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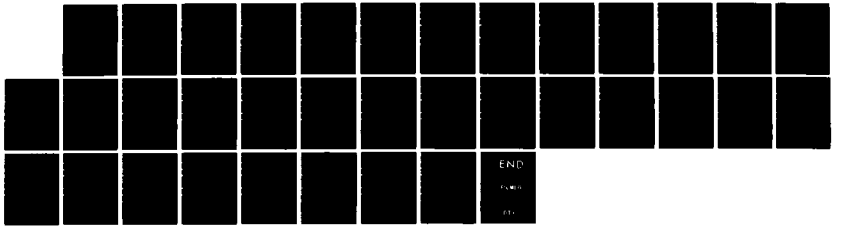

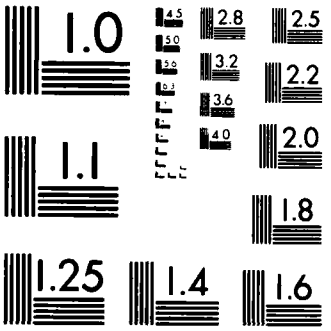

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# VALIDATION OF THE ALGORITHM FOR BASE TCTO MATERIAL COST FOR THE COMPONENT SUPPORT COST SYSTEM (D160B)

Contract No. F33600-82-C-0543

15 August 1983

Report Number
V-83-31859-03



Submitted to:

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## EXECUTIVE SUMMARY

Visibility and Management of Operating and Support Costs is a program initiated by the Office of the Secretary of Defense (OSD) in order to ensure that each Military Department gathers, tracks, and computes operating and support costs by weapon system. VAMOSC II is an Air Force management information system which is responsive to the OSD initiative. It uses information from existing Air Force data systems to satisfy both Air Force and OSD needs for certain weapon system operating and support (O&S) costs.

At present, the VAMOSC II system comprises three subsystems:

(1) The Weapon System Support Cost (WSSC) system (D160), which deals with aircraft,

(2) The Communications - Electronics (C-E) system (D160A), which deals with ground communications - electronics equipment,

(3) The Component Support Cost Subsystem (CSCS) (D160B), which deals with subsystems and components for aircraft.

The Component Support Cost System (CSCS) of VAMOSC II gathers and computes support costs by assembly/subassembly and relates those costs back to the end item or weapon system. CSCS replaces the Logistic Support Cost (LSC) model of K051 (AFLCR 400-49) for aircraft and engines.

The CSCS receives inputs from 15 Air Force data systems. On

a quarterly basis, the system provides two standard reports each processing cycle and twelve other types of reports as requested by users. It also provides pre-programmed data base extracts on magnetic tape on a one-time basis in response to user requests. Special requests for data in user selected format may also be satisfied on a case by case basis.

At the heart of the CSCS is a set of 30 algorithms for estimation or allocation of costs. Information Spectrum, Inc. (ISI) was awarded a contract to validate these algorithms. This effort included investigations of logic, appropriateness of the algorithms and assumptions inherent in the algorithms. ISI was also to survey published findings, reports of audit, etc. relating to the accuracy of the source data systems. In addition to the algorithm validation, ISI was to perform certain "special tasks," including a user survey.

This report provides the verification and validation of the algorithm called "Base TCTO Material Costs." The costs of direct labor performed in maintenance of aircraft is a major component of support costs. This maintenance includes activities in response to Time Compliance Technical Orders (TCTOs), which are "directives issued to provide instructions to Air Force activities for accomplishing one-time changes, modifications, or inspections of equipment or installation of new equipment."

Material required for TCTOs is issued in the form of kits, each containing all parts and materials (except for petroleum

products such as jet fuels, lube oil, and solvents) required to complete the TCTO instructions on one end item or article of equipment. The algorithm addressed in this report calculates the costs of TCTO kits issued in a calendar quarter. These costs are developed separately for each combination of aircraft MDS and base.

The algorithm is perfectly straightforward: the count of TCTO kits issued and the kit price are provided to the CSCS by an input data system. The product of these is accumulated for each combination of base and MDS.

In order to verify and validate the CSCS algorithms, a set of analysis procedures applicable to all of the algorithms was established. These procedures were then applied to each algorithm. This report first describes the analysis procedures, without reference to the specific algorithm addressed by this report.

Next, the Base TCTO Material Cost algorithm is defined and described in detail. This description includes identification of source data systems and files, and the calculation procedures currently implemented by the CSCS.

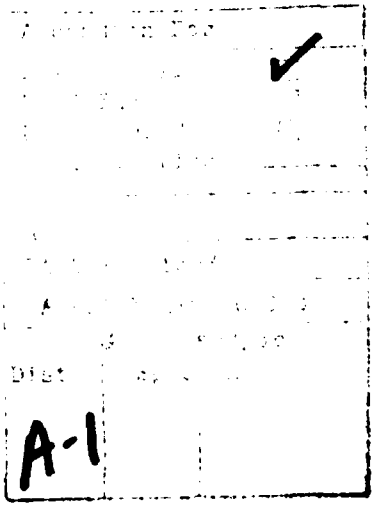
Finally, a critique of the algorithm is provided as required by the contract. It addresses the following topics:

- o Verification of assumptions and approximations for appropriateness and accuracy.
- o Validation of accuracy of source data.

- o Validation of appropriateness of source data as inputs to CSCS logic.
- o Investigation of the accuracy and appropriateness of algorithms.
- o Consideration of replacement of indirect cost methods with more direct ones.
- o Identification of algorithm impact on CSCS output reports.

For each algorithm addressed, ISI is required to affirm the process or procedure and reject any portion that cannot be affirmed. Where the algorithm or portion of the algorithm is rejected, an alternate procedure must be specified.

No defects in the TCTO Material Cost algorithm could be found. It is recommended that it be retained in its present form.



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## 1.0 INTRODUCTION

Visibility and Management of Operating and Support Costs is a program initiated by the Office of the Secretary of Defense (OSD) in order to ensure that each Military Department gathers, tracks, and computes operating and support costs by weapon system (all costs are computed and portrayed in "then year" dollars). VAMOSC II is an Air Force management information system which is responsive to the OSD initiative. It uses information from existing Air Force systems to satisfy both Air Force and OSD needs for certain weapon system operating and support (O&S) costs.

At present, the VAMOSC II system comprises three subsystems:

(1) The Weapon System Support Cost (WSSC) system (D160), which deals with aircraft,

(2) The Communications - Electronics (C-E) system (D160A), which deals with ground communications - electronics equipment,

(3) The Component Support Cost Subsystem (CSCS) (D160B), which deals with subsystems and components for aircraft.

### 1.1 The Component Support Cost System

The Component Support Cost System (CSCS) of VAMOSC II gathers and computes support costs by assembly/subassembly and relates those costs back to the end item or weapon system. CSCS replaces the Logistic Support Cost (LSC) model of K051 (AFLCR 400-49) for aircraft and engines.

The objectives of the Component Support Cost System are:

(1) To improve the visibility of aircraft and engine component support costs and to relate those costs to the end item or weapon system.

(2) To improve the Life Cycle Costing capability for the Air Force and the Department of Defense in the acquisition of new weapon systems.

(3) To assist in the design of new weapon systems by providing cost information on existing weapon systems thereby enhancing design tradeoff studies.

(4) To provide historical cost information at the weapon subsystem level to improve logistic policy decisions.

(5) To identify system component reliability, effectiveness, and costs so that high support cost items may be identified and addressed.

The CSCS is described in detail in references [1], [2], and [3]. It receives inputs from 15 Air Force data systems. On a quarterly basis, the system provides two mandatory reports each processing cycle and twelve other types of reports as requested by users. It also provides pre-programmed data base extracts on magnetic tape on a one-time basis in response to user requests. Special requests for data in user selected format may also be satisfied on a case by case basis.

The twelve reports mentioned above are of primary interest

to the user community. They are identified by name in Table 1. Descriptions and samples are provided by reference [1].

At the heart of the CSCS is a set of 30 algorithms for estimation or allocation of costs. The algorithms are identified by name in Table 2. Information Spectrum, Inc. (ISI) was awarded a contract to validate these algorithms. This effort included investigations of logic, appropriateness of the algorithms and assumptions inherent in the algorithms. ISI was also to survey published findings, reports of audit, etc. relating to the accuracy of the source data systems. In addition to the algorithm validation, ISI was to perform certain "special tasks," including a user survey.

## 1.2 Overview of the Algorithm

This report provides the verification and validation of algorithm 3 of Table 2, "Base TCTO Material Costs." Time Compliance Technical Orders (TCTOs) are identified in reference [32] as the media to provide instructions to Air Force activities for accomplishing or making a record of "one time" changes to standard systems, equipment, materials, munitions, and computer programs or for imparting precautionary instructions relating to safety, limitations, or inspections or system/equipment or munitions. Compliance is required within specified time limits.

TABLE 1. CSCS OUTPUT REPORTS

| Number* | Name |
|---|---|
| 8105 | Cost Factors |
| 8104 | MDS Logistics Support Costs |
| 8106 | Base Work Unit Code (WUC) Costs |
| 8107 | Total Base Work Unit Code (WUC) Costs |
| 8111 | Depot On-Equipment Work Unit Code (WUC) Costs |
| 8108 | Total Base and Depot Work Unit Code (WUC) Costs |
| 8109 | NSN-MDS-WUC Cross-Reference |
| 8110 | MDS-WUC-NSN Cross-Reference |
| 8112 | Logistic Support Cost Ranking, Selected Items |
| 8113 | Summary of Cost Elements |
| 8114 | NSN-WUC Logistics Support Costs |
| 8115 | Assembly-Subassembly WUC Costs |

* CSCS output reports are assigned Report Control symbol HAF-LEY(AR)nnnn, where nnnn is the number in the table.

TABLE 2. CSCS ALGORITHM NAMES

1. Base TCTO Labor Cost
2. Base TCTO Overhead Cost
3. Base TCTO Material Cost
4. TCTO Transportation Costs
5. Base Inspection Costs
6. Base Other Support General Costs
7. Base Labor Costs
8. Base Direct Material Costs
9. Base Maintenance Overhead Costs
10. Second Destination Transportation Costs
11. Second Destination Transportation Costs (Engine)
12. Base Exchangeable Repair Costs (NSN)
13. Base Exchangeable Repair Costs (Engine)
14. Base Exchangeable Modification Costs (NSN)
15. Base Condemnation Spares Costs/NSN
16. Base Exchangeable Modification Costs (Engine)
17. Base Supply Management Overhead Costs
18. Depot TCTO Labor Costs
19. Depot TCTO Material Costs
20. Depot TCTO Other Costs
21. Depot Support General Costs
22. Depot Labor Costs
23. Depot Direct Material Costs
24. Depot Other Costs
25. Depot Exchangeable Repair Costs (NSN)
26. Depot Exchangeable Repair Costs (Engine)
27. Depot Exchangeable Modification Costs (NSN)
28. Depot Exchangeable Modification Costs (Engine)
29. Depot Condemnation Spares Costs (NSN)
30. Depot Material Management Overhead Cost

Material required for TCTOs is issued in the form of kits, each containing all parts and materials (except for petroleum products such as jet fuels, lube oil, and solvents) required to complete the TCTO instructions on one end item or article of equipment. The algorithm addressed in this report calculates the costs of TCTO kits issued in a calendar quarter. These costs are developed separately for each combination of aircraft MDS and base.

## 2.0 ANALYSIS PROCEDURES

In order to verify and validate the CSCS algorithms, a set of analysis procedures applicable to all of the algorithms was established. These procedures were then applied to each algorithm. This section describes the analysis procedures, without reference to the specific algorithm addressed by this report.

The algorithm analysis process consists of five portions, described in the following sections.

### 2.1 Algorithm Description

The algorithms are described in references [1], [2], and [3]. These descriptions are not identical. In general they supplement, rather than contradict each other. The first two describe what the system is to achieve; the third describes the system design to do so.

None of these decriptions provides the combination of level of detail and clarity of concept required for this validation effort. The first step in the analysis methodology was the generation of such a description. The descriptions in the three reference sources just cited were made explicit. When necessary, Air Force personnel involved in implementation of the D160B subsystem were contacted for clarification.

### 2.2 Input Data Definitions

Closely related to the first step was the clarification of

the definitions of the input data. The identification of each input data element and of the system providing it was provided by the User's Manual (reference [1]). This identification was refined by identification of a particular file within the source system and the structure of the file as described in both the CSCS System/Subsystem Specification and in the Memoranda of Agreement. The Memoranda of Agreement have been established between the Office of VAMOSC and the Offices of Primary Responsibility (OPR) for the systems providing the input data. Any inconsistencies or voids were identified and resolved through contact with the Office of VAMOSC and/or implementing personnel.

Whenever appropriate, input data element definitions were further refined by tracing the elements back to their sources through the reference data provided. If these were inadequate, the OPRs were contacted directly for clarifications. In tracing the data back to their origins, possible sources of data contamination were considered. Information on the likelihood and significance of such contamination was collected from cognizant personnel and from published references.

## 2.3 Concept Validation

The two steps above established exactly what the algorithm does. The third, and most critical step, considered the validity of the procedure. It depended on the ability of the analyst to translate mathematical formulas and data processing techniques into meaningful concepts.

Some explicit techniques which were generally used in concept validation are listed below.

(a) Consider how the cost element would be calculated if there were no constraints on resources. (For example, suppose the CSCS could identify the pay grade and hours worked of each individual involved in a maintenance action.)

(b) Identify assumptions* incorporated into the Algorithm. Generally this procedure will identify the real constraints which affect the approach in (a) above.

(c) Identify approximations incorporated into the algorithm. For instance, one such approximation is the use of an average labor rate for each aircraft.

(d) Study each approximation for possible sources of error. Some examples are biases introduced by editing procedures, obsolete data, or inappropriate application. Whenever feasible, estimate the likelihood of these errors by reviews of the literature and contact with cognizant personnel.

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* Note that assumptions, approximations, and allocations are different concepts, although in some cases the boundaries between them are not sharp. ISI has recognized few assumptions in the algorithms, but many approximations and allocations.

(e) Test the algorithms under conditions of assumed extreme values for the inputs. For instance, in evaluating the algorithm for base maintenance overhead costs, assume that for a single reporting period all maintenance labor is overhead and none is direct. Also try the reverse assumption. If an assumption of an extreme input leads to an illogical result, the algorithm is flawed.

General Task (4) of Section C-2 of the contract speaks of appropriate statistical techniques to confirm or repudiate each algorithm. Statistical techniques could confirm or repudiate only statistical hypotheses as assumptions. (Use of an average does not constitute an assumption.) Accordingly, statistical techniques apply to confirmation or repudiation of an algorithm only to the extent that statistical hypotheses can be developed.

(f) As each algorithm is considered, ensure that the costs do not overlap others already accounted for. (In some cases an overlap may be necessary and desirable. where this occurs, the overlap will be noted.)

(g) In each CSCS output report, identify the data elements incorporating the output of the algorithm, so that a final assessment of report accuracy can be made for each output report.

(h) Consider alternative sources of input data for the algorithm. Also consider more direct cost assignments then those incorporated in the algorithm.

## 2.4 Problem Resolution

Whenever a significant deficiency was recognized in one of the algorithms, one or more proposed solutions were developed. This was a creative analytic process for which few guidelines could be proposed in advance. Certainly it depended on familiarity with the various existing Air Force data reporting and processing systems. Proposed solutions were discussed with personnel of the Office of VAMOSC, and revised as appropriate. Recommended solutions were expressed in the form of contributions to a draft Data Automation Requirement (DAR) when these would be applicable.

## 2.5 Documentation

The documentation of the analysis of each algorithm was a crucial part of the effort. Emphasis was placed on making it thorough, clear, and unambiguous. In the documentation, every assertion was substantiated. This was done by reference to source documentation, by explicitly expressed application of the experience and judgment of the contractor, or by citation of information provided by cognizant Air Force personnel. In the last case, the information was supported by documentation identifying the source, the date, and the information provided.

## 3.0 Algorithm Analysis

The previous section described the general analysis procedures applied to all algorithms. This section presents the results of applying those procedures to the algorithm for Base TCTO Material Costs.

Section 3.1 provides a detailed description of the algorithm and of the input data it uses. Section 3.2 provides a critique, structured to correspond to the contractual requirements. Section 4.0 makes recommendations for solutions of problems.

### 3.1 Algorithm Description

In the following description COBOL-type data names are used to express the algorithm output and its components. The available source documentation does not provide the actual data names used by the CSCS programs. They are presumably different from those used in this report.

This description provides a formula for the calculation that is derived from the Users Manual and other sources. It is not the same as the formula provided in the Users Manual. It is intended to be more explicit. The formula is stated in Section 3.1.1. The input data elements and their sources are provided in Section 3.1.2. The calculation is described verbally in Section 3.1.3. Unless otherwise noted, the descriptions are based on references [1], [2], and [3], and on direct discussion with personnel of the Office of VAMOSC. In case of any discrepancies, information provided by knowledgeable personnel was accepted as most current, hence most definitive.

### 3.1.1 Calculations

MDS-BASE-TCTO-MAT-COST

$$= \sum_{NSN} \text{(NUM-NSN-TCTO-MDS-BASE X NSN-PRICE)}$$

### 3.1.2 Inputs

Name: NUM-NSN-TCTO-MDS-BASE

Definition: Number of TCTO kits issued by base supply with a specified NSN for the MDS, base, and calendar quarter.

Source System/File: D002A/(1)

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Name: NSN-PRICE

Definition: Unit price of TCTO kit with specified NSN

Source System/File: D002A/(1)

### 3.1.3 Description of Calculation Procedure

Each month, the CSCS receives the Base Consumable Material file from D002A. The structure of this file is described in references [6.1] and [51]. TCTO records are identified by the presence of a unique character in one position of the record. For each such record, the product of the number of kits and the unit price is calculated. Standard Reporting Designators (SRDs) for both aircraft and engines reported by D002A are converted to the aircraft MDS using tables stored in the CSCS program. For each MDS, base, and calendar quarter the results are summed for all NSNs.

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(1) "Base Consumable Material" file (no number).

## 3.2 Critique of Algorithm

This section addresses various facets of the algorithm. The discussion is structured to correspond to the contractual requirements. Each aspect is either affirmed or rejected. Rejections lead to recommendations in Section 4.0.

### 3.2.1 Appropriateness and Accuracy of Assumptions and Approximations

The algorithm incorporates no assumptions or approximations.

### 3.2.2 Accuracy of Source Data and Congruence of Data Element Definitions

Information Spectrum was directed to validate accuracy of source data based on a survey of published findings, reports of audit, etc. No direct sampling of data was to be performed. The Office of VAMOSC has indicated that direct validation of source data is planned for future efforts.

This algorithm receives data only from the Automated Materiel System Interfaced With Supply System at Base Level (Data System Designator D002A). Just one published criticism of this system could be found. As a result of Information Spectrum's investigations, personnel of the Air Force Data Systems Design Office identified two program errors. The one applicable to the Base TCTO Material Costs algorithm is described in reference [24] as follows:

> "TMC 5 - The computation of the consolidated quantity is computed by adding all quantities from the transactions being consolidated without regard to whether it is an issue, reverse post issue, turn-in, or a reverse post turn-in. The end result is all TMC 5 transactions are assumed to be issues by the program."

The other D002A error will be addressed in a later report.

Section 4.1 provides an appropriate recommendation.

Reference [32] indicates that TCTO kits are issued complete. The number of kits is therefore unambiguous. Reference [51] shows (Section 60.1.1,b) that TCTO kits are counted as they are issued, with the prices (Section 2.2.3,h) extracted from Federal supply catalogs. All of the usages are consistent with the CSCS application. ISI affirms the congruence of the definitions of the input data as supplied by D002A with the definitions used by the CSCS.

### 3.2.3 Appropriateness of Source Data as Inputs

Section 5-1.a. of reference [32] specifies that "TCTO kits shall contain all parts and materials, except petroleum products such as jet fuels, lube oil, and solvents, accomplish the instructions contained therein on one end article or item of equipment as specified in the pertinent TCTO." Thus, kit quantities and prices are appropriate for measuring TCTO material cost.

According to section 2.2.1,c of reference [51], supply-generated transactions are entered into computer processing as they occur. As each transaction is processed, it is checked against the selection criteria to determine whether it should be incorporated into the file of data to be transmitted to the CSCS. Thus, the data sent to the CSCS represents a direct recording of the appropriate transactions. Accordingly, ISI affirms the appropriateness of the source data as inputs.

### 3.2.4 Accuracy and Appropriateness of the Algorithm

The algorithm is as simple and direct as can be imagined. Subject to the accuracy of the input data, there is no possible inaccuracy in the calculations performed by the CSCS. Information Spectrum affirms the accuracy and appropriateness of the algorithm.

### 3.2.5 Directness of Costing

This algorithm provides a direct costing methodology. A more direct costing methodology is neither possible nor necessary.

### 3.2.6 Application to CSCS Output Reports

TCTO material costs are components of CSCS reports as described by Table 3. The accuracy of the algorithm output will impact the accuracy of the reports as a whole. However, the total report accuracy cannot be addressed until all algorithms are reviewed. This will occur in the final report of this effort. Evaluation of the usefulness of the report will also be provided in the final report of this effort and after ISI conducts a survey of users.

TABLE 3

CONTRIBUTION OF BASE TCTO MATERIAL
COST ALGORITHM TO CSCS OUTPUT REPORTS

| OUTPUT REPORT/NUMBER[1] | COST ELEMENTS CONTRIBUTED TO BY THE ALGORITHM[2] |
|---|---|
| 1. MDS Logistics Support Costs/8104 | 1. By MDS for all bases:<br>a. TCTO COSTS, BASE OVERHEAD<br>b. TCTO COSTS, BASE NR TCTO KITS |
| 2. Base Work Unit Code (WUC) Costs/8106 | 2. By MDS and base:<br>a. TOTAL BASE COSTS, TCTO<br>b. WUC COSTS, MAT MGT OV/HEAD<br>c. WUC COSTS, TOTAL WUC |
| 3. Total Base Work Unit Code (WUC) Costs/8107 | 3. By MDS and base:<br>a. TOTAL BASE COSTS, TCTO<br>b. WUC COSTS, MAT MGT OV/HEAD<br>c. WUC COSTS, TOTAL WUC |
| 4. Total Base and Depot Work Unit Code (WUC) Costs/8108 | 4. By MDS for all bases:<br>a. TOTAL COSTS, TCTO<br>b. WUC MAT MGT OH COST<br>c. BASE & DEPOT WUC TOTAL |
| 5. Summary of Cost Elements/8113 | 5. By MDS for all bases:<br>a. SUSTAINING INVESTMENT, MODIFICATION KITS, TCTO MATERIAL COST, BASE<br>b. DEPOT NON-MAINTENANCE, BASE MAT MGMT OVERHEAD COST |

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(1)CSCS output reports are assigned Report Control Symbol HAF-LEY (AR) nnnn, where nnnn is the number in the table.

(2)Capital letters indicate the titles printed on the report.

## 4.0 RECOMMENDATIONS

Section 3 has presented ISI's critique of the algorithm for Base TCTO Material Cost. Every aspect of the algorithm was affirmed, and we recommend that it be retained in its present form.

Section 3.2.2 described a programming error in the D002A system discovered by personnel of the Air Force Data Systems Design Office as a result of investigations by Information Spectrum. Section 4.1 presents a recommendation to correct the error.

### 4.0a Office of VAMOSC (OOV) Comments

Concur. The Base TCTO Materiel Cost Algorithm will be retained pending further reviews.

### 4.1 Correction to D002A

It is recommended the programming error in D002A be corrected. Appropriate DAR entries are provided in Attachment 1.

### 4.1a Office of VAMOSC (OOV) Comments

Concur. DAR will be submitted by 31 July 1984.

REFERENCES


[1] AF Regulation 400-31, Volume IV (6 August 1982), Visibility and Management of Operating and Support Cost Program (VAMOSC) Component Support Cost System (CSCS)

[2] FD-K-14010C, Functional Description (for the Component Support Cost System (CSCS), Data System Designator D160B, undated draft)

[3] SS-K-15010B, Component Support Cost System/Subsystem Specification, 1 June 1983

[4] TO-00-20-2, Technical Manual: The Maintenance Data Collection System, 1 November 1981

[5] TO-00-20-2-45-2, Operational Supplement to Technical Order: Maintenance Documentation for In-Shop Engine Maintenance, 1 October 1982

[6] Memoranda of Agreement (listed separately)

[7] Letter from Chief, Material, Cost & International Accounting Systems Division, Directorate of Plans & System, HQ USAF, dated 27 Feb 1981, Subject: Direct Labor Rates

[8] Air Force Magazine, May 1983 (Almanac Issue)

[9] AFLC Pamphlet 173-10, AFLC Cost and Planning Factors, 31 December 1981

[10] "A Statistical Evaluation of the Accuracy of Maintenance Direct Labor Data Used in Support of Operating and Support Costs." Desmatics, Inc. Final Report No. 111-1, by Dennis E. Smith, Robert L. Gardner, and Terry L. King, April 1979

[11] "The Air Force Can Improve Its Maintenance Information System," U.S. General Accounting Office Report No. GAO/GGD-83-20, 25 January 1983

[12] Compendium of Authenticated Systems and Logistics Terms, Definitions and Acronyms, School of Systems and Logistics, Air Force Institute of Technology, 1 April 1981

[13] AF Regulation 177-101, General Accounting and Finance Systems at Base Level, 17 March 1980 updated to 1 June 1982

[14] AF Manual 177-380, USAF Standard Base Level Maintenance Cost System (B3500), 19 October 1976 updated to 31 July 1981

[15] AF Regulation 173-13, USAF Cost and Planning Factors, 1 February 1982

[16] HQ USAF/ACF (AFAFC) Denver, Co ltr (undated), Subject: Direct Labor Rates for VAMOSC (your 21 Apr 83 ltr)

[17] "Validation of the Algorithm for Base TCTO Labor Cost for the Component Support System (D160B)," Information Spectrum, Inc., Report No. V-83-31859-01, 15 August 1983

[18] AF Regulation 300-4, Vol. III, Unclassified Data Elements and Codes, 1 May 1982

[19] AF Manual 177-674, USAF Standard Base Level Accounting and Distribution System (AFDS): H069R/XQ (H6000), 1 April 1980, updated to 18 June 1982

[20] AF Manual 177-370, USAF Standard Base-Level Accounting and Finance System (B3500), 1 December 1979

[21] TO-00-20-2-2, Technical Manual: On-Equipment Maintenance Documentation for Aircraft; Air-Launched Missiles; Ground-Launched Missiles; Except ICBMS; Drones; and Related Training Equipment, 1 August 1976, updated to 15 October 1982

[22] TO-00-20-2-10, Technical Manual: Off-Equipment Maintenance Documentation for Shopwork, Conventional Munitions, and Precision Measuring Equipment, 1 January 1978, updated to 1 August 1982

[23] AF Manual 66-267, Maintenance Data Collection System (MDC), DSDC: G001BD, Users Manual, 1 October 1979, updated to 1 January 1983

[24] Letter from Chief, Material Systems Division, Directorate of Comptroller Systems, Air Force Data Systems Design Center, to HQ AFLC/MM(VAMOSC), dated 15 September 1983, Subject: "D002A, Daily Consumable Material Cost Data Interface with D160B, Component Support Cost System (CSCS) (your ltr, 15 Aug 83)."

[25] AF Manual 67-1, USAF Supply Manual, Vol. II, Part I, Base Procedures, updated to 18 April 1983

[26] AFLC Regulation 72-2, Cataloging and Standardization, 3 March 1980, updated to 29 May 1982

[27] "Validation of the Algorithm for Base TCTO Overhead Costs for the Component Support Cost System (D160B)," Information Spectrum, Inc., Report No. V-83-31859-02, 15 August 1983

[28] "Validation of the Algorithm for Base Labor Costs for the Component Support Cost System (D160B)," Information Spectrum, Inc., Report No. V-83-31859-06, 13 December 1983

[29] DoD Handbook 7220.29-H, Department of Defense Depot Maintenance and Maintenance Support Cost Accounting and Production Handbook, updated through 13 September 1979

[30] AF Manual 400-1, Volume II, Comprehensive Engine Management System (D042) Engine Status, Configuration and TCTO Reporting Procedures, 1 October 1983

[31] "Validation of the Algorithms for Base Exchangeable Repair Costs (Engine) and Base Exchangeable Modification Costs (Engine) for the Component Support Cost System (D160B)," Information Spectrum, Inc., Report No. V-84-31859-10, 11 February 1984

[32] TO-00-5-15, Technical Manual: Air Force Time Compliance Technical Order System, 15 April 1983

[33] "Validation of the Algorithm for Depot TCTO Labor Costs for the Component Support Cost System (D160B)," Information Spectrum, Inc., Report No. V-84-31859-12, 12 April 1984

[34] "Validation of the Algorithm for Depot TCTO Material Costs for the Component Support Cost System (D160B)," Information Spectrum, Inc., Report No. V-84-31859-13, 12 April 1984

[35] "Validation of the Algorithm for Depot TCTO Other Costs for the Component Support Cost System (D160B)," Information Spectrum, Inc., Report No. V-84-31859-14, 12 April 1984

[36] AFLC Regulation 170-10, "Depot Maintenance Service Air Force Industrial Fund (DMS, AFIF) Financial Procedures, 28 June 1979, updated to 16 February 1982

[37] "Validation of the Algorithms for Base Exchangeable Repair Costs (NSN) and Base Exchangeable Modification Costs (NSN) for the Component Support Cost System (D160B)," Information Spectrum, Inc., Report No. V-84-31859-09, 11 February 1984

[38] AF Manual 67-1, "USAF Supply Manual," Vol. II (Ph IV) Part II, 1 February 1984

[39] "Validation of the Algorithm for Base Maintenance Overhead Costs for the Component Support Cost System (D160B)," Information Spectrum, Inc., Report No. V-83-31859-08, 13 December 1983

[40] "Aircraft Operating and Support Cost Development Guide," Office of the Secretary of Defense, Cost Analysis Improvement Group, 15 April 1980

[41] DoD 7220.29H, "DoD Depot Maintenance and Maintenance Support Cost Accounting and Production Reporting Handbook," updated through 28 October 1981

[42] VAMOSC Operating Instruction 7, Component Support System (CSCS), Mission Support of the CSCS (D160B), 9 April 1982

[43] VAMOSC OI7, 28 December 1983

[44] AFLC Regulation 75-1, Shipment Processing and Documentation, 15 October 1975, updated to 21 December 1977

[45] AFM 400-1, Volume I, Selective Management of Propulsion Units, Policy and Guidance, 21 June 1976

[46] Aircraft Operating and Support Cost Development Guide, Office of the Secretary of Defense, Cost Analysis Improvement Group, 15 April 1980

[47] Letter from ACM to ALMAJCOM-SOA/ACM/ACC/ACR, Subject: Commercial/Industrial Type Activities (CITA) Factor Development Procedures (RCS: HAF-ACM(AR)8004) (AF/MPMX Msg, 251445Z Jul 80), signed by Donald G. Kane, Colonel, USAF, Director of Cost and Management Analysis

[48] AFLC Regulation 65-12, Management of Items Subject to Repair (MISTR). 2 August 1978

[49] AFLC Regulation 66-61, Operational Planning, 27 October 1983

[50] "Validation of the Algorithms for Depot Support General, Labor, Direct Material, and Other Costs for the Component Support Cost System (D160B)," Information Spectrum, Inc., Report No. V-84-31859-15, 12 April 1984

[51] AF Manual 177-206, Automated Material System Interfaced with Supply System at Base Level, Users Manual, 1 August 1979, updated to 1 February 1983.

[52] AF Regulation 66-1, Maintenance Management, Volume 3, Squadron Maintenance, 2 January 1980

[53] "Validation of the Algorithm for Base Inspection Costs for the Component Support Cost System (D160B)," Information Spectrum, Inc., Report No. V-83-31859-04, 15 August 1983

MEMORANDA OF AGREEMENT
FOR SYSTEM INTERFACES

| Ref. No. | Memorandum No. | Date |
|---|---|---|
| [6.1] | D002A/M024B/D160B-A | 9 Jun 1980 |
| [6.2] | D002A/M024B/D160B-B | 9 Jun 1980 |
| [6.3] | D024A/D160B-A | 30 Jun 1980 |
| [6.4] | D033./ARC/D160B | 14 Jun 1980 |
| [6.5] | D042A/DNB/D160B | 4 Nov 1983 |
| [6.6] | D046/M024/D160B | 9 Apr 1981 |
| [6.7] | D046/D160B | 23 Jun 1982 |
| [6.8] | D056A/BDN/D160B-A | 23 Jan 1981 |
| [6.9] | D056A/D160B-C | 13 Oct 1981 |
| [6.10] | D056A/D160B-D | 29 Jan 1981 |
| [6.11] | D056A F005 | 25 Apr 1979 |
| [6.12] | D056B/BDN/D160B-A | 22 Dec 1980 |
| [6.13] | D056C/D160B-A | 4 Mar 1981 |
| [6.14] | D071/D160B | 17 Jun 1982 |
| [6.15] | D143B/D002A 9159 | 3 Aug 1979 |
| [6.16] | D143F/ARC/D160B-A | 5 Feb 1981 |
| [6.17] | D160/D160B | 11 Jun 1982 |
| [6.18] | G004L/M024B/D160B-A | 30 May 1980 |
| [6.19] | G004L/M024B/D160B-B | 30 May 1980 |
| [6.20] | G004L/M024B/D160B-C | 5 Nov 1981 |
| [6.21] | G019F/D160B | 8 Sep 1982 |
| [6.22] | G033B/D160B | 12 Jul 1982 |
| [6.23] | G072D/BDN/D160B-A | 19 Apr 1982 |

MEMORANDA OF AGREEMENT
FOR SYSTEM INTERFACES (Continued)

| Ref. No. | Memorandum No. | Date |
|---|---|---|
| [6.24] | H036B/RC/D160B-A | 10 Feb 1981 |
| [6.25] | H069R/M024B/D160B-B | 19 Jan 1981 |
| [6.26] | O013/BDN/D160B | 22 Jul 1982 |

Attachment 1: Proposed DAR Entries Supporting Correction of Programming Error in D002A

Requirement:

Supply Consumable Material data is provided to the Component Support Cost System (DSD D160B) by D002A in accordance with procedures described in AFM 177-206, Chapter 60. Personnel of the Air Force Data Systems Design Center have identified[1] a programming error which they describe as follows:

> "TMC 5 - The computation of the consolidated quantity is computed by adding all quantities from the transactions being consolidated without regard to whether it is an issue, reverse post issue, turn-in, or a reverse post turn-in. The end result is all TMC 5 transactions are assumed to be issues by the program."

The program should be corrected to provide net issues.

Impact Statement

Failure to implement means that CSCS TCTO material costs may be in error.

Justification Benefits/Cost Savings

Required to correct an acknowledged programming error. Although te impact of the error on the CSCS as a whole is a small, TCTO cost outputs are now wrong for any TCTO material turned in and for reverse post entries.

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[1]Letter from Chief, Material Systems Division, Directorate of Comptroller Systems, Air Force Data Systems Design Center, to HQ AFLC/MM (VAMOSC), dated 15 September 1983. Subject: D002A, Daily Consumable Material Cost Data Interface with D160B, Component Support Cost System (CSCS) (Your ltr, 15 Aug 83)."

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

| REPORT DOCUMENTATION PAGE | READ INSTRUCTIONS BEFORE COMPLETING FORM |
|---|---|
| 1 REPORT NUMBER: AD-A156648 | 3 RECIPIENT'S CATALOG NUMBER |
| 4 TITLE (and Subtitle): Validation of the Algorithm for Base TCTO Material Cost for THE CSCS (D160B) | 5 TYPE OF REPORT & PERIOD COVERED: Technical Report |
| | 6 PERFORMING ORG. REPORT NUMBER: V-83-31859-03 |
| 7 AUTHOR(s): Dr. Sheldon J. Einhorn | 8 CONTRACT OR GRANT NUMBER(s): F33600-82-C-0543 |
| 9 PERFORMING ORGANIZATION NAME AND ADDRESS: Information Spectrum, Inc. 1745 S. Jefferson Davis Highway Arlington, VA 22202 | 10 PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS |
| 11 CONTROLLING OFFICE NAME AND ADDRESS: HQ AFLC/MML(VAMOSC) Wright-Patterson AFB, OH 45433 | 12 REPORT DATE: August 1983 |
| | 13 NUMBER OF PAGES: 34 |
| 14 MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) | 15 SECURITY CLASS. (of this report): Unclassified |
| | 15a DECLASSIFICATION DOWNGRADING SCHEDULE |

16 DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17 DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18 SUPPLEMENTARY NOTES

19 KEY WORDS (Continue on reverse side if necessary and identify by block number)

VAMOSC
O&S Costs
Cost Allocation

20 ABSTRACT (Continue on reverse side if necessary and identify by block number)

This study is the third of a set of reports documenting the findings of a study conducted by Information Spectrum, Inc (ISI) for the Office of VAMOSC, Air Force Logistics Command. This study constitutes an assessment of the algorithm for the Base TCTO Material Costs within the Component Support Cost System (CSCS) subsystem of VAMOSC, the Air Force Visibility and Management of Operating and Support Cost System. CSCS deals with subsystems and components for aircraft.

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20. Material required for Time Compliance Technical Orders (TCTOs) are issued in the form of kits, each containing all parts and materials (except for petroleum products such as jet fuels, lube oil,, and solvents) required to complete the TCTO instructions on one end item or article of equipment. The algorithm addressed in this report calculates the costs of TCTO kits issued in a calendar quarter. These costs are developed separately for each combination of aircraft MDS and base.

This volume presents ISIs conclusions and recommendations, and the comments of the Office of VAMOSC.

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