesis was tested:

A sample group of officers who had used the case study would score significantly higher on an examination consisting of questions pertaining to C/SCSC and SAME than would a similar group who had the subject presented to them through a classroom lecture.

## Chapter 2

### PROCEDURE

#### Nature and Sources of Data

The data required to meet the objectives of this paper fell naturally into two distinct categories. First, there was the data necessary to write the case study. Second, there was additional data required to test the hypothesis concerning validity of the case as an educational aid. Since the two types of data were significantly different with respect to nature and source they are discussed separately in the following paragraphs.

Case related data. Before specifically considering the required data for this area, and its nature and source, it was first necessary to briefly outline the completed case study and then consider the parts of it separately. In so doing, the case outline in Appendix A was developed. The remainder of this section addresses the areas of the outline and defines the nature and sources of the data that were required to complete the corresponding section of the case study.

The introductory portion of the case consists of two main parts, a statement of background and a statement of desired learning objectives from the case. Data for the

first of these areas is factual in nature and was taken from the background presented in Chapter 1 of this paper, edited to include those items it was considered necessary for the student to know.

The statement of desired learning objectives, as the name implies, was included in order to outline for the student the knowledge he should have on completion of the case study. Items in this area were obtained through discussion with Professor Chauncey H. Dean, Jr., of the School of Systems and Logistics (AU), Air Force Institute of Technology, in whose course the case was primarily intended to be used.

The section of the case entitled "The B-1 System Program Office (SPO)" contains three major areas. The first of these is general in nature and begins the "story-line" of the case by introducing the characters involved, all of which are fictitious. The main character, who is used throughout the case, is a young Air Force Captain (Captain James Blake) who was supposedly newly assigned to the procurement section of the B-1 SPO. The purpose of the use of a story-line and characters was to aid in maintaining continuity in the case, to gain the student's interest, and (in the case of Captain Blake) to provide a character with whom the majority of the students would be able to identify. The case therefore follows "Captain Blake" as he learns the rudiments of his new job, beginning with his attendance at

a SAIMS briefing, in which essential information about SAIMS was presented. Data in this section was taken from the available DoD and USAF publications describing SAIMS and its component parts. Data was selected from these publications in such detail as was needed by the student to acquire minimum acceptable knowledge of SAIMS, as defined in the section on desired learning outcomes. In the second part of this section, the C/SCS Criteria were presented to the student. This was done in the context of office conversation between Captain Blake and Captain Bradbury after the SAIMS briefing. Data for this portion of the case was taken from DoD Instruction 7000.2, dated 22 December 1967, and entitled Performance Measurement for Selected Acquisitions. A complete copy of the criteria, taken from this publication was included as an attachment to the case problem for the use of those students who wished to review the Criteria in their original form. The final area covered in this section was in the context of conversation between Captain Blake and his supervisor, Major Finley. The topics were the purposes of C/SCSC and the method of gaining contractor compliance. Data presented was extracted from DoD Instruction 7000.2 (referenced above) and from Air Force Regulation 375-7, dated 27 June 1969, entitled Performance Measurement (PM) for Selected Acquisitions.

The next major section of the case study is entitled "Validation" and was divided into three sub-topics for presentation. The first of these is a brief description

of the validation process, as explained to Captain Blake by a fellow worker, Captain Bradbury. The facts presented were obtained from the undated U.S. Air Force Systems Command (SCCCB) publication C/SPCS and C/SCSC Validation Process Brief. As in previous areas, the amount of detail to include was determined by review of the learning objectives of the case with regard to this area. The second sub-topic in the section presented the first actual data from the B-1 SPO used in the case. This was done by having Captain Blake and his co-worker, Captain Bradbury, review briefly the C/SCSC information system description of the contractor. Information presented was taken from the North American Aviation Division of North American Rockwell, as presented in their publication Compass: LAD Program Planning and System Control. The final sub-topic in the "Validation" section is the Report of Cost/Schedule Control System Demonstration, dated December 1970, written by the Validation Team on the North American system validation review. Actual data presented consisted of the C/SCSC Demonstration Review Checklist, to illustrate the scope of the validation effort, and a single example of supporting exhibits and narrative justification for one item on the checklist. The illustrative item chosen, checklist item 1.b. of the organization criteria, was selected because it is representative of supporting documentation in general and not particularly lengthy. In this section of the case,

as in others, the actual data was used primarily to lend authenticity to the case and to solicit interest from the student through association of the case with the B-1 Manned Bomber, a topic of inherent interest to most Air Force officers.

The final major topic area of the case is Surveillance. It was included in the context of an orientation visit by Captain Blake to the Air Force Plant Representative Office (AFPRO) serving the contractor. There, in the case context, Mr. McDonald of the AFPRO Production Division explained the surveillance function. In a subsequent subtopic of this section, the Work Breakdown Structure (WBS) was explained and the interlocking relationship was illustrated. Finally, this section contained an illustration of a Cost Performance Report and an explanation of the data thereon. The data presented was changed from actual at the request of the B-1 SPO but the form and format were retained from the original.

The final two portions of the case are discussion questions on the material presented and suggested answers for the questions. The questions were developed from the learning objectives of the case and the answers from material presented therein. Each is designed to generate discussion including the main points of the related objective(s). The questions were so constructed that the answers to each could be found in the case or inferred from information presented therein.

Validation data. The data needed for this area of the paper was used in testing the hypothesis presented in Chapter 1 (page 8), that a sample group of Air Force officers who had used the case study would score significantly higher on an examination of the topic than would a similar group who had had C/SCSC presented to them through a classroom lecture. This data was collected by developing the test questions in Appendix C and administering the resultant examination to two selected groups of officers. The first group consisted of ten randomly selected officers from Graduate Logistics Class 721 of the Air Force Institute of Technology, School of Systems and Logistics. Upon their completion of the Financial Management Course (M.S. 5.22), which was taken during their first quarter (8 March - 14 May 1971), the test was administered to them. This group had received their instruction concerning C/SCSC through the classroom lecture presented in the aforementioned course. The second group consisted of a group of ten officers who were, at that time, faculty members of the School of Systems and Logistics. This group worked through the case problem and was then given the same test as the first group.

The examination consisted of twenty-five multiple choice questions, with a possible value of four points each, for a total of one-hundred points. In scoring the results, the full four points were given for a correct answer and no

points were given for any other choice. Total score was calculated for each individual tested by multiplying the number of correct answers by four. The resultant scores were used in the statistical test of hypothesis described in Chapter 3.

#### Data Collection Techniques

To a large extent data collection techniques were discussed in the foregoing sections of this chapter. However, the following points are deserving of emphasis or summarization.

Data used in the case study was selected based on the author's judgement of its usefulness in illustrating points related to the desired learning outcomes of the case. As such, it should not be viewed by the reader as comprehensive, nor should its selection be considered to be random. Since the case was designed to be a relatively short introduction to, and overview of, the main points of C/SCSC the data was often edited to retain only that which was considered to be essential.

Data collected for purposes of the statistical test of the usefulness of the case, however, was strictly controlled to eliminate bias wherever possible. Randomness of both groups to be tested was assured by selection through use of a random number table. Potential group members were polled in advance of group selection and eliminated from consideration if they professed prior knowledge of C/SCSC

and/or SAIMS. Members of both groups were selected prior to the time C/SCSC was presented to them and were told in advance they would be asked to take a test. This was considered necessary since those taking the case approach would necessarily have to know the purpose in advance and it therefore seemed that the members of the other group should have similar advance warning of the impending "test."

In addition to the completion of the test itself, the group of faculty members were also asked to provide answers to several short questions shown in Appendix C to this paper. These questions, four in number, were used by the author to identify weak areas in the case and to gain initial evaluations of the difficulty and time requirement of the case. Answers to these questions were considered and evaluated by the author and, when suggestions seemed warranted, appropriate changes were made to the case.

## Chapter 3

### ANALYSIS AND HYPOTHESIS TESTING

The objective of the statistical tests performed was to be able to make inferences as to the possible validity of the case study developed. The method selected to accomplish the objective was to develop a multiple choice examination covering the topics of the case and administer the exam to two sample groups, one of which had studied the case. Since the case was developed for use in the Financial Management course at the Air Force Institute of Technology, School of Systems and Logistics, the most useful test of validity was considered to be one which would compare examination results of students of the course to another group. The two sample groups were therefore chosen to be: (1) a group of ten students who had completed the aforementioned course, and (2) an equal sized group who had not taken the course but had studied the case.

Since the course students are primarily officers in the U.S. Air Force, the group to study the case was also limited to Air Force officers. Both populations were further defined to exclude officers professing prior knowledge of the subject matter of the case.

Availability of prospective participants for inclusion in the group to cover the case was limited. The decision was therefore made to draw members of the "case" group from the faculty of the School of Systems and Logistics. This decision resulted in a group composed primarily of holders of Doctoral degrees. Consideration was therefore given to the possibility that comparison of results of one group composed of members holding Doctoral degrees to another group composed of Masters degree candidates might bias the test. After due consideration, it was decided the results would not be significantly biased by the educational difference of the two groups. Other factors entering into this decision were: (1) the Financial Management course devotes approximately ten weeks to the study of Financial Management in the Federal Government, (2) several class meetings of the course are directed to topics related to case material, (3) the faculty group would be expected to spend one to two hours covering the case, and (4) the student motivation to learn the material offered in the course would be expected to be greater than the motivation of the faculty group, since members of the latter group are extremely busy and have no particular personal interest in the outcome of the exam. The result of considering all factors is the conclusion that any excess learning ability of the faculty group over the student group should be sufficiently offset by increased motivation of the

student group. The groups were selected and the test completed based on this assumption.

#### Selection of the Statistical Test

The method employed to test a hypothesis similar to the one stated in Chapter 1 (page 8) is use of a statistical test to determine whether or not results of the two samples were likely to have come from populations which are the reverse of the predicted difference. One of the most powerful tests to accomplish this is the  $t$  test, applied to the sample means. However, one of the assumptions necessary for this test is normality of the populations from which the samples were drawn. There was no available evidence to justify assumption of normality in this test. Considerations of time and the limited number of faculty members available to participate precluded drawing a sufficiently large sample to take advantage of the central limit theorem. It was, therefore, decided that a non-parametric test would be appropriate.

The Mann-Whitney test and the Kolmogorov-Smirnov two sample test both provide a suitable nonparametric method of making the intended test. Of the two, the Kolmogorov-Smirnov test provides the higher power-efficiency for small samples. It was therefore chosen as the test to be used.

Description of the Kolmogorov-  
Smirnov Test

The Kolmogorov-Smirnov two sample test determines whether two independent samples were drawn from populations having the same distribution. The one-tailed version of the test may be used to determine whether or not the values of one of the populations are larger than those of the other. Specifically, the test has been suggested as appropriate for determining whether or not scores of a test group are higher than those of a control group.<sup>1</sup>

Methodology employed in applying the Kolmogorov-Smirnov test may be summarized in four steps:<sup>2</sup>

1. Results from the two groups are arranged in a cumulative frequency distribution, using the same intervals for each.
2. At each point in the above distribution, the difference between the groups is calculated by subtraction.
3. The largest difference in the predicted direction (for a one-tailed test) is determined by inspection.
4. For sample sizes less than forty-one, published tables are used to determine significance of the observed differences.

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<sup>1</sup>Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences, (New York: McGraw-Hill, Inc., 1956), p. 127.

<sup>2</sup>Ibid., p. 135.

### Analysis of the Examination Results

The results of the examination of the two sample groups are shown in Table 1. The scores displayed were calculated by multiplying the number of correct responses times four. Maximum score possible was one-hundred. The methodology previously discussed was applied to the ordered data shown in the table.

Table 1

#### Ordered Scores of the Sample Groups

Non-Case Group Scores	Case Study Group Scores
8	32
8	60
8	64
8	68
20	68
24	72
24	72
28	84
48	84
48	92

The statistical test was performed to accept or reject the null hypothesis, which is: The group of officers who studied C/SCSC without the use of the case study will score as high or higher on the examination than the group who did use the case.

The alternate hypothesis is: The group of officers who studied C/SCSC by use of the case study will score

15-718  
higher on the examination than the group who did not use the case.

The significance level set for rejection of the null hypothesis is .05. Reference to Table L in the Siegel text showed the critical  $K_D$  value to be six, where  $K_D$  is the maximum difference, in the predicted direction, between the two cumulative distributions. Thus, a calculated value of  $K_D$  which is equal to or greater than six allows rejection of the null hypothesis, while a calculated value less than six does not.

The cumulative step functions for the two distributions were calculated by the method described in Appendix E. Results of the calculations are shown in Table 2. The largest difference in the predicted direction is ninetenths, as indicated in the table. The numerator of this difference is taken as the calculated value of  $K_D$ . Therefore,  $K_D = 9$  is the value to be compared to the critical  $K_D$  value (6). Since the calculated value is larger than the critical value, the null hypothesis is rejected.

At the .05 significance level, the conclusion is the sample group of officers who did not use the case study was not drawn from a population scoring as high or higher than the population of the sample group which did use it.

Table 2  
 Cumulative Step Functions for Scores  
 of the Sample Groups

		Portion of Group Scoring Less Than:									
		10	20	30	40	50	60	70	80	90	100
Case	--				1/10	1/10	1/10	5/10	7/10	9/10	10/10
Group	--			--	1/10	1/10	1/10	5/10	7/10	9/10	10/10
Non-case	4/10	4/10	8/10	8/10	10/10	10/10	10/10	10/10	10/10	10/10	10/10
Group	4/10	4/10	8/10	8/10	9/10	9/10	9/10	5/10	3/10	1/10	0
Difference	4/10	4/10	8/10	7/10	9/10	9/10	9/10	5/10	3/10	1/10	0

## Chapter 4

### CONCLUSIONS AND RECOMMENDATIONS

The purpose of this research effort was to develop a case study based on the Cost/Schedule Control System Criteria (C/SCSC) as applied by the B-1 Systems Program Office. To that end the case included as Appendix B was developed. To guide the endeavor three research questions and one hypothesis were developed. The conclusions in this thesis are related to the subjects therein.

#### Research Question #1

Can the Cost/Schedule Control System Criteria be presented in a comprehensive, self-contained case study?

The case developed in the course of this research effort does present the Cost/Schedule Control System Criteria within the case context. It is comprehensive, in that explanations and illustrations of the criteria, related systems, and major processes involved in application of C/SCSC to an acquisition are all included in the case. Finally, since the case does not rely on availability of manuals, regulations, or other publications, it is self-contained. Accordingly, this research question is answered affirmatively.

Research Question #2

Can such a case study be developed based on an actual C/SCSC application?

Throughout the case, topics explained are illustrated by examples drawn from the B-1 SPO application of C/SCSC to the North American B-1 contract. The basic framework of the case is the sequence of events followed by the B-1 SPO in establishing C/SCSC as the basis of performance measurement on the contract. It is therefore valid to conclude that an application of C/SCSC can be used as the basis of a case study.

Research Question #3

Would such a case study be useful in imparting basic understanding of the C/SCSC system, methods, and procedures?

To facilitate evaluation of the extent to which the case study imparts understanding of C/SCSC an examination was developed and administered. The scores of two independent samples of Air Force officers were analyzed to test a hypothesis related to the research question. The hypothesis tested was: A sample group of officers who had used the case study would score significantly higher on an examination consisting of questions pertaining to C/SCSC and SAIMS than would a similar group who had the subject presented to them through a classroom lecture.

Two sample groups were chosen and the examination in Appendix C was administered to members of each. The

results of the examination, significant at the .05 level, support the hypothesis stated above. The case is therefore accepted as a useful educational vehicle in this regard.

#### Recommendations

Based on the conclusions of the research effort it is recommended the case study in Appendix B be incorporated into the Financial Management course at the School of Systems and Logistics, Air Force Institute of Technology. Also recommended is repetition of the statistical validity test of the case subsequent to the first offering in which the case is used. The examination in Appendix B should be administered to students of the class and their scores used to construct a cumulative step function, as explained in Appendix D. The results should be compared to those of the Financial Management students of Graduate Logistics Class 72A, who comprise the non-case study group in Chapter 3. Further use of the case should consider the results of tests between the two student groups as well as the instructor's evaluation of the level of understanding achieved by the two groups.

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Appendix A

CASE STUDY OUTLINE

## CASE STUDY OUTLINE

### The B-1 Manned Bomber Case

- I. INTRODUCTION
  - A. Background
  - B. Learning
- II. THE B-1 SYSTEM PROGRAM OFFICE
  - A. The SAMS Briefing
    - 1. Economic Information System (EIS)
    - 2. Cost Information Reports (CIR)
    - 3. Contract Fund Status Reports (CFSR)
    - 4. Performance Measurement System (PMS)
  - B. The Cost/Schedule Control System Criteria
    - 1. Organization criteria
    - 2. Planning and Budgeting criteria
    - 3. Accounting criteria
    - 4. Analysis criteria
    - 5. Revisions criteria
  - C. Objectives of the Systems
- III. VALIDATION
  - A. The AFSC Validation Brief
  - B. COMPASS
  - C. The North American Demonstration Report
- IV. SURVEILLANCE
  - A. The Surveillance Program
    - 1. Reconciliations
    - 2. Organization
    - 3. Planning and Budgeting
    - 4. Accounting
    - 5. Analysis
    - 6. Revisions

- B. The Work Breakdown Structure
- C. Performance Measures

V. DISCUSSION QUESTIONS

VI. SUGGESTED ANSWERS

Appendix B

THE B-1 MANNED BOMBER CASE

## THE B-1 MANNED BOMBER CASE

### Introduction

This case has been developed specifically for use in the Financial Management course (M.S. 5.22) at the School of Systems and Logistics. It is intended as an introductory overview of the Department of Defense (DoD) Cost/Schedule Control System Criteria (C/SCSC) and the environment within which it is used. References to the B-1 System Program Office (SPO) and to the data from the North American Rockwell contract are for illustrative purposes only and should not be taken as factual representations of the state of the contract. Much of the data presented has been changed to make it suitable for illustrative purposes but basic form and format has been retained.

### Background

During the years from the end of World War II to the mid-1960s rapid technological change and the cold war requirement for a standing military force combined to produce a rapidly expanding defense industry. Larger and more complex weapons/support systems costing millions of dollars contributed to a rapid expansion of the defense budget. As DoD competed for larger shares of the Federal

tax dollar both congressional and public pressure increased demands for better management of the defense dollar.

In response to demands for better management and increased visibility into the uses of tax dollars on large defense contracts, numerous management information systems were developed and imposed on contractors. Many of these systems met some degree of success but, even so, disastrous cost overruns and schedule slippages continued to occur with embarrassing regularity. Further, the major defense industry contractors began to complain that DoD was preempting their management prerogatives by imposing detailed and overlapping systems on them.

In response the Air Force Systems Command (AFSC) in 1962, adopted the Work Breakdown Structure (WBS) concept developed by the Navy in 1958 for their Polaris missile project. AFSC augmented WBS with a concept whereby the contractor would be allowed to develop his own management system, designed around the WBS, which would have to meet certain specified minimum criteria of acceptability. Based on demonstrated success of the new system AFSC published its Cost/Schedule Planning and Control Specification (C/SPACS) in June 1966.

In August 1966, the then Secretary of Defense, Robert S. McNamara, launched the DoD Resource Management System (RMS) with the issuance of DoD Directive 7000.1. RMS was an attempt to improve financial management throughout all phases of resource acquisition, utilization, and

retirement. Implementation in the acquisition phase was begun in December 1967 with the issuance of DoD Instruction 7000.2 entitled "Cost/Schedule Control System Criteria" (C/SCSC). This instruction adopted AFSC's C/SPCS for DoD wide use. It is this system that is discussed in the remainder of this case.

#### Learning Objectives

C/SCSC and the Selected Acquisition Information Management System (SAIMS), of which it is a portion, are complex interlocking financial management systems designed to provide the DoD manager with the tools with which he can manage. To do so they provide for furnishing needed information to managers at all levels of the Federal Government. In many instances, they are necessarily detailed and a thorough working knowledge of them comes only with months or years of experience. This case and the course in which it is used cannot possibly achieve that level of detail in the time available. The intent is, therefore, to provide the student an overview or framework on which to build in the future. Accordingly, the following objectives have been developed to aid the student in recognizing the desired level of knowledge and understanding.

Upon completion of this case the student should:

1. Know what the Selected Acquisition Information Management System (SAIMS) is, know how it is organized, and recognize its position as a part of FSC.

2. Understand the need and reasons for SAEMS existence.
3. Know the four major sub-systems of SAEMS and understand the purpose of each.
4. Know the five areas of the Cost/Schedule Control System Criteria and understand the specifications made by each.
5. Understand the Work Breakdown Structure concept, the earned value concept, and the reasons for their use.
6. Know the major events and chronological sequence of their occurrences in a C/SCSC application.
7. Know the functions served by Validation and Surveillance and understand the reasons for them.
8. Understand DoD/Air Force policy concerning application of C/SCSC.

#### The B-1 System Program Office

Captain James Blake had reported to the SPO only a few days before. As a procurement officer in the Air Force Logistics Command, he had heard of SAEMS and C/SCSC but had only a brief acquaintance with either. He was, therefore, somewhat uneasy upon learning he would be very much involved with both in his new position as one of the contracting officers for the SPO. He was pleased when his new supervisor, Major Finley, told him to attend a briefing

by Captain Bradbury of the SPO Program Evaluation Division. The Briefing was an informal one which Captain Bradbury often gave for new officers at the SPO.

#### The SAIMS Briefing

As the briefing began, Captain Blake took notes on the significant points covered. Captain Bradbury introduced his presentation with a short history of the development of the Resource Management System (RMS) by DoD. He then explained how RMS is divided into four groups of systems, each with a different area of concern. SAIMS, he continued, was a part of the Acquisition Information and Management System (AIMS) portion of RMS. To illustrate, he showed a chart such as the one in Figure 1, on page 40.

The chart showed AIMS to be one of two systems for management of assets. Captain Bradbury explained the Inventory Management System was for management of assets already in the DoD inventories and AIMS was for those still in the acquisition phase. Since information inputs to AIMS originate with the contractors rather than within DoD, special systems are required to control the type and quality of the data. These systems, he said, were the Selected Acquisition Information Management System (SAIMS), for major acquisitions, and a collection of others known as Other Capital Acquisitions for smaller procurements. Captain Bradbury next addressed SAIMS and the systems that are a part of it. He explained that SAIMS is the major

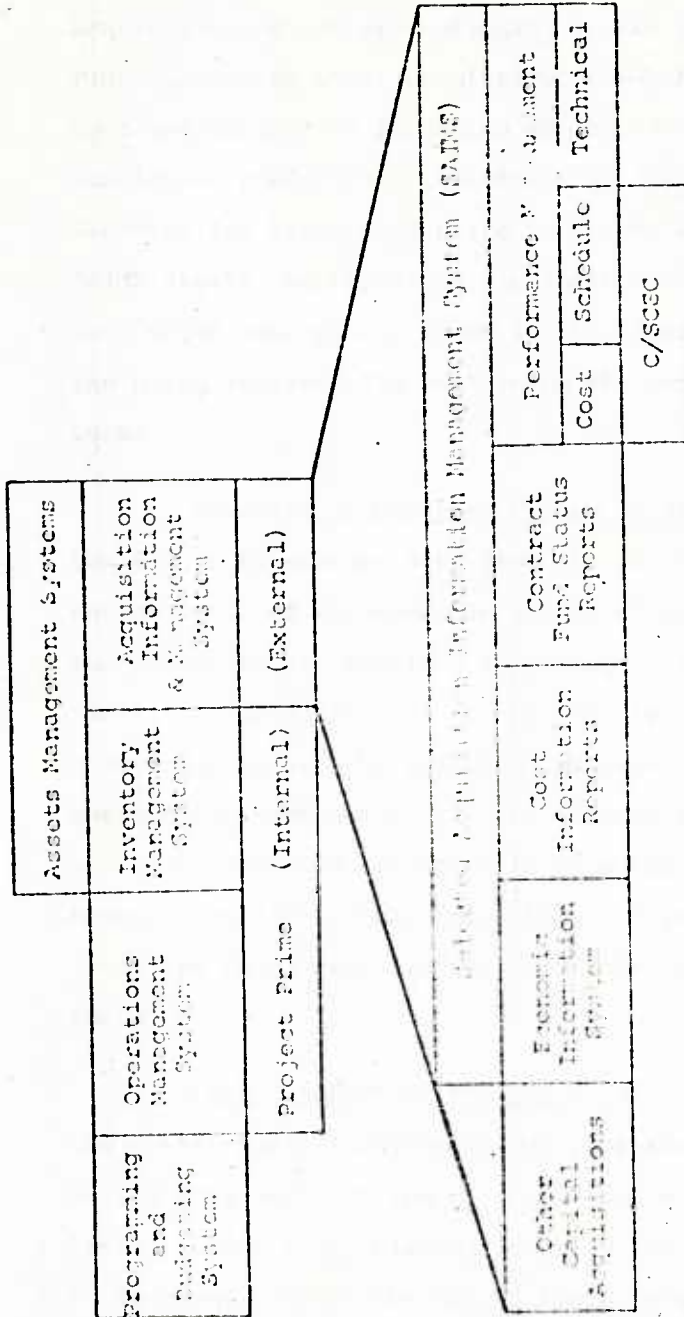


Figure 1<sup>a</sup>

Component Sub-Systems of the DoD Resource Management System

<sup>a</sup> General Electric Company, "Why, What & How of C/SCSC," Aerospace Management, 1969 Volume 4, Number 2, p. 15.

information is used to build a data base accessible to procurement offices throughout DoD. Information from the file is used to support cost estimating, programming, and budgeting for procurement of future systems.

Contract Fund Status Reports (CFSR). The CFSR extracts data from the contractor's information system relative to funding requirements of the contract. Actual costs the contractor has incurred in performing contract work and applied to the contract cost accounts are reported, as are projected costs to be incurred and applied in the future. The costs are time phased in the report to indicate which fiscal quarter the contractor expects to bill the Government. Information on the report is used by the Systems Program Office to update forecast fund requirements, to aid in planning and decision making on changes affecting the requirement for funds, and to develop fund requirements and budget estimates to support approved programs.

Performance Measurement Systems (PMS). The PMS is a collection of three areas of performance covered by two different systems. The performance areas, as indicated in Figure 1, are cost, schedule, and technical. The systems are the Cost/Schedule Control System Criteria (C/SCSC) for cost and schedule performance, and System Engineering Management (SEM), for technical. The C/SCSC, which are not covered in detail in this briefing, provide the basis for

assuring that data on the contractor's EIS, CIR, and CFSR reports are valid and compatible with internal DoD information systems. It also provides the basis by which the Air Force can measure the contractor's progress in meeting the contract work schedule and provides a method to identify cost overruns and underruns on the work being done. The technical sub-system, SEM, requires the contractor to interface the technical performance aspects of the weapon or support system with the C/SCSC. It also provides the basis for validating his own System Engineering Management program.

The Cost/Schedule Control System  
Criteria (C/SCSC)

After the SAIME briefing ended, Captain Blake asked Captain Bradbury to explain the C/SCSC in more detail. In response, he explained that C/SCSC is divided into five areas. Each is concerned with a different aspect of the contractor's information system and provides the minimum framework the system must meet to provide necessary information for control and reporting. The five areas together provide the entire set of minimum criteria for the system and thereby assure the data on the reports for EIS, CIR, and CFSR will be adequate. Next, Captain Blake was shown the list of criteria from DoD Instruction 7000.2 (see Attachment #1). Captain Bradbury explained the orientation and major provisions of each of the five areas of the criteria.

Organization criteria. Criteria in this area set minimum standards for the contractor to meet in organizing to perform the work required by the contract. To comply, the contractor must: (1) define all work to be done to support the contract, (2) identify the sub-contractor or element in his own organization that will be responsible for the work, and (3) provide for integration of the work into his organizational structure. The contractor's system is also required to provide for reliable performance measurement once the contract work begins.

Planning and Budgeting criteria. These criteria require the contractor to separately schedule and budget for the elements of work identified under the Organization criteria. They also require that any contingency funds--known as management reserves--be identified and assigned to a specific managerial position for control. Another major provision requires the total of budgeted work and management reserves be used to establish a budget baseline for the contract. This baseline is used later as the basis against which performance is measured.

Accounting criteria. These criteria establish minimum standards for the contractor's accounting system. One major requirement prohibits application of costs to contract cost accounts prior to the accounting period in which work is performed. Another requires all costs incurred--both direct and indirect--to be applied to the appropriate

cost accounts. Finally, the contractor's system is required to provide unit costs for completed units and provide a traceable audit trail that can be used to verify those costs.

Analysis criteria. This area consists of criteria establishing management analysis standards for the contractor's information and management systems. They are still referred to as "reporting" criteria in the DoD Instruction but are most commonly known as "analysis" criteria. The basis for analysis is provided by requiring the contractor's system to provide monthly totals of costs in three categories. First, total budgeted costs for work scheduled to be completed must be available for each work element or package. Next, total budgeted costs for work actually performed on each work package must be available. Finally, actual costs incurred in performing the completed work must be collected and totaled for each work package. The contractor is then required to analyze variances calculated from these totals. Actions to identify and correct problems that created the variances are also required. As an example, suppose a particular work package was scheduled to be completed in the past accounting period. Assume the budgeted cost for it was \$10,000. If the work were only 80 percent complete at the end of the period, the contractor would calculate a schedule variance by subtracting the Budgeted Cost of Work Scheduled (BCWS) from the Budgeted Cost of Work Performed (BCWP). The BCWS is \$10,000 and the BCWP \$8,000

(80% x \$10,000). The variance of \$2,000 is negative, indicating it is unfavorable. Similarly, if cost accounts showed the work actually performed cost \$8,500, the contractor would calculate a cost variance. In this case, the variance would be the BCWP, which the budget indicated the work should have cost, minus the Actual Cost of Work Performed (ACWP), which is what it did cost. The difference is -\$500 (\$8,000 - \$8,500) and is again negative and therefore unfavorable. Similar variances would be calculated for each element of work that had a separate budget established and the contractor would be required to identify the reasons for the variances and either explain them or, if appropriate, initiate action to correct the problems that caused them.

Revisions criteria. The final area of the criteria deals with maintenance of the budget baseline established under the Planning and Budgeting Criteria. During contract performance contract changes may change the work required. Similarly, the contractor may replace portions of the work as it progresses and thereby change work schedules or assignments. The revisions criteria require that he separately budget the effects of these changes, whether positive or negative, and integrate them with the original budget. Changes requiring added work and cost are added to existing budgets and those reducing work subtracted. In either case, the budgets before and after a change must be reconciled to show that revisions are clearly a result of the

changed work requirement. This is necessary to insure continuity of the budget baseline is not lost due to inability to trace the effects of changes. The contractor is prohibited from using previously budgeted amounts to perform work resulting from the change or new budgets to cover previously authorized work. Retroactive changes to cost accounts are prohibited to avoid performance of work in anticipation of a contract change. Otherwise, contractors might request changes and then proceed with the work. Then, if the Government refuses the request, it is too late because the work is already done. The contractor may not be paid for the unauthorized work but might have to undo its effects before proceeding, thus causing a delay in work completion. The final requirement of the criteria is for the contractor to project the effects of changes and cost variances to give a revised estimate of the total contract price at completion of all work. These projections must be reconciled with the budget, the contract price, and the funding requirements shown on the Contract Funds Status Report for the period.

#### Objectives of the System

When Captain Bradbury finished his explanation of the Cost/Schedule Control System Criteria Captain Blake returned to his own office. He felt he had learned a great deal about C/SCSC but still did not fully understand the reasons for its existence or just how contractor compliance was enforced. He therefore asked Major Finley to explain these aspects of the system.

Major Finley began by explaining that the primary purpose of the Cost/Schedule Control System is to provide a method acceptable to both industry and the Government whereby an acceptable basis for performance measurement can be established. The criteria are not an end in themselves but simply a method by which both parties can be assured that information from the contractor's management control system will be sufficient to permit managers on both sides to perform their jobs. Neither the Government nor industry believes it is appropriate--or even feasible--for a standard system to be developed and forced on all contractors because internal conditions and requirements are varied. The Government, however, must be assured that a contractor's system is acceptable and data from it not misleading or inadequate. One way to serve both purposes is to specify minimum standards and general guidelines for the system to meet. This is what has been done with C/SCSC.

To insure contractor compliance, the criteria, in an expanded form, are included as an annex to the Request for Proposals (RFP) issued to prospective contractors. The RFP requires each responding firm to design an information system in compliance with the annex. Government personnel evaluating proposals consider each prospective contractor's system as one factor in determining which will receive the contract. Other factors, such as weapon system design and proposed price, are also considered and a contract is awarded.

to the firm that meets all requirements at the lowest price. The contract incorporates the requirements of the original RFP and thereby contractually requires the contractor to comply with the criteria. The Air Force then reviews the contractor's management information system in detail and, if it meets the criteria in all respects, validates it. One contract provision requires the contractor to include C/SCSC requirements in major subcontracts identified by the SPO and contractor as critical to the overall program. Subcontractors are then required by their contract with the prime to design and implement an acceptable system, unless they have previously done so. Government personnel also review and validate the sub-contractors' systems, since competitive considerations usually prohibit allowing the prime contractor access to internal records.

At this point Captain Blake interrupted and asked Major Finley how and why the Air Force validates the contractor's information system. Major Finley suggested that he postpone the explanation until the next day and arrange to have Captain Bradbury explain it, since he had been on the Validation team for North American.

#### Validation

The next morning when Captain Blake came in, he went straight to Captain Bradbury's office. Captain Bradbury was waiting for him with an array of documents and papers concerning the validation process, the North American

information system (known as "COMPASS"), and results of the validation demonstration accomplished after the contract was awarded. As the two men reviewed the documents, Captain Bradbury explained the major points of each.

#### The AFSC Validation Brief

The first document was an Air Force Systems Command Brief on the C/SCSC Validation process. Captain Bradbury pointed out that the Brief was the major guide used in validating a contractor's system. It began with a statement of purpose for the validation process. Assurance that the contractor's system would comply with the criteria was one of several objectives. Others were: (1) insurance of an effective operating cost/schedule control system by the contractor, (2) development of understanding of the contractor's system by government personnel, and (3) development of a trained government staff who would be familiar with contractor management operations and the use of performance measurement data.

The Brief also included a milestone list of the events leading to validation of the contractor's system and an explanation of the process. There were eleven milestones, covering a period of nearly three-hundred days (see Figure 2, on page 51).

The validation process begins before contract award when a pre-award system design review is held for prospective contractors. At this meeting they are briefed on the

The following is the sequence of events leading to validation of the contractor's system.

	Approx. No. of Calendar Days Between Phases
1. DoD Program and Contractors selected for application of AF C/SPCS or DoD C/SCSC	(Variable)
2. Pre-award management control system design review	(Variable)
3. Contract award.	(Variable)
4. Start preliminary validation testing (pre-demo).	90
5. Start validation testing (demo).	15
6. Complete validation testing.	30
7. Report written and placed in coordination	30
8. Report submitted to contractor	30
9. Fix-it conference (plan and schedule discussion).	60
10. Redemonstration and/or Maintenance and Surveillance Program	10-30
11. Final Report	10

Figure 2<sup>a</sup>

Milestones in the Validation Process

<sup>a</sup>U.S. Air Force Systems Command (SCSC), C/SPCS and C/SCSC Validation Process Brief, (undated), pp. 2-3.

requirements their information systems must meet to be acceptable. Questions are answered and every attempt is made to assure that prospective contractor's understand what is required. After proposals are received and the contract is awarded, the successful contractor's system is reviewed in more detail by the SPO and obvious deficiencies are pointed out so they may be corrected before the Validation review. Validation testing then begins. The demonstration team, consisting of about twenty members from the SPO, the Air Force Plant Representative Office (AFPRO), and the Defense Contract Audit Agency (DCAA); travels to the contractor's facility and spends thirty days observing the management control and information system in operation. When this period is complete the team withdraws from the contractor's facility to write the demonstration review report. After the report is written and coordinated with the SPO Director, the report is final and constitutes validation of his system. Otherwise a fix-it conference is held to explain deficiencies. The contractor is given time to make necessary changes and a redemonstration is held. In the redemonstration, changed portions of the system are observed to determine if they meet the criteria. This process is repeated until all criteria are met. The final report is then issued validating the system.

As Captain Bradbury completed the AFSC brief he commented that the North American (NA) system, called

"COMPASS," was validated on the first try. He also said one of the pamphlets contained a description of the NA system.

### COMPASS

The pamphlet on COMPASS was published by North American to explain the program planning and control system used on defense contracts. The system was summarized under three headings: Planning, Authorizing, and Controlling.

The first of these, Planning, takes place primarily before contract award and consists of breaking the work down into individual parts and identifying who is to do what and when and how it is to be done. This is begun by examining the schedule of items and work statement in the Request for Proposals. Each item is divided into the products and services necessary to produce it. These are then subdivided into work packages which result in a Work Breakdown Structure (WBS) resembling an organization chart (see Attachment #2). Use of the WBS, Captain Dradbury explained, is required by the Organization criteria. The Government provides the top three levels in MIL-STD-881. Possible Level 1 elements are Aircraft, Electronics, Missile, Ordnance, Ship, Space, and Surface Vehicle systems. The Level 1 WBS element on the NA contract is "Aircraft System." Levels 2 and 3 are also provided in the MIL-STD. The contractor must continue the breakdown to the work package level. Each entry on the WBS is then assigned to an organizational element that will be responsible for its

accomplishment. This enables responsible managers to plan how and when their work packages will be performed, subject to control of the program manager.

Once the contract is awarded work may commence. Work authorizations are issued to functional managers at the appropriate times to assure timely completion of work packages. Controlling, the third phase, then begins. On a monthly basis, each manager reports the status of his work packages. These status reports are used by the Program Manager to calculate and report variances in cost or schedule. The reports go both to the managers responsible, and, in summarized form, to the Government.

#### The North American Demonstration Report

The last document Captain Bradbury examined was the demonstration report from the North American validation. The report was in three sections, the first of which was Findings and Recommendations. This part was a fifty page summary of the team findings. Based on their findings, the validation team recommended that the contractor's system be validated. With the approval signatures affixed, this section of the report constituted the official final report sent to the contractor as evidence of validation. As long as the contractor maintains the information system as described in the report it need not be revalidated--even for a future contract requiring C/SCSC.

Section II of the report--some 270 pages long--consisted of the validation checklist audit and supporting exhibits. Captain Bradbury pointed out that the validation team had used the Air Force Systems Command's "Demonstration Review Checklist for C/SCSC" in conducting the review (see Attachment #3). The checklist contains entries for each of the criteria and provides space for team members to indicate whether or not the contractor's system complies. The remarks column is used to reference supporting exhibits for each item. As an example of the supporting documentation, Captain Bradbury cited paragraph 1.b. of the organization criteria, on page 1 of the checklist. Exhibit I-1, cited opposite that item of the checklist, and the accompanying verbal comments (Attachment 3, pages 9 and 10) are typical of the documentation for most checklist items. He also cited items 1.c., 2.a., 2.b., 3.d., 4.a., and 6.c. of the organization criteria as entries validated by detailed reviews of the contractor's system description documents and, where appropriate, by verifying the existence of internal procedures to assure compliance with the criteria. Other checklist items, such as 1.a., 1.b., 1.c., 1.d., 1.e., and 2.a of the accounting criteria are validated by beginning with source documents and tracing them through the system to verify appropriate processing. Copies of the documents and detailed write-ups of the processing are included as supporting exhibits to justify the conclusions and recommendations.

Section III of the validation report contains copies of the source documents reviewed and the original worksheets used by team members during the validation review. It is retained by the SPO Performance Measurement Division as detailed documentation for the first two sections.

At this point all of the documents had been reviewed. The discussion ended and Captain Blake started back to his office. He was beginning to understand the criteria and the process that occurred in applying them to a program. However, he still wanted to review some of the reports and have them explained. Major Finley later suggested postponing review of the reports until the orientation trip to the AFPRO the following week. There he would not only see the latest reports, but also observe the AFPRO surveillance activities.

#### Surveillance

A few days later Captain Blake arrived at the North American (NA) plant at Los Angeles International Airport, the home of the Los Angeles Division. He was met by Mr. McDonald of the AFPRO Production Division, who took him to the AFPRO offices. Mr. McDonald was one of several production men who worked primarily on the NA contract and had been asked to explain the AFPRO surveillance program to Captain Blake.

### The Surveillance Program

Mr. McDonald began by explaining the surveillance program had been provided for in the original DoD Instruction establishing the performance measurement system, of which C/SCSC was a part. According to the Instruction, surveillance was to be a continuing effort of auditing, monitoring, and reconciling the contractor's system and records. AFR 375-7, he said, had further defined the surveillance effort as being similar to the demonstration reviews for validation, but more limited in scope. The same regulation assigned primary responsibility for surveillance to Air Force Systems Command (AFSC). AFSC, in turn, assigned this function to the Air Force Contract Management Division, to accomplish through the APPRO. The result is a surveillance effort accomplished primarily by the APPRO or, if no APPRO is available, by the cognizant Defense Contract Administration Services Office. In either case, the Defense Contract Audit Agency assists the surveilling activity whenever an audit capability is required.

Mr. McDonald went on to explain Air Force Contract Management Division (AFCMD) Regulation 170-4 which specified APPRO responsibilities and outlined tests, checks, and reconciliations to be accomplished. The program actually began, he said, before the contract was even awarded. When the APPRO received word the contractor was designing a system to be validated status monitoring was begun. Then, after contract award, the APPRO had personnel on the validation

team and participated actively in the validation review.

After validation is accomplished, the continuing surveillance effort begins. Tasks in this area, in addition to general assistance to the contractor, fall into six categories. The AFCD regulation contains chapters prescribing detailed tests and checks for each.

Reconciliations. This section requires implementation of procedures to assure reports from the contractor reconcile to one another and to his internal reports. Also specified are checks to verify that reports emanate from the validated system. This insures the contractor does not operate one system for Government reports and a different one for his internal management. Reports reconciled include the Contract Funds Status Report, Cost Information Reports, and Economic Information System reports, all of which are generated from SAIMS requirements, but are not actually a part of C/SCSC. They do, however, use information from the C/SCSC system and therefore need to be reconciled against system data.

Organization. This chapter of the regulation requires the AFPRO to ensure the contractor's organization structure continues to comply with the criteria. Continuing analysis also assures the Work Breakdown Structure is kept current as changes to work specifications occur. Finally, checks are prescribed to ensure continued compliance

of contractors' subsystems, such as his scheduling and work authorization systems. If the contractor implements procedural changes the AFPRO must review them for compliance.

Planning and Budgeting. This chapter provides guidelines for ensuring continued compliance with the Planning and Budgeting criteria. AFPRO personnel review the contractor's scheduling and budgeting documents and, when possible, attend schedule and budget meetings held by the contractor for operating managers. Observations of actual beginning and ending dates are made and later compared to contractor records to assure accurate recording. The contractor's response to ahead or behind schedule conditions is observed as is his capability to identify and resolve scheduling problems. Finally, spot-checks are made to assure use of variance analysis to identify problems or potential problems.

Accounting. Tests prescribed in this chapter determine whether or not the contractor's system continues to comply with the accounting criteria. Entries to contract cost accounts are verified to be certain costs were actually incurred and are chargeable to the contract. Other checks ascertain whether or not the costs are identified to the correct WBS elements. Indirect costs, such as executive salaries and other similar entries to overhead accounts, are checked to be certain of proper allocation to contract cost accounts. This insures the Air Force is charged for

its fair share of those costs but not for portions which should be charged to commercial work.

Analysis. Provisions of this chapter require the AFPRO to assure continued performance analysis capability is maintained by the contractor and to verify the correctness of his analysis. Various checks of the system assure correct identification of the Budgeted Cost of Work Scheduled, Budgeted Cost of Work Performed, and Actual Cost of Work Performed for each work package of the WBS. Further checks verify calculated variances and determine whether or not explanations and follow-up action were adequate.

Revisions. The final chapter of the regulation provides procedures the AFPRO must use to assure contractor compliance with the revisions criteria. Evaluations to be performed include checks of contractor handling of contract changes to ensure timely and proper incorporation into budgets and schedules. Also included are audits to detect retroactive changes to completed work packages, which are prohibited. Finally, procedures are established to reconcile new budgets to those which existed prior to the change.

#### The Work Breakdown Structure

At the completion of the review of the surveillance regulation Captain Blake asked about the relationship between the WBS and the contractor's organization structure. Mr. McDonald explained how both the WBS and the organization

could be represented by the classical organization charts used by many firms. Then, he said, if one was turned sideways and overlaid on the other, an interlocking matrix would be formed at the lower level. To illustrate he sketched a diagram (see Figure 3 on page 62).

The diagram showed each work package at the lower level of the WBS within one of the lower level organizational elements. A given section usually has more than one work package assigned, often from different branches of the WBS, but each work package is assigned to only one section.

The work packages, Mr. McDonald said, each represent a measureable unit of work assigned at the level where the work will be performed. The packages are clearly delineated and separately budgeted and scheduled. Then, when work begins, actual costs are collected and identified to the proper work package. The contractor can then sum the budgets and actual costs for work packages 1, 2, 3, and 4 in the diagram, for instance, to provide totals for WBS Element A. These could be added to Element B totals to provide figures for Element C and so on, up to the total Aircraft System. This summation is used for reports to the Government, with figures reported for the top four levels of the WBS. As reports are forwarded up the Government chain of command, they are further summarized until DoD officials, as an example, receive only the level one summarization.

The total Budgeted Cost of all work packages on the contract plus management reserves and profit should

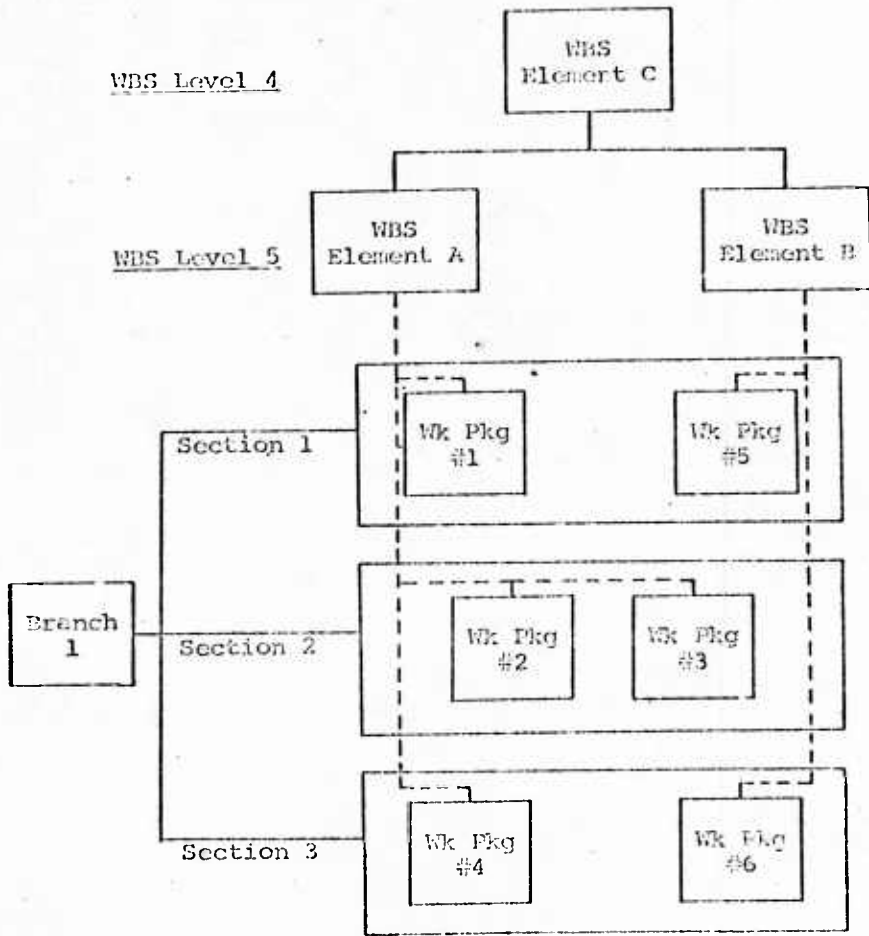


Figure 3

Example Matrix Formed by Interlocking the Contractor's Organization Structure and the Work Breakdown Structure

equal the total contract price at any given time. The management reserves are simply contingency funds the contractor is allowed to assign to some management levels without identifying them to a particular work package. Within the limit of these reserves he can cover small overruns on work packages or unexpected increases in the amount of work necessary to complete a work package.

To go the other direction, the manager of Branch 1 can obtain reports on Section 1 by totaling Work Packages 1 and 5. The manager above the Branch might receive a single summary of all six Work Packages. Any manager may, of course, ask for more detailed reports if his summaries indicate problems are occurring. By analyzing variances a problem can be traced to the work package creating it and corrective action may be initiated.

#### Performance Measures

Since the subject of variance analysis had arisen, Mr. McDonald began to discuss performance measures. Captain Blake was already familiar with the Budgeted Costs for Work Scheduled (BCWS), Budgeted Costs for Work Performed (BCWP), and Actual Costs for Work Performed (ACWP) but had not yet seen how reporting occurred. He was therefore shown part of the latest Cost Performance Report (see Attachment 4).

The report displayed the BCWS, BCWP, and ACWP--both for the latest period and cumulative to date--for a third level WBS element. Fourth level supporting data for the

entry also appeared on the report. Current period and cumulative variances had been calculated and explained. The last items on the report, shown only for the fourth level item, were the approved budget and revised estimate for total cost of the item at completion, as well as the variance between the two.

After the briefing ended Captain Blake spent a few days becoming better acquainted with operations at the AFPRO and the contractor's facility. Then, having collected the latest CFSR and CPR from the AFPRO, he returned home. Upon arrival he took the reports to Captain Bradbury, who told him information would be extracted from the reports at the second WBS level and reported to the SPO Project Manager. Significant variances would be explained and recommendations made for any actions deemed appropriate. These actions, he said, could range from conferences between SPO and contractor management to initiation of contract changes.

As the discussion ended Captain Blake returned to his own office feeling that he was finally beginning to understand SAIMS and C/SCSC.

#### Discussion Questions

When Captain Blake returned to his office Major Finley asked him the following questions about SAIMS, C/SCSC, and performance measurement. If you were Captain Blake, how would you have answered them?

1. What is the relationship between RBS and SAIMS?
2. What are the objectives of SAIMS?
3. What are the major sub-systems of SAIMS? What purposes are served by each?
4. What are the five major areas of criteria in C/SCSC? What are the primary requirements of each?
5. What are the Validation and Surveillance functions? Why are they necessary?
6. What is the primary concept underlying the use of the Work Breakdown Structure? What benefits does the WBS provide for the Government? for the contractor?
7. What are the major DoD/Air Force policies governing administration of SAIMS and C/SCSC? What minimum criterion must a program meet to be subject to these systems?
8. What conditions existed after World War II and up to the early 1960s that led to the development of SAIMS and C/SCSC?
9. Suppose that you were given the information shown below for an element of the WBS. What variances would you calculate from the information? What is the amount of the variances? What do they indicate about the WBS element?

<u>Item</u>	<u>Amount</u>
Budgeted Cost of Work Scheduled	\$ 25,000
Budgeted Cost of Work Performed	23,000
Actual Cost of Work Performed	24,500

Assume that the figures are all cumulative through the latest reporting period.

## Suggested Answers

1. Resource Management Systems (RMS) is the name given to the program begun in 1966 when Secretary of Defense McNamara issued DoD Directive 7000.1. This program, designed to create integrated financial management in the DoD, is composed of four major systems: (1) the Programming and Budgeting System (PBS), (2) the Operations Management System (OMS), (3) the Inventory Management System (IMS), and (4) the Acquisition Information and Management System (AIMS). The latter two are assets management systems, with IMS serving for internal asset management information and AIMS for external. AIMS, in turn, consists of the Selected Acquisition Management and Information System (SAIMS) which covers certain selected major acquisitions, and Other Capital Acquisitions, for the remainder. SAIMS is therefore a sub-system of one of the four major RMS systems.

2. SAIMS has several major objectives which, if met, make it advantageous to both the Government and to the contractor. First, SAIMS is designed to provide an adequate basis for responsible decision making by both contractor management and the responsible DoD component. Second, SAIMS is designed to minimize, to the extent practicable, the data gathering and reporting workload imposed on contractors and in-house DoD activities. Third, SAIMS has an objective of identifying management control

systems and procedures which are most effective in meeting contractor's requirements and encouraging acceptance and installation of those systems and procedures. Finally, SAIMS has an objective of providing integrated financial management reporting of usable summary data for all echelons of internal management. Meeting the latter two objectives allows SAIMS to meet the first two by providing the vehicle for their accomplishment.

3. The four major sub-systems of SAIMS are the Economic Information System (EIS), Cost Information Reports (CIR), Contract Fund Status Reports (CFSR), and the Performance Measurement System (PMS). The primary purpose served by the EIS is to provide data for analyzing the impact of defense spending by industry and by geographic area. The EIS reports are furnished to Congress, DoD, and other interested Federal agencies. Cost Information Reports are provided to the various DoD components to furnish necessary data on estimated and actual costs of the acquisition cycle of completed programs. Data from the CIR are used to build a consistent data base for cost-estimating, programming, budgeting, and procurement of future systems. Contract Funds Status Reports are furnished to the contracting agency through the AFPRO and SPO to provide the necessary data for determining funding requirements by fiscal year for the remainder of the existent program. The Performance Measurement System, encompassing cost, schedule, and technical performance measurement areas, also furnishes data for the

SPO. It is controlled by the Cost/Schedule Control System Criteria (C/SCSC) and Systems Engineering Management (SEM). The former provides data which enables the Government and contractor to maintain visibility into the contractor's progress and position with respect to cost and schedule requirements of the contract. SEM provides visibility into the technical aspects of the contractor's performance. Together the four sub-systems provide a complete, integrated system for control of major acquisitions.

4. The major sections of the Cost/Schedule Control System Criteria and their requirements are:

- a. The organization criteria, which require the contractor to define the required work, segment it into work packages, and assign each work package to a single organizational element within his facility for accomplishment.
- b. The planning and budgeting criteria, which require the contractor to schedule and budget for each work package so actual performance can later be compared to the plan for each individual work package.
- c. The accounting criteria, which require the contractor's accounting system to be adequate to record both direct and indirect costs applicable to the contract and identify costs to the appropriate work packages.

- d. The analysis criteria, which require the contractor's system to provide monthly figures on applied costs, budgeted costs for work scheduled, budgeted costs for work performed, actual costs of work performed, and current estimates of the total cost at contract completion. These criteria also require the contractor to calculate and analyze variances and use them as the basis to initiate actions to identify and correct problems which created the variances.
- e. The revisions criteria, which require the contractor to establish adequate procedures to assure continuity of budgets and plans. These procedures must result in contract changes being budgeted, scheduled, and integrated into the existing plan so that the original plan, plus or minus changes, can be reconciled to the new plan. Inherent in this is the necessity to assure avoidance of retroactive changes to budgets and costs for completed work.

5. The Validation function is a process whereby a team of Government personnel conduct a detailed post-award review of the structure and operation of the contractor's management information system and management operations.

This on-site demonstration review of actual operations enables team members to insure operation of an effective cost/schedule planning and control system, determine its compliance with the C/SCSC, and develop an understanding of the way the system is designed and how it works. It also provides a vehicle for training Government personnel in the uses of performance measurement data by giving them the opportunity to observe the collection and analysis methods used by the major government contractors.

The Surveillance function, carried out primarily by the Defense Contract Administration Service Office or Air Force Plant Representative Office serving the contractor, consists of reconciliation of data on contractor reports and checks to assure continued contractor compliance with the various criteria of C/SCSC. This function is carried out primarily after completion of Validation and, unlike Validation, is a continuing effort to assist and monitor contractor operation of the system.

6. The underlying concept of the Work Breakdown Structure (WBS) is Performance Measurement. A common base is needed to allow integration of the work required by the contract with the contractor's organizational structure. This is realized by performing successive sub-divisions of the required work until, at the lowest level, the divisions represent separate units of work. Each of these is clearly identifiable and may be separately budgeted and scheduled. By assigning each work package to a single organizational

element for accomplishment, the contractor creates an interlocking matrix with the WBS on one axis and his own organizational chart on the other. By controlling the work at this level, it is a simple matter to summarize data by combining WBS elements at successive work levels and provide data compatible with the contract work specifications for Government use. Conversely, it is easy to combine those WBS elements which are assigned within given organizational elements to provide data compatible with the needs of managers at any given level of the contractor's organization. Thus, the system is able to provide data to both parties in the form, and at the level of summarization, most helpful to them. As an additional benefit for both parties, the level of control established allows timely discovery of variances from plan and facilitates identification of problems which led to those variances. Unfortunately, this system--as any other--focuses attention on the problems but does not solve them. That is still up to the managers involved and, as always, they may or may not follow through on the problem solving.

7. SAIMS and its component sub-systems, including C/SCSC, are applied to acquisitions estimated in the Five Year Defense Plan to require total cumulative Research, Development, Test, and Evaluation financing in excess of \$25 million or cumulative production investment in excess of \$100 million (except Firm Fixed Price contracts). In

applying the systems to acquisitions meeting these criteria, contractors are not required to use any specified management control system or organize in any specific way. Rather, the contractor's system is to be of his own design, subject to the minimum acceptability requirements of the criteria. Capability of the contractor's system to satisfy these criteria may be considered as a factor in evaluating his response to a Request for Proposals but not to the exclusion of weapon system design considerations, proposed price, and other evaluation factors. Finally, during performance of a contract requiring C/SCSC, all performance data furnished by the contractor must be taken from the internal management control system validated by the Government. Each of these policies is intended to leave the contractor free to design a management information system capable of satisfying Government requirements for information and internal requirements.

8. The basic conditions which led to the development and implementation of SAIMS and C/SCSC began during and after World War II. During the period up to the time of their development the cold war created a situation in which a standing military force was needed. Concurrent technological advances entailed arming this force with successively more complex and more expensive weapons systems. The ensuing production of large numbers of complex systems unique to the military resulted in the establishment and growth of companies oriented to defense production.

As the dollar value of defense contracts grew the DoD competed for increasing shares of the Federal tax dollar. Predictably, pressure began to mount for better and better management of the defense share of the tax dollar. This pressure increased as the complexity of weapons systems made it more difficult to estimate accurately in advance what the cost of a new system would be.

In response to pressures from Congress and the public, DoD established and tried numerous systems of control to improve management in this area. Some met with initial success but were later misapplied to non-similar programs with disastrous results. In addition, defense contractors began to complain of being forced to implement redundant systems, many of which were not appropriate to their management and organizational structure.

In response to this situation AFSC designed the basic system adopted by DoD as C/SCSC, the desired result of which is to provide both DoD and contractors with the information needed to manage, but without preempting the contractors' right to design a management information and control system tailored to organizational requirements.

9. The two variances to be calculated from the given information are the schedule variance and the cost variance. The schedule variance is calculated by subtracting the Budgeted Cost of Work Scheduled from the Budgeted Cost of Work Performed:

$$(BCWP - BCWS) = \$23,000 - \$25,000 = -\$2,000$$

This negative variance is unfavorable and indicates that work is behind schedule on the WBS element. The cost variance is calculated by subtracting the Actual Cost of Work Performed from the Budgeted Cost of Work Performed:

$$(BCWP - ACWP) = \$23,000 - \$24,500 = -\underline{\underline{\$1,500}}$$

This variance, also unfavorable, indicates actual cost incurred in performing the work was greater than the budgeted amount for the same work.

In both cases, the circumstances causing the variance should be identified and appropriate action taken to explain the variance. If the problem is of a continuing nature, action should also be taken to resolve it before further schedule slippages and cost overruns occur.

## COST/SCHEDULE CONTROL SYSTEM CRITERIA

The following criteria are taken from Enclosure 1 to DoD Instruction 7000.2 dated December 22, 1967. The criteria are listed as Paragraph 3 of that enclosure and constitute pages 3-6 of the original document.

### Criteria

The contractor's system will include policies, procedures, and methods which are designed to insure that it will accomplish the following:

#### a. Organization

(1) Define all the authorized work and related resources to meet the requirements of the contract, using the framework of the contractor's extension of an appropriate work breakdown structure.

(2) Identify the authorized work within the following categories:

(a) Discrete work packages with a defined end result, or

(b) Level of effort or apportioned-effort work packages whose completion does not produce a definable end result.

(3) Identify the internal organizational elements and the major subcontractors responsible for accomplishing the authorized work.

(4) Identify the managerial positions responsible for controlling overhead (indirect costs).

(5) Identify overhead (indirect costs) and the methods used for its allocation.

#### b. Planning and Budgeting

(1) Describe, plan and schedule the work.

Attachment 1 (1 of 4)

(2) Identify physical products, milestones, technical performance goals, or other indicators that will be used to measure output.

(3) Establish budgets for all authorized work.

(4) To the extent the authorized work has been identified in the categories described in 3.a.(2) above, establish budgets for these categories in terms of dollars, hours or other acceptable units.

(5) Establish overhead budgets for the total costs of each significant organizational component whose expenses will become indirect costs. Reflect in the contract budgets at the appropriate level, the amounts accumulated in overhead pools that will be allocated to the contract as indirect costs.

(6) Identify management reserves, if used.

(7) Provide that the contract price plus the estimated undefinitized price of authorized but unpriced changes and unpriced work is reconciled with the sum of all internal contract budgets and management reserves.

(8) Retain the original budgets for those elements of the work breakdown structure identified as priced line items in the contract and for those elements at the lowest level of the DoD Project Summary Work Breakdown Structure as a traceable basis against which contract performance can be compared.

#### c. Accounting

(1) Record applied direct costs on a basis consistent with the budgets in a formal system that is controlled by the general books of account.

(2) Record indirect costs all or part of which will be allocated to the contract.

(3) These formal records in (1) and (2) above should make it possible to determine unit or lot costs for priced line items.

(4) Summarize applied direct costs and overhead allocations in the accounting records for (a) those elements of the work breakdown structure identified as priced line items in the contract, and (b) those elements at the lowest level of the DoD Project Summary Work Breakdown Structure.

(5) Identify the bases for allocating the cost of level of effort or apportioned-effort work packages to appropriate cost accounts.

(6) Provide a basis for auditing records of incurred costs, applied direct costs, and overhead (indirect costs).

d. Reporting

(1) Identify on a monthly basis or more often at the discretion of the contractor in the detail needed by management for effective control, using data from, or reconcilable with, the accounting system:

(a) Applied direct costs for work performed and the budgeted costs for the same work.

(b) Actual indirect costs and budgeted indirect costs.

(c) Budgeted costs for work performed and budgeted costs for work scheduled.

(d) Significant variances resulting from the above comparisons classified in terms of labor, material, overhead, and any other appropriate elements, together with the reasons therefor.

(2) Identify, on a monthly basis or more often at the discretion of the contractor significant differences between actual and planned schedule and actual and planned technical performance, together with the reasons therefor.

(3) Identify managerial actions that are made necessary by the above.

e. Revisions

(1) Estimate the effect of both authorized changes and internal replanning actions on technical performance, schedule, and cost provisions of the contract, and record the effects of authorized changes and internal replanning actions in schedules and budgets.

(2) Reconcile original budgets for those elements of the work breakdown structure identified as priced line items in the contract, and for those elements at the lowest level of the DoD Project Summary Work Breakdown Structure, with current budgets in terms of (a) changes

to the authorized work and (b) internal replanning in the detail needed by management for effective control.

(3) Prohibit retroactive changes to records pertaining to work performed that will change previously reported amounts for applied direct costs, indirect costs, and budgets, except for normal accounting adjustments or for reasons agreed to by the contracting parties.

(4) Based on performance to date and on estimates of future conditions, develop latest revised estimates of cost at completion and reconcile these with:

(a) Original budgets for those elements of the Work Breakdown Structure identified as priced line items in the contract,

(b) Original budgets for those elements at the lowest level of the DoD Project Summary Work Breakdown Structure

(c) Current budgets,

(d) Contract price,

(e) The contractor's latest statement of fund requirements reported to the Government.

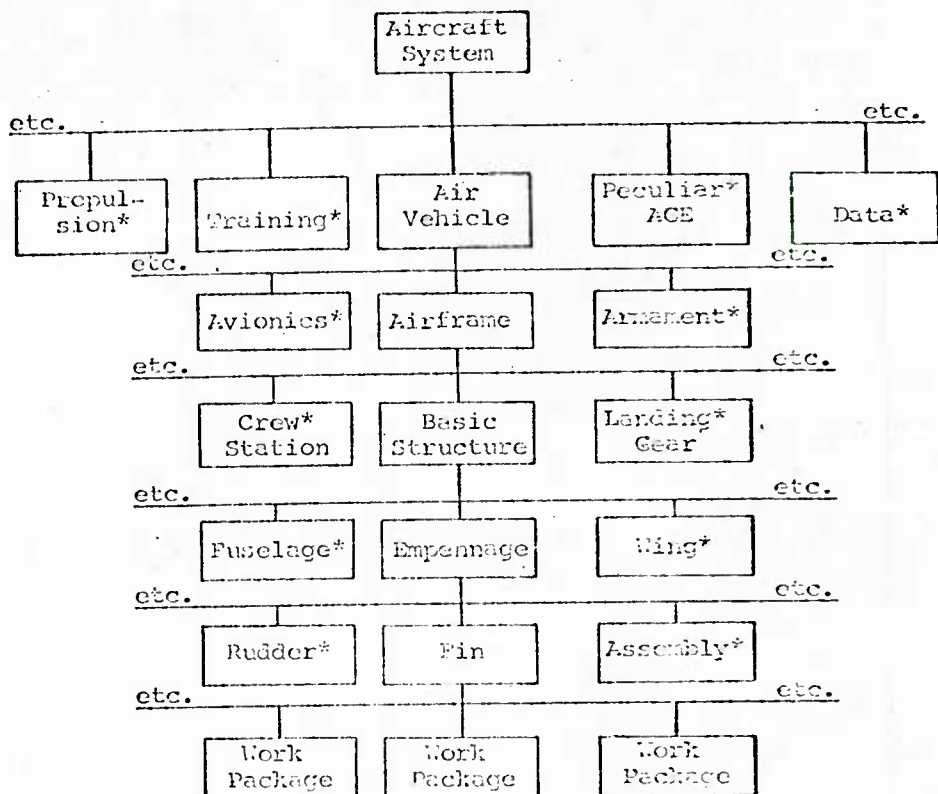


Figure 4

A Typical Work Breakdown Structure (Partial)\*\*

\*Breakdown not shown

\*\*Adapted from partial work breakdown structure shown in "Points of COMPASS," undated brief by North American Rockwell, Inc., p. 5.

EVALUATION/DEMONSTRATION REVIEW CHECKLIST FOR C/SCSC		DATE	
		December 1970	
CRITERIA	YES	NO	REMARKS
<b>1. ORGANIZATION</b>			
1. Define all the authorized work and related resources for all the key elements of the contract, using the framework of the contract work breakdown structure.			
a. Only work assigned for the contract (attach copy of WBS)	X		EXHIBIT 1-1
b. Summary levels of the WBS in relation to the contract work structure	X		EXHIBIT 1-1
c. Follow-up items included in the WBS (Annotated copy of WBS to show elements below)			
(1) Total contract	X		
(2) Contract tasks or product functions	X		EXHIBIT 1-1
(3) WBS items specified for the study	X		EXHIBIT 1-1
(4) Major suborganizations	X		EXHIBIT 1-1
(5) Cost accounts	X		EXHIBIT 1-1
(6) Work packages	X		
(7) Functional organizational levels	X		
2. Identify the internal organizational elements and the major sub-contractors responsible for each element. The latter are shown as:			
a. All work used to the extent of the identified organizational elements (This is not a cut of the WBS, but a cut of the contract work structure) (Do not show sub-relationships)	X		EXHIBIT 1-5
b. Subcontractor input data incorporated into the WBS at the project level of work identification (Do not show sub-relationships)	X		EXHIBIT 1-3
3. Provide for the integration of the contract work structure with the budgeting, work authorization, and control systems of the contractor. The contract work breakdown structure is the basis for the integration of all systems.			
a. Subsystems listed in the contract work structure, each other and the work breakdown structure at the project level. The latter are shown as illustrative examples (Do not show sub-relationships)			
(1) Total contract	X		EXHIBIT 1-6
(2) Contract work	X		EXHIBIT 1-6
(3) Work packages	X		EXHIBIT 1-6
b. Subcontractor systems (Do not show sub-relationships)			
(1) Work authorization system	X		EXHIBIT 11-1
(2) Integration of the contract work structure with the budgeting system	X		EXHIBIT 11-1 & 2
(3) Detailed technical and control systems (Do not show sub-relationships)	X		EXHIBIT 11-1 & 2
c. The budgeting system (Do not show sub-relationships)			
(1) Budgeting system (Do not show sub-relationships)	X		TABLE 1-1
(2) Budgeting system (Do not show sub-relationships)	X		TABLE 1-2
(3) Budgeting system (Do not show sub-relationships)	X		TABLE 1-3
(4) Work packages (Do not show sub-relationships)	X		TABLE 1-4
d. The control system (Do not show sub-relationships)			
(1) Control system (Do not show sub-relationships)	X		TABLE 1-5
(2) Integration of the contract work structure with the budgeting and control systems (Do not show sub-relationships)	X		TABLE 1-4
(3) Authorization of work within cost accounts (Do not show sub-relationships)	X		TABLE 1-4
(4) Work packages (Do not show sub-relationships)	X		TABLE 1-4

CRITERIA	YES	NO	REFERENCES
<p>v. The cost accumulation system. (Reference appropriate sub-headers for Section II, Criteria 9)</p>			
(1) Provides for collection of all direct costs (by cost element) within cost accounts	X		ATTACHMENT D
(2) Provides for direct cost allocation of costs through the VMS	X		ATTACHMENT D
(3) Provides for direct cost allocation of costs through the organization structure	X		ATTACHMENT D
(4) Provides for summarization of indirect costs from the point of allocation to the contract total	X		ATTACHMENT D
4. Provide for reliable performance measurement at the level where work is performed.			
<p>a. Contractor's system includes procedures for measuring performance of the lowest level operating organizations. (Provide typical example)</p>	X		TABLE I-5
5. Identify the organizational positions responsible for controlling overhead (indirect costs).			
<p>a. Individuals responsible for the control of overhead clearly identified. (See Criteria II.7.)</p>	X		EXHIBIT I-12
6. Provide for integration of the VMS with the contractor's functional organizational structure in a manner that permits performance measurement for VMS and organizational elements.			
<p>a. Organizational integration exists at the cost account and work package levels with each work package assigned to a single operating organization and each cost account the responsibility of the managing organization. (Provide typical example of the managing organization. (See graphic display in section II, Table I-6)</p>	X		EXHIBIT I-6
<p>b. Organizational integration at a work package level selected by the contractor for program control and variance analysis. (One such point is required for the major for the contractor's work, i.e., Engineering, Manufacturing, Tooling, Quality Control, etc.) (See worksheet 8.1)</p>	X		EXHIBIT I-6
<p>c. In order to perform variance analysis, the following elements are available at the levels selected for control and analysis. (See Worksheet 8.1)</p>			
(1) Budget cost for work scheduled	X		TABLE I-6
(2) Budget cost for work in progress	X		TABLE I-6
(3) Actual cost	X		TABLE I-6
II. PLANNING AND BUDGETING			
1. Schedule the authorized work in a manner that identifies the sequence of work and determines the overall completion required to meet the development, production, and delivery requirements of the contract.			
<p>a. The scheduling system provides scheduling for all identified work contained in the lowest defined element of the VMS (i.e., such scheduling is available with respect to the lowest element of the VMS.) (Provide example of scheduling system. (See Worksheet 11.1)</p>	X		EXHIBITS 11-1 & 2
<p>b. Key relationships clearly identified among the work packages</p>	X		EXHIBIT 11-1
<p>c. Scheduling system provides for identification of work packages against technical milestones and elements of complex activities of scheduled work.</p>	X		EXHIBIT 11-2
2. Identify physical, political, technical, performance, or other indicators that will be used to measure progress.			
<p>a. Meaningful indicators identified with each of the tasks established for program control and variance analysis, which are technical performance indicators. (Provide typical example.)</p>	X		EXHIBITS 11-1, 2, & 3
<p>b. Contractor's system identifies with the program control and variance analysis. (Provide typical example.)</p>	X		EXHIBITS 11-3 & 4
<p>c. Current performance indicators clearly identify the program control and variance analysis. (Provide typical example.)</p>	X		EXHIBIT 11-10

CRITERIA	YES	NO	REMARKS
2. Establish budgets for all authorized work to the lowest level of contract planning with separate identification of cost elements (labor, material, etc.)			
a. Budgets assigned to cost accounts identify activity on following cost elements. (Provide exhibit as described in 2.)			
(1) Direct labor dollars	X		EXHIBITS 1-10 & 11-11
(2) Material and/or contract dollars	X		EXHIBITS 1-10 & 11-11
(3) Other direct dollars	X		EXHIBITS 1-10 & 11-11
b. Budgets assigned to work packages in terms of dollars, hours, or other measurable units. (See Worksheet 2.)	X		EXHIBIT 1-5
3. To the extent the authorized work can be identified in discrete, shop-level work packages, establish budgets for the work in terms of dollars, hours, or other measurable units. Where the entire cost account cannot be subdivided into detailed work packages, identify the largest effort (up to six months) in larger planning packages for budget and scheduling purposes.			
a. Work packages reflect the actual way in which the work will be done and are meaningful and measurable subdivisions.	X		
b. Detailed work packages planned as far in advance as practicable with each planning extending at least six months into the future. (Provide representative sample.)	X		EXHIBIT 11-12
c. Work which cannot be planned in detail subdivided to the maximum possible extent for planning and scheduling purposes. (Provide sample.)	X		EXHIBIT 11-15
d. Work progressively subdivided into detailed work packages as requirements are defined.	X		EXHIBIT 11-16
e. Work packages reasonably short in time duration in order to minimize the in-process effect. (See Worksheet 3, 5a, 5b.)	X		EXHIBIT 11-17
f. Work packages consist of discrete tasks which are adequately described. (Provide representative sample.)	X		EXHIBITS 11-12, 13 & 8
g. Work packages formally defined in terms of physical accomplishment and reflected by calendar dates.	X		EXHIBITS 11-12, 13 & 8
5. Identify relationships of budgets or cost centers in which planning was authorization systems to identify work packages.			
a. For the production effort, formal relationships exist between work package budget to scheduling and other internal work measurement systems. (Provide sample showing relationships.)	X		EXHIBIT 11-19
6. Identify level/effort activity in cost accounts which are planned and controlled by time-planned budgets, or scheduled in the progress of work which can be identified in discrete, shop-level work packages will be classified as level/effort.			
a. Time-planned budgets established for planning and control of level/effort activity. (Explanation of control and analysis.)	X		EXHIBITS 11-20, 21 & 8
b. Work partially classified as measured, level/effort, or appointed effort. (See Worksheet 3 and explain classification procedures.)	X		
7. Establish exception budgets on a basis consistent with the way resources are to be measured and accounted for.			
a. In final budgets established in accordance with the way resources are controlled and measured, exceptions are identified in the following manner: <ul style="list-style-type: none"> <li>• Excess for completion of planned and actual activity at cost. (See Worksheet 4.)</li> </ul>	X		EXHIBIT 11-25
b. Authority formally assigned to cost commitments with responsibility for management control of the costs. (Explanation of the level/effort activity.)	X		

CRITERIA	YES	NO	REMARKS
8. Identify management reserves and unfundated budgets.			
a. Management reserves are properly identified.	X		EXHIBIT II-26
b. Records maintained to show how management reserves are used. (Provide exhibit)	X		EXHIBIT II-26
c. Records maintained to show how unfundated budgets are controlled. (Provide exhibit)	X		EXHIBIT II-15
9. Provide that the contract cost plus the estimated cost of authorized but unfundated work is reconciled with the sum of all internal contract budgets and management reserves.			
a. Sum of the cost account budgets and management reserve equals the contract target cost plus the estimated cost for authorized unexpended work. (Provide Exhibit - see worksheets #2 & 3).	X		ATTACHMENT D
10. Establish and maintain a performance measurement baseline consisting of budgets assigned to scheduled cost accounts. For cost accounts that exceed one year in duration, establish smaller budget planning packages for baseline planning and controls.			
a. Budgets assigned to cost accounts (or budget planning packages) are maintained as a baseline for performance measurement. (Explain baseline maintenance procedures - see Worksheet #7)	X		EXHIBIT II-15
b. Contract has formal procedures to preclude the application of budget initially allocated for future effort to current effort. (Explain procedure)	X		
c. Opening and closing of cost accounts based on the schedules for work packages contained therein. (See Worksheet #4)	X		
11. Provide that the sum of all work package budgets plus planning packages within a cost account equals the cost account budget.			
a. The sum of all work package budgets plus planning packages within selected cost accounts equals the budgets assigned to those accounts. (See Worksheet #4)	X		ATTACHMENT D
<b>III. ACCOUNTING</b>			
1. Record applied direct costs on a basis consistent with the budgets in a formal system that is controlled by the general books of account.			
a. Include within the cost accounts the amounts to be charged to work in process in the time period:			
(1) When labor, material, and other direct resources are actually consumed; or	X		
(2) When material resources are received that are uniquely identified to the contract and recorded for use within the same accounting period or a later date in the next accounting period. (Due to nature of applied direct cost, the accounting period should be extended beyond the time period of receipt.)	X		
(3) When a specific amount is received that is specifically and uniquely identified to a single contract or contract item.	X		
b. All direct costs are related with work described in work packages charged to the cost accounts containing those work packages. (Provide exhibit)	X		EXHIBITS II-32 & 3-10
c. Material costs transferred for the point of application to the point of storage by established procedure (if that is possible)	X		EXHIBIT III-2
d. Elements of cost (labor, material, etc.) separately identified on a basis consistent with the way such costs are allocated. (See Worksheets #2 and #3)	X		EXHIBIT III-3
e. Costs are recorded according to accounting (Provide exhibit)	X		EXHIBITS I-10 & 32-33
2. Summarize applied direct costs from cost accounts into the WBS without allocation of a single cost account to two or more WBS elements.			
a. Possible to summarize applied direct costs from cost accounts into the WBS without allocation of a single cost account to two or more WBS elements. (See Worksheets #2 and #3)	X		ATTACHMENT D

CRITERIA	YES	NO	REMARKS
3. Summarize applied direct costs from the cost account to the contract by functional organizational structure without allocation of a single cost account to two or more A/B's categories.			
a. Possible to summarize applied direct costs from the cost account level to the highest functional organizational level without allocation. (See Worksheet 5.2)	X		ATTACHMENT D
4. Record all indirect costs which will be allocated to the contract.			
a. Indirect costs charged to appropriate overhead pools by methods acceptable to ICMA.	X		
b. Method for allocating expenses from each overhead pool to the contract established with what was followed in developing the planning data and acceptable to ICMA. (Explain procedure)	X		
c. Possible to summarize indirect costs from the level of record to the contract level with allocation. (See Worksheet 7.0)	X		ATTACHMENT D
5. Identify the basis for allocating the cost of apporportioned effort to the discrete work packages to which it performs.			
a. Cost of direct apporportioned effort directly related to discrete work packages. (Provide example)	N/A		
b. Methods used for apply apporportioned effort to discrete work packages documented in an established procedure	N/A		
c. Only effort that by itself cannot readily be classified into discrete work packages treated as apporportioned effort. (Exclusive of Level of Effort)	N/A		
6. Identify unit and equivalent unit costs and/or usable lot costs.			
a. System provides unit or lot costs. (Describe procedure)	X		
7. Reconcile original budgets for those elements of the work breakdown structure identified in the contract for reporting to the government with current budgets in terms of changes to authorized work.			
a. Current budgets reconcilable to original budgets for specified reporting items. (See Worksheet 8.2)	X		ATTACHMENT D
IV. <b>PROFIT</b>			
1. Identify at the cost account level on a monthly basis using data from an accounting system: Budgeted cost for work scheduled and budgeted cost for work performed. Budgeted cost for work performed and applied direct costs for the same work.			
2. Variances resulting from the above comparisons classified in terms of labor, material or other appropriate elements together with the reasons for significant variances.	X		
a. Contractor derive Budgeted Cost for Work Scheduled and Budgeted Cost for Work Performed from work packages in a consistent, systematic manner.	X		
b. Applied direct cost used for variance analysis reconcilable with data from the accounting system. (If Criteria B.2 and B.3 of ICMA provide exhibit)	X		ATTACHMENT D
c. Value earned the way work is planned.	X		
d. Contractor's variance analysis procedure provides for identifying cost variances resulting from: (Provide example)			
(1) Differences in labor rates and work	X		EXHIBIT IV-4 & 5
(2) Differences in material prices and usage	X		EXHIBIT IV. C

CRITERIA	YES	NO	REMARKS
IV. Part 1 (Contd)			
a. Contractor's variance analysis on work items (Provide examples)			
(1) Identify and list problems causing unfavorable cost variances	X		ATTACHMENT C
(2) Evaluate the impact of such changes, work around etc.	X		EXHIBIT IV-7
(3) Evaluate the adequacy of existing procedures which result in cost control of plant and equipment packages	X		
(4) Evaluate the effectiveness of the performance of operating equipment etc.	X		TABLE IV-1
(5) Monitor the effectiveness of corrective actions taken to resolve problems	X		EXHIBIT IV-3
(6) Identify potential or actual problems for future use or the application to other activities	X		TABLE I-6
3. Identify on a monthly basis the details provided by management for effective control, budgeted and actual costs, actual indirect costs, and variance along with the reasons therefor.			
a. Contractor's variance analysis on all data permits him to identify cost variances resulting from (Provide examples)			
(1) changes in installed rates and	X		EXHIBIT IV-10
(2) changes in availability base	X		EXHIBIT IV-10
b. Variance between budgeted and actual for fuel, by indirect charges, demand and availability, and the level of responsibility for control of such as per attached <i>Cost Control III and IIIa</i> (see work sheet #2)	X		EXHIBIT II-25
4. Summarize the data elements and associated variances listed in Items 1-4 above then, in the contract organization and work breakdown structure to the reporting level specified in the contract.			
a. Data elements ( <i>Historical Cost Control, Cost Control, Control Cost by Work Breakdown Structure</i> ) are properly identified and derived from the detail level to the contract organization (See <i>Table IIIa</i> ) (Provide exhibit for each of <i>Table III, Table IIIa, and IIIb</i> )	X		ATTACHMENT D
b. Data elements are derived from the contract organization structure for reporting to the contract organization (Provide exhibit for each of <i>Table III, Table IIIa, and IIIb</i> )	X		ATTACHMENT D
c. Methods of variance analysis are used and consistently applied at selected levels and appropriate methods are applied to provide a meaningful comparison of results	X		ATTACHMENT C EXHIBITS IV-3, 12, 13, 10
5. Identify on a monthly basis significant differences between planned and actual available operating hours completed and actual technical performance together with the reasons therefor.			
a. Scheduling system identifies both the task elements and conditions in a manner which permits a comparison (Provide appropriate examples)	X		EXHIBITS IV-7 & 14
b. Plans for the achievement of scheduled objectives and the resolution of technical problems are formulated and complete	X		
c. Reporting program is used to track and compare planned vs. actual work effort and to identify areas of corrective action (Provide examples)	X		
d. Contractor's system identifies the areas of effective control, the areas of technical problems, and the areas of corrective action (Provide appropriate examples)	X		

CRITERIA	YES	NO	REMARKS
6. Identify management actions taken as a result of this 5.			
a. Timely and available progress data disseminated to the contractor's management. <i>(Provide example)</i>	X		TABLE 1-6 EXHIBIT IV-15 & 16
b. Data being used by managers in an effective manner to evaluate progress, identify critical status, identify reasons for significant variances, and initiate appropriate corrective actions. <i>(Provide example)</i>	X		EXHIBIT IV-3
7. Monitor the effectiveness of actions taken to resolve problems or correct deficiencies.			
a. Methods used to insure complete follow-up on corrective actions noted by a contractor manager documented as an established procedure. <i>(Provide a corrective example)</i>	X		ATTACHMENT C
b. Follow-up activities performed on a routine basis in accordance with the procedure established.	X		EXHIBIT IV-3
8. Based on performance to date and on estimates of future requirements, develop revised estimated cost of completion for WBS elements identified in the contract and compare them with the contract baseline budget, the contract price and the latest statement of funds requirements reported to the government.			
a. Latest revised estimates of cost at completion based on performance to date plus estimates of future conditions.	X		
b. Procedures for determining estimates of costs at completion formally established and applied in a consistent manner and reconcilable with data reported in the Cost Performance Report. <i>(Attach procedure - see Worksheet #11)</i>	X		
c. Final cost estimates reconcilable with data reported in CRNs where applicable. <i>(See Worksheet #12)</i>	N/A		
d. Final cost estimates reconcilable with the contractor's latest estimate of final requirements reported to the government on the CRN or equivalent. <i>(See Worksheet #13)</i>	X		ATTACHMENT D
<b>V. REVISIONS</b>			
1. Incorporate contractual changes in a timely manner recognizing the effects of such changes in budgets and estimates. In the directed programmatic effort, incorporate all contract amendments estimated and budgeted to the functional organization.			
a. Authorized changes being incorporated in a timely manner.	X		TABLE V-1
b. All affected work authorization, technical, and scheduling documents amended to properly reflect the effects of authorized changes. <i>(Provide example)</i>	X		TABLE V-1
c. Budgets for authorized, but not reported, changes based on the estimates submitted to the government for the contract.	X		EXHIBIT V-2
2. Prohibit retrospective changes to records pertaining to work performed that will change previously reported amounts for applied direct costs or indirect costs, except for correction of errors and routine accounting adjustments.			
a. Accounting adjustments being recorded in accordance with accounting procedures acceptable to PCAS.	X		EXHIBIT V-3
b. Accounting system provides a basis for an itemized record of applied direct costs and indirect costs chargeable to the contract.	X		
b. Prohibit revisions to the contract budget, unless except for a contract directed change to contract object class, scope, work and schedule.			
a. Prohibit retrospective changes to previously reported costs at contract baseline unless they are caused by contractual errors.	X		
b. Integrity of the contract budget is maintained and in accordance with the contract and contract plus authorized changes thereto. <i>(See Worksheet #14)</i>	X		ATTACHMENT D

CRITERIA	YES	NO	REMARKS
4. At the time changes occur, where the program activity of any changes to baseline budgets or schedules:			
a. Changes to the performance measurement baseline made only as a result of contractual modification or final appropriations (see Attachment 7)	X		ATTACHMENT D
b. Program activity modified only as to the performance measurement baseline as a result of change through an established procedure (if appropriate)	X		
c. Program activity, without a justification of change to the performance measurement baseline, that this does not affect contractor compliance with contract activity for baseline activity	X		
d. Program activity evaluates the validity or need for program changes which affect the performance measurement baseline	X		
e. Program actions held to a common standard for effective program completion	X		
f. Results of program actions which affect the performance measurement baseline properly reflected on cost performance by its (Provide examples)	X		ATTACHMENT 7
5. Work packages that have been opened will not be changed, work packages that have been closed will not be reopened. Any changes to unopened work packages will be accompanied by documents' explanation of budget and if it moved.			
a. Process established to prevent changes to budgets for open work packages	X		
b. Before the release to complete work package budgets specifically prohibited in contract budgeting	X		
c. Work package budgets maintained as originally established once work packages have been opened	X		
d. Changes to unopened work packages properly documented to show changes and reasons therefor	X		EXHIBIT V-9
6. The contractor offers and provides a record of performance will be provided access to all of the data, information and records in support thereof.			
a. Contractor provides access to all program records to the designated surveillance team	X		
REMARKS			

The following excerpt from Section II of the B-1 Report of Cost/Schedule Control System Demonstration is the verbal description supporting the affirmative determination for Demonstration Review Checklist Item 1.a.

#### Organization

1.a. In response to Contract Data Item M-126 (Contract Work Breakdown Structure) and Statement of Work Paragraph 2.1.8.1, North American has developed and is maintaining a Contract Work Breakdown Structure (CWBS) and Dictionary that complies with provisions set forth in Mil-Std-881. The final negotiated CWBS (NA-70-79) was submitted to the SPO on 1 July 1970. The summary levels (levels one through three) of the CWBS and the North American extension to the cost account level of detail have been reviewed and approved by Hq AFSC. Exhibit 1-1 is the first of twenty-four pages that comprise the contractual CWBS Index.



Cost Performance Report Entry  
(Dollars in Thousands)

Item	CURRENT PERIOD				CUMULATIVE TO DATE				AT COMPLETION				
	Budgeted Cost of Work		Variance		Budgeted Cost of Work		Variance		Budget	Var			
	Sched	Perf	ACWP	Sched Cost	Sched	Perf	ACWP	Sched Cost	Est	Est			
AMOUNT	1,011.6	1,012.4	1,024.4	30.8	13.0	1,041.6	1,973.1	1,941.5	31.5	31.6	414,002.	411,340.	2,662.
Budget	401.3	433.5	415.1	32.2	18.4	834.6	857.7	826.3	43.1	31.4	---	---	---
Primary Cost	37.0	37.0	36.2	---	1.7	209.4	200.1	198.3	(9.3)	1.8	---	---	---
Work	572.4	571.0	573.2	(1.4)	(5.1)	917.6	915.3	916.9	(2.3)	(1.6)	---	---	---

Remarks: Performance Evaluation

Remarks: The cumulative schedule variance was increased by \$30.8K during the current period to a total of \$101.6K. This variance is favorable and within tolerance. It is attributed to the early completion of work package Alpha and under the basic structure element. The work package was scheduled for completion in the following period, which will show an offsetting variance.

Cost: The cumulative cost variance was increased by \$18.0K to \$31.6K during the current period. This variance is favorable and within tolerance. It is attributed to savings resulting from reduction of the material cost requirements for work package Alpha and in the basic structure element. Change Order 00017 to reflect this change is in process and should be completed during the following period.

Appendix C

VALIDATION: EXAMINATION AND  
RELATED INSTRUCTIONS

## FACULTY GROUP INSTRUCTIONS

The attached case study is the primary output of my research paper. It is intended to present the Cost/Schedule Control System Criteria (C/SCSC) to students in the Financial Management course of the Graduate Logistics program. However, it is not the intent of either the case or the course to present a detailed review of the individual criteria. Rather, the case is designed to show how the C/SCSC operate as a concept, how they form a basis for performance measurement, and how the "calendar-of-events" might look for an application of the criteria.

One of the objectives of my research paper is to test the validity of the resultant case as a teaching aid. The method I have chosen to do this entails administration of an examination to two groups of officers. One group, composed of students, has already taken the examination based on knowledge of the subject matter gained in the Financial Management course. I am now asking an equal group of faculty officers to cover the case study and take the same examination. In addition to the examination results themselves, I am also interested in any comments --pro or con--you may have about the case. A four question evaluation sheet is therefore included for your use.

Accordingly, I request that you read the attached case, go through the discussion questions and suggested answers to them, and give some thought to the material presented in them. Having done so please take the twenty-five question multiple choice examination. Please take this as a "closed-book" exam. Then, please answer the evaluation questions, adding any comments you deem appropriate, and return this package to me. You are welcome to place the case copy and examination in my mailbox "anonymously" if you so choose. As you go through the case, please feel free to annotate corrections to grammar, punctuation, spelling, etc., if you are so inclined.

Thank you for your time and effort. I recognize how busy you are at this time and appreciate your cooperation.

*Donald D. Wright*  
DONALD D. WRIGHT, Captain, USAF  
Grad Log Class 71B

\_\_\_\_ Please advise me  
of my score.

NAME \_\_\_\_\_

RANK \_\_\_\_\_

STUDENT NUMBER \_\_\_\_\_

The attached examination consists of twenty-five multiple choice questions concerning the Cost/Schedule Control System Criteria and related topics. Each question has only one correct answer. Indicate your choice of the answers by a circle or other mark around the letter in front of the answer. Please answer each question to the best of your knowledge. If you do not know the answer to a question DO NOT guess. Your score will not be known to anyone other than myself and I am interested in your knowledge in this area, not in your ability to guess.

Please indicate your name, rank, and student number in the spaces at the top of this page. If you would like to know how you score on the exam, mark the statement at the above left. You may begin whenever you are ready. There is no time limit to complete the exam so take your time.

The following abbreviations are used throughout the examination:

ABBREVIATION

MEANING

C/SCSC	Cost/Schedule Control System Criteria
DoD	Department of Defense
RES	Resource Management Systems
SALMS	Selected Acquisition Information and Management System
SPO	System Program Office
WBS	Work Breakdown Structure

1. The Selected Acquisition Information and Management System (SAIMS) is best described as:
  - a. A sub-system of the "Programming and Budgeting System" portion of the Resource Management Systems (RMS).
  - b. A sub-system of the "Operations Management System" portion of RMS.
  - c. A sub-system of the "Inventory Management System" portion of RMS.
  - d. A sub-system of the "Acquisition Information and Management System" portion of RMS.
  - e. Not a part of RMS. SAIMS is a separate but complementary system intended to perform the same function, but for external rather than internal information.
  
2. SAIMS is intended for application to:
  - a. All acquisitions by the DoD from external sources.
  - b. Those acquisitions specifically designated, on an individual basis, by the Secretary of Defense, Secretary of the Air Force (or other service), or the Chief of Staff of the procuring service.
  - c. Those acquisitions estimated in the Five Year Defense Plan to require total cumulative Research, Development, Test and Evaluation financing in excess of \$25 million or cumulative production investment in excess of \$100 million (except Firm Fixed Price contracts).
  - d. Certain critical acquisitions from contractors whose past performance has been below acceptable levels but who occupy a sole-source position on a major weapon system.
  - e. Acquisitions of major weapon systems which are estimated to exceed \$10 million total cost, including both Research, Development, Test and Evaluation and production costs.

3. Which of the following is not an objective of the Selected Acquisition Information and Management System (SAIMS)?
- a. To bring to the attention of and encourage DoD contractors to accept and install management control systems and procedures which are most effective in meeting their requirements.
  - b. To provide an adequate basis for responsible decision making by both contractor management and DoD components.
  - c. To provide a standard internal planning and control system with a uniform chart of accounts for use by DoD contractors in order to assure compatibility and accuracy of information from them.
  - d. To minimize, to the extent practicable, the data gathering and reporting workload imposed on contractors and in-house activities.
  - e. To provide an integrated financial management reporting system which will provide usable summary data for all echelons of internal management.
4. The four major sub-systems of the Selected Acquisition Information and Management System (SAIMS) are:
- a. Economic Information System, Operations Management System, Contract Funds Status Report, and Performance Measurement (including cost, schedule and technical).
  - b. Contract Fund Status Report, Economic Information System, Performance Measurement (including cost, schedule, and technical), and Cost Information Reports.
  - c. Performance Measurement (including cost, schedule, and technical), Assets Management System, Cost Information Reports, and Programming and Budgeting System.
  - d. Program Operations System, Performance Measurement (including cost, schedule, and technical), Cost Information Reports, and Contract Fund Status Report.
  - e. Cost Information Reports, Contract Funds Status Report, Inventory Management System, and Performance Measurement (including cost, schedule, and technical).

5. The sub-system of SAINS which provides data for determining funding requirements by fiscal year is:
  - a. Contract Funds Status Report.
  - b. Economic Information System.
  - c. Programming and Budgeting System.
  - d. Operations Management System.
  - e. Cost Information Reports.
  
6. The sub-system of SAINS which provides data for analysis of the impact of defense spending by industry and by geographical area is:
  - a. Cost Information Reports.
  - b. Contract Funds Status Reports.
  - c. Cost and Economic Status Reporting System.
  - d. Economic Information System.
  - e. Programming and Budgeting System.
  
7. The sub-system of SAINS which provides data on actual and estimated costs of the acquisition cycle of completed programs to build a consistent data base for cost-estimating, programming, budgeting, and procurement of future systems is:
  - a. Performance Measurement (including cost, schedule, and technical).
  - b. Programming and Budgeting System.
  - c. Contract Funds Status Report.
  - d. Operations Management System.
  - e. Cost Information Reports.

8. Under SAHMS the Performance Measurement sub-system includes the Cost/Schedule Control System Criteria (C/SCSC), consisting of five major areas of criteria. These five are:
  - a. Organization, Planning and Budgeting, Accounting, Analysis, and Revisions.
  - b. Work Breakdown Structure, Organization, Analysis, Revisions, and Accounting.
  - c. Planning and Budgeting, Accounting, Auditing, Analysis, and Revisions.
  - d. Planning, Budgeting, Accounting, Analysis, and Auditing.
  - e. Organization, Planning and Budgeting, Accounting, Analysis, and Validation.
  
9. The portion of the C/SCSC which is concerned with defining the required work, breaking it into work packages, and assigning each work package to a particular section within the contractor's organization is:
  - a. Reporting Criteria.
  - b. Work Breakdown Structure Criteria.
  - c. Organization Criteria.
  - d. Accounting Criteria.
  - e. Work Assignment Criteria.
  
10. The portion of the C/SCSC which is concerned with assuring that identifiable work is scheduled and budgeted for such that actual performance can later be compared to the plan is:
  - a. Organization Criteria.
  - b. Planning and Budgeting Criteria.
  - c. Work Breakdown Structure Criteria.
  - d. Auditing Criteria.
  - e. Reporting Criteria.

11. The purposes of C/SCSC Validation of a contractor's internal planning and control system include:
  - a. To insure an effective operating cost/schedule planning and control system.
  - b. To develop understanding of the planning and control systems used by major contractors and to determine their compliance with the C/SCSC.
  - c. To develop a trained staff of personnel who understand contractors' management operations and the use of performance measurement data.
  - d. All of the above.
  - e. "a." and "b." above, but not "c."
  
12. Final C/SCSC Validation action (approval or disapproval) is based primarily on:
  - a. Review of the system description submitted by the contractor as part of his response to the Request for Proposals, along with review of the attached Defense Contract Audit Agency comments.
  - b. An in-depth, detailed demonstration of the system in which a validation team visits the contractor's facility and observes actual system operation for a period after award of the contract.
  - c. Results of the Defense Contract Audit Agency review of the operating system.
  - d. The contractor's detailed presentation of the system to SPO and procurement personnel, which takes place before contract award.
  - e. Recommendations of the resident Air Force Plant Representative or Defense Contract Administration Service Office that reviewed the contractor's system for the Government subsequent to contract award.

15. The Validation process for a contractor's system normally occurs:
- a. Before he is allowed to submit proposals on programs requiring the use of C/SCSC.
  - b. After the contractor submits a proposal on a program which would require the use of C/SCSC, but before he is awarded a contract.
  - c. When he is identified as having submitted the low proposal in response to a Request for Proposals involving C/SCSC. If he is otherwise eligible, the contract award is temporarily withheld until his system is validated. Failure to become validated within 180 days will result in award being made to the next lowest contractor with a validated system.
  - d. After receipt by the contractor of a contract award requiring the use of C/SCSC.
  - e. Each time he receives a new contract requiring the use of C/SCSC.
16. The SAAMS Surveillance Program is carried out primarily by:
- a. The System Program Office (SPO).
  - b. The Defense Contract Audit Agency, with assistance from the AFIC Surveillance Office.
  - c. The cognizant Defense Contract Administration Service Office or Air Force Plant Representative Office, with assistance from the Defense Contract Audit Agency.
  - d. The nearest Air Force Systems Command Contractor Surveillance Office, with assistance from the Defense Contract Audit Agency.
  - e. None of the above.

17. The Cost/Schedule Control System Criteria is extended to cover sub-contracts of a qualified program:
- a. Only if the sub-contractor has a previously validated system.
  - b. At the election of the prime contractor, who is then responsible for validating the sub-contractor.
  - c. Never. C/SCSC applies to Government contracts only, not to contracts between the contractor and his sub-contractors.
  - d. When selected by the System Program Office and prime contractor according to the criticality of the sub-contract to the program.
  - e. Only when the sub-contract meets the same criteria as the basic contract.
18. Which of the following is not characteristic of the work packages developed under the Work Breakdown Structure?
- a. They represent units of work at levels where work is performed.
  - b. Their work content is clearly delineated from all other work packages.
  - c. The sum of the budgeted costs of all work packages is equal to the total contract price.
  - d. They are assignable to a single operating organization for accomplishment.
  - e. They have budgets expressed in terms of dollars, man-hours, or other measurable units.

19. The Surveillance Program for C/SCSC includes all of the following except:
  - a. A program of reconciliation testing on the data on contractor reports to the Government.
  - b. Checks to assure that all retroactive changes to completed work packages are fully documented and valid.
  - c. Checks to assure that the contractor's organization structure continues to comply with the C/SCSC Organizational Criteria.
  - d. Checks on the contractor's capability to calculate and use variance information to locate and resolve problems.
  - e. Checks to assure the propriety of changes which affect the contract budget baseline.
  
20. When the Validation demonstration review results in finding discrepancies in the contractor's management system the validation team:
  - a. Advises the System Program Office (SPO) to withhold award of the contract.
  - b. Advises the System Program Office to begin action to terminate the contract for cause.
  - c. Is authorized, according to the C/SCSC provisions of the contract, to make such changes to the contractor's system as are required to meet minimum requirements of the criteria.
  - d. Advises the contractor that failure to make necessary changes to assure compliance within a period of 90 days will result in loss of the contract.
  - e. Submits a final report of their findings which, after approval, is transmitted to the contractor so that he may begin making the necessary changes to assure compliance.

21. The C/SCSC Surveillance Program consists of:

- a. A semi-annual review of the contractor's system, records, and documents, performed by the cognizant surveilling activity, along with assistance to the contractor as requested.
- b. A Scheduled annual review of the contractor's system, records, and documents plus one unannounced audit of the system each year, both performed by the cognizant surveilling activity and accompanied by assistance to the contractor as requested.
- c. Direct and continuing participation in the contractor's management process by a selected team from the surveilling office, the members of which are assigned to work in the contractor's facility.
- d. A continuing effort of audit, monitoring, and reconciliation of the contractor's system, records, and documents by the cognizant surveilling activity, along with assistance to the contractor as requested.
- e. None of the above.

22. Which of the following is not a use of the Work Break-down Structure?

- a. To enable the contractor to integrate the resultant work packages with his organizational structure and thereby identify each organizational element with the work it must support.
- b. To facilitate budgeting and scheduling of the individual elements assigned to each organizational element.
- c. To enable the contractor and Government personnel to separately identify and control those work packages which were awarded to the contractor.
- d. To enable the contractor to identify and analyze significant variances to isolate factors causing cost overruns and underruns or contributing to schedule slippages.
- e. "b." and "d." above.

23. Which of the following is a valid statement of Air Force policy concerning C/SCSC?
- a. Application of the criteria will not be interpreted as requiring the use of specified management control systems.
  - b. Performance data furnished by the contractor will be taken from the contractor's internal management control system.
  - c. Application of the criteria will not be interpreted as requiring contractors to organize or reorganize in any specific way.
  - d. The capability of the contractor's internal management control system to satisfy the C/SCSC may be considered as an element in evaluating his response to an individual Request for Proposal.
  - e. All of the above.
24. Which of the following is true of the C/SCS Accounting Criteria?
- a. They require the contractor's system to be adequate to record both direct and indirect costs applicable to the contract.
  - b. They specify that the standard BoD chart of accounts is to be utilized in the contractor's system.
  - c. They require the contractor's system to be able to identify all applicable contract costs to the appropriate elements of the Work Breakdown Structure.
  - d. They require the contractor's system to be sufficiently accurate to insure that actual costs do not vary appreciably from budgeted costs.
  - e. "a." and "c." above.

25. Which section of the C/SCSC specifies the nature and format of the reports the contractor must submit to the Government showing data collected by his management system?
- a. Organization Criteria.
  - b. Accounting Criteria.
  - c. Analysis Criteria.
  - d. Revisions Criteria.
  - e. None of the above, C/SCSC does not require reports.





## Answers to Examination Questions

The following indicated responses are the correct answers to the examination questions.

<u>Question Number</u>	<u>Correct Response</u>
1	d
2	c
3	c
4	b
5	a
6	d
7	e
8	a
9	c
10	b
11	d
12	b
13	a
14	e
15	d
16	c
17	d
18	c
19	b
20	e
21	d
22	c
23	e
24	e
25	e

Appendix D

METHOD FOR CALCULATION OF CUMULATIVE STEP FUNCTION

## METHOD FOR CALCULATION OF CUMULATIVE STEP FUNCTION

The purpose of this Appendix is to describe the technique used to calculate the cumulative step function values displayed in Table 2, page 23.

Symbols used in the calculation are defined to be:

$n_1$  = Sample group one, the group which studied C/SCSC by use of the case study.

$n_2$  = Sample group two, the group which studied C/SCSC in the Financial Management course.

$X$  = A random variable, the score of a member of either group on the examination.

$K$  = The number of scores of either group which are less than a given value of  $X$ .

$S_{n_1}(X)$  = The observed cumulative step function of group one.  $[S_{n_1}(X) = K/n_1]$

$S_{n_2}(X)$  = The observed cumulative step function of group two.  $[S_{n_2}(X) = K/n_2]$

$D$  = The maximum observed difference between  $S_{n_1}(X)$  and  $S_{n_2}(X)$  in the predicted direction.

Since the size of each sample was ten, the denominators for  $S_{n_1}(X)$  and  $S_{n_2}(X)$  were both ten. For purposes of the test, the range of possible scores was divided into ten cumulative increments of ten points each, such that increment one consisted of scores less than ten, increment two of scores less than twenty, etc. The numerator of the

two fractions was then determined by counting the scores of a group which fell in to each cumulative increment.

The difference, in the predicted direction, between the two fractions for each increment was calculated by subtraction.

$$\text{Difference} = S_{n_1}(X) - S_{n_2}(X)$$

The maximum difference was found by observation and compared to  $k_p$ , the critical D value for samples of size ten, as discussed in Chapter 3.