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SPARES PRICING TO SUPPORT UPDATE OF THE ARMED SERVICES PRICING MANUAL

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EXECUTIVE SUMMARY

The purpose of this study was to review the Armed Services Pricing Manual (ASPM) to identify topics which required significant revision, and then document those topics and the nature of the revisions required; revise Chapter 8B, "Spare Parts," of the ASPM to reflect the policy changes from the Armed Services Procurement Regulation (ASPR) to the current Federal Acquisition Regulation (FAR) and the new approaches to pricing of spare parts, allocating overheads, assuring unit price integrity, developing profit objectives and pricing data; develop and validate a statistical analysis technique for rapid calculation of estimated unit cost of an item based on historical and projected information.

The review of the ASPM involved comparing the ASPM with the current FAR and the Department of Defense FAR Supplement (DFARS) to identify areas requiring changes. Areas requiring revision were documented in the following format: Topical Area, ASPM References, Specific Problems With Current Text, Sources of Data for Rewrite Material and Points of Contact Within DOD. Contacts were made with personnel at the Aeronautical Systems Division, Air Force Institute of Technology, Air Force Systems Command, Defense Electronics Supply Center, Headquarters Army Material Command, Headquarters Naval Material Command, Headquarters United States Air Force, Naval Supply Systems Command, Office of the Under Secretary of Defense (Research and Engineering), Oklahoma City Air Logistics Center and San Antonio Air Logistics Center. The documented areas suggested for revision are provided in Appendix A.

The revision of the ASPM involved gathering and incorporating information on current spare part pricing policies and procedures from contacts within the DOD and from available published material. The 15 September 1975 version of Chapter 8B and a revised preliminary draft of Chapter 8B were disseminated for recommended changes, deletions and additions. Visits were made to the Headquarters Air Force Logistics Command, Headquarters Army Materiel

Command, Headquarters United States Air Force, Naval Material Command, Naval Supply Systems Command, Oklahoma City Air Logistics Center, United States Army Aviation Systems Command, and United States Army Missile Command. Further contacts were made by mail or telephone to the Air Force Systems Command, Air Training Command and Office of the Under Secretary of Defense (Research and Engineering). The revised Chapter 8B, "Spare Parts," is presented in Appendix B.

The statistical analysis involved developing a valve nomograph based upon previous quantities and unit prices paid. Visits were made to Headquarters Air Force Logistics Command, Oklahoma City Air Logistics Center and San Antonio Air Logistics Center. A complete listing of contacts made is provided in Appendix K. Data for the analysis was obtained from the Air Logistics Center Nonrecoverable Item Requirements Computation Process System (D062) and the Acquisition and Due-In System (J041). Several linear regression analyses were performed in order to determine a common factor (slope) that could be used for development of a valve nomograph. Based upon our findings, we determined that a common factor did not exist for the data we analyzed; therefore one nomograph that would accurately represent valves could not be developed. Instead, a nomograph for each national stock number was required (an example of a nomograph for one national stock number appears in Appendix J). However, this concept was unrealistic for practical applications. We compared the results of the regression analysis to results obtained from application of a least squares learning curve formula, and found that the latter method produced superior predictive results.

Based on these determinations, we developed two recommendations regarding the statistical analysis. We recommended that nomographs should not be developed to represent families of parts, and we recommended that a user-friendly program should be considered for implementation on the Contract Information Data Base System (J018).

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1. INTRODUCTION

1.1 STUDY PURPOSE

The purpose of this study was to:

1. review the Armed Services Pricing Manual (ASPM) to identify topics which required significant revision, and then document those topics and the nature of the revisions required;

2. revise Chapter 8B, "Spare Parts," of the ASPM to reflect the policy changes from the Armed Services Procurement Regulation (ASPR) to the current Federal Acquisition Regulation (FAR) and the new approaches to pricing of spare parts, allocating overheads, assuring unit price integrity, developing profit objectives and pricing data;

3. develop and validate a statistical analysis technique for rapid calculation of estimated unit cost of an item based on historical and projected information.

1.2 BACKGROUND

1.2.1 ASPM Review and Revision

The purpose of the current ASPM, published on 15 September 1975, was to provide guidance to Department of Defense (DOD) personnel engaged in the analysis and negotiation of contract prices. The current ASPM was based upon policies in the ASPR, which was replaced by the Defense Acquisition Regulation (DAR), which was superseded by the FAR. While the majority of the material in the ASPM was not affected by these changes, certain areas no longer reflected current policies and procedures. Other areas of the ASPM, specifically the pricing of spare parts, originated from DOD Directives which were amended or superseded. Current policies and procedures had to be reflected in the ASPM in order for it to continue to be an effective training document and reference handbook.

1.2.2 Statistical Analysis

Several major events that occurred during 1982 to 1983 formed a prelude to the media blitz which highlighted to the DOD, Congress and general public the recurring problems associated with the acquisition of spare parts. For example, during 1979 to 1982, the Air Force Logistics Command (AFLC) examined the causes of sharp increases in prices being paid for particular spare parts. As a result, in 1982, a public disclosure of an Oklahoma City Air Logistics Center (ALC) report on engine spare parts price increases was made. This disclosure led to a series of Congressional hearings. The report of engine spare parts price increases and other price increases within the Air Force led to the chartering of the Air Force Management Analysis Group (AFMAG).

This charter required an in-depth study of the spare parts acquisition process. The AFMAG summarized their findings and recommendations in the AFMAG Spare Parts Acquisition Final Report, dated October 1983. The AFMAG report stated that, "the potential for paying significantly overstated prices for relatively common low value items . . . bought in small quantities is great." A survey conducted by the AFMAG group "revealed that the largest potential for overpricing exists in the 0 to $25,000 range." The AFMAG report also stated that, "sufficient tools were not available to the buyer . . ." Because of this extreme concern in the pricing of spare parts that cost $25,000 or less and the volume of items acquired within this range, it was highly desirable that a method be established for quickly forecasting unit costs of spare part items, given prior costs and quantities.

1.3 STUDY METHODOLOGY

This study was conducted by Analytics Incorporated and Arthur Young & Company. Analytics' role in this study involved developing the study approach, gathering background information, obtaining data, accomplishing research and analyses, reviewing and evaluating material, and making recommendations concerning the ASPM review and revision, and the statistical analysis. Arthur Young's role in the study involved reviewing the methodology, task performance, conclusions and recommendations in order to ensure that the approach was logical and appropriate and that the recommendations were reasonable and supported by the facts gathered.

The methodology used within this study involved a review of the ASPM to identify topics which required significant revision; collection and review of potential new material; revising Chapter 8B, "Spare Parts," of the ASPM; and conducting research for the development of a statistical analysis technique for calculating item unit cost utilizing the parameters of unit cost, impact of quantity variance and escalation factors since the previous buy.

1.3.1 ASPM Review

The review of the ASPM involved comparing the ASPM with the current FAR and the DOD Far Supplement (DFARS) to identify areas requiring changes. Contacts were made with personnel having staff pricing responsibility within the DOD in order to obtain their suggestions concerning revisions.

1.3.2 ASPM Revision

The revision of Chapter 8B was accomplished by gathering and incorporating information on current spare part pricing policies and procedures from contacts within the DOD and from available published material. Then, a preliminary revised version of Chapter 8B was disseminated to obtain comments and/or recommendations for the final submission of Chapter 8B.

1.3.3 Statistical Analysis

The statistical analysis commenced with the Air Force selection of the part family for the illustrative nomograph ("a graphic representation that consists of several lines marked off to scale and arranged in such a way that by using a straightedge to connect known values on two lines an unknown value can be read at the point of intersection with another line") from a list of five potential candidates. After the part family was identified, requisite procurment history data for the part family was obtained from the ALC Nonrecoverable Item Requirements Computation Process System (D062) and the Acquisition and Due-In System (J041). Based on the data obtained from these files, computer linear regression analyses were performed. The results of these analyses were then discussed with Headquarters Air Force Logistics Command personnel responsible for the oversight of this study. Information received from the Ogden Air Logistics Center concerning the least squares learning curve slope program was reviewed.

2. ARMED SERVICES PRICING MANUAL REVIEW

2.1 REVIEW RESEARCH

Initially, we reviewed the ASPM to identify the areas which required revision. The review was based on the latest guidance in the FAR, DFARS and procedural changes that have occurred within the Services. The next step in our review process was to document the areas that required revision in the following format:

1. Topical Area,
2. ASPM References,
3. Specific Problems With Current Text,
4. Sources of Data for Rewrite Material and
5. Points of Contact Within DOD.

After documenting the topics and the nature of revisions required, we met with or received correspondence from the government personnel listed in Figure 1 for recommended changes, additions and deletions.

Figure 1. ASPM Review Personnel Contacts

1. Mr. Richard J. Bearr
   Chief, Pricing Division
   Directorate, Contracting and Manufacturing
   SA-ALC/PMF
   Kelly AFB, TX

2. Mr. Pete Bryan
   Procurement Analyst
   Directorate, Cost, Pricing and Finance
   OUSD(R&E)/AMCPF
   Washington, DC

3. Mr. Jim Carter
Price Analyst
Directorate, Contracting and Manufacturing
SA-ALC/PMF
Kelly AFB, TX

4. Mr. Bob Johnson
Supervisory Contract Price Analyst
Directorate, Contracting and Manufacturing
OC-ALC/PMF
Tinker AFB, OK

5. Mr. Ron Luftman
Member of Contracts Review Committee
Air Force Systems Command Contract Division
AFSC/PKC
Andrews AFB
Washington, DC

6. John H. Lynskey
Chief, Contract Pricing and Financial Office
Directorate, Contracting and Manufacturing Policy
HQ USAF/RDCP
Washington, DC

7. Mr. Tom Moran
Chief, Pricing Branch
Deputy Chief of Staff for Procurement and Production
Hq AMC/PP-SC
Alexandria, VA

8. Cpt John Mullen
Competition Director
Spares Competition and Logistics Technology Program
NAVSUP/PML550
Washington, DC

9. LTC Theodore J. Novak, Jr.
Head, Department of Cost Analysis and Pricing
School of Systems and Logistics
AFIT/LSQ
Wright-Patterson AFB, OH

10. Mr. Frank Schmidt
Chief, Cost and Price Analysis Branch
Directorate, Price Competition
DESC/PMP
Dayton, OH

11. Mr. Mervin Shreve
Branch Head, Electronics and Ordinance Systems
Contracts and Business Management Branch
HQ NAVMAT/0223
Washington, DC

12. Mr. Tom Smith
Supervisory Price Analyst
Directorate, Contracting and Manufacturing
SA-ALC/PMF
Kelly AFB, TX

13. Mr. John Welch
Contract Price Analyst
Directorate, Pricing
ASD/PMF
Wright-Patterson AFB, OH

The documented areas suggested for revision are provided in Appendix A.

3. ARMED SERVICES PRICING MANUAL REVISION

3.1 REVISION RESEARCH

We visited the Air Staff in Washington, DC and obtained policy letters and their attachments which were related to spare parts pricing. These letters had been issued through HQ USAF/RDC and HQ USAF/RDCP. The following subject areas were discussed in the letters:

1. Adjustment of Billing Prices for Fixed-Price Incentive Contracts,
2. Contract Audit Follow-Up,
3. Cost Allocation and Line Item Distributions in Spare Parts and Support Equipment Contracting,
4. Cost of Engineering Data,
5. Cost or Pricing Data for Actions Which Do Not Exceed $500,000,
6. Definition of When Audit Reports are Dispositioned,
7. Disposition of Contract Audit Reports,
8. DLA Policy for Limitations on Price Increases,
9. DLA Spare Parts Pricing Policy,
10. Firm Fixed Price Level of Effort Contracting,
11. Guide to Remedies for Overpricing,
12. Price Analysis and Review Technique for Spares (PARTS),
13. Pricing of Proposed Changes to Contract Cost Principles and
14. Use of Published Commercial Price Lists.

Other documentation utilized to revise Chapter 8B included:

1. AF Pamphlet 70-6, Guide for Air Force Base Level Pricing,
2. AFLC Pacer Price Conference held at Oklahoma City ALC,

3. AFLC Regulation 70-18, Logistics Command Contract Pricing,

4. AFLC Spares Management Analysis and Review Technique (SMART) Briefing,

5. AFMAG Report,

6. Army Spares Task Force Final Report (SPRINT) and

7. Proceedings of the Worldwide Air Force Pricing Conference, "Enhancing Air Force Pricing."

In addition to visiting HQ USAF, we visited the establishments in Figure 2. During our visits, we met with personnel listed in Figure 3. They were mailed or presented a copy of the current version of Chapter 8B for recommended changes, deletions and additions. However, only those marked with an asterisk submitted marked-up copies of the 15 September 1975 version of Chapter 8B.

Figure 2. Government Establishments Visited

1. Headquarters Army Material Command (HQ AMC)
2. Naval Material Command (NAVMAT)
3. Naval Supply Systems Command (NAVSUP)
4. Oklahoma City Air Logistics Center (OC-ALC)
5. San Antonio Air Logistics Center (SA-ALC)
6. U.S. Army Aviation Systems Command (AVSCOM)
7. U.S. Army Missile Command (MICOM)

Figure 3. ASPM Revision Personnel Contacts

1. Dr. Vernon Allen
   Chief, Breakout Branch, Logistics Engineering Division
   Directorate, Engineering
   AMSAV-ELB
   AVSCOM, MO

2. Mr. Richard J. Bearr
Chief, Pricing Division
Directorate, Contracting and Manufacturing
SA-ALC/PMF
Kelly AFB, TX

3. Mr. Jim Brennan
Competition Advocate
Directorate, Competition Advocacy and Spares Management
AMSAV-3
AVSCOM, MO

4. Mr. Jim Carter
Price Analyst
Directorate, Contracting and Manufacturing
SA-ALC/PMF
Kelly AFB, TX

5. Mr. Don Crow
Deputy Director, Competition Advocacy
Directorate, Competition Advocacy
OC-ALC/CR
Tinker AFB, OK

6. Mr. Joe Delprado
Chief, Weapons System Pricing Branch
Directorate, Competition Advocacy
SA-ALC/CRV
Kelly AFB, TX

7. Mr. Mrityumjoy Dutta
General Engineer
Directorate, Engineering
AMSAV-EAS
AVSCOM, MO

8. Mr. Gene Gerber
Industrial Engineer
Directorate, Procurement and Production
AMSAV-PEH
AVSCOM, MO

9. *Mr. Daniel P. Haugan
Chief, LHX/RPV Branch
Directorate, Procurement and Production
AMSAV-PEH
AVSCOM, MO

10. Mr. J.W. Hollaway
Deputy Director, Competition Advocacy
Directorate, Competition Advocacy
SA-ALC/CR
Kelly AFB, TX

11. *Mr. Bob Johnson
Supervisory Contract Price Analyst
Directorate, Contracting and Manufacturing
OC-ALC/PMF
Tinker AFB, OK

12. LTC Dickie Love
Program Manager
PM, Competition Management Office
MICOM, AL

13. *Mr. Tom Moran
Chief, Pricing Branch
Deputy Chief of Staff for Procurement and Production
HQ AMC/PP-SC
Alexandria, VA

14. Cpt John Mullen
Competition Director
Spares Competition and Logistics Technology Program
NAVSUP/PML550
Washington, DC

15. Mr. Pete Peterson
Chief, Price Appraisal Division
Directorate, Competition Advocacy
SA-ALC/CRV
Kelly AFB, TX

16. Mr. Joe Plaxco
Associate Director, MICOM Small Business Office
MICOM, AL

17. Mr. Mervin Shreve
Branch Head, Electronics and Ordinance Systems
Contracts and Business Management Branch
HQ NAVMAT/0223
Washington, DC

18. Mr. Jack Slaughter
Chief, Price Appraisal Division
Directorate, Competition Advocacy
OC-ALC/CRV
Tinker AFB, OK

19. Mr. Tom Smith
Supervisory Price Analyst
Directorate, Contracting and Manufacturing
SA-ALC/PMF
Kelly AFB, TX

20. Mr. Paul Thakur
Industrial Engineer
Directorate, Procurement and Production
AMSAV-PEH
AVSCOM, MO

21. Mr. Ed Weaver
Industrial Engineer
Directorate, Procurement and Production
AMSAV-PEH
AVSCOM, MO

In addition to the marked up copies of Chapter 8B, we received the following documentation from Mr. Bob Johnson (OC-ALC/PMF) and Mr. Mervin Shreve (HQ NAVMAT/0223):

1. Article on Commercial Pricing for Supplies,

2. DLA and DCAA Guidance on Spare Parts Pricing and DLA Guidance on Limiting Price Increases for Spare Parts,

3. Memorandum for Director, DAR Case 84-0-30, "DOD FY85 Authorization Act,"

4. Memorandum for Director, DAR Case 84-0-30, "DOD FY85 Authorization Act," - Regulations for Allocating Overhead to Parts to Which the Prime Contractor Has Added Little Value,

5. Memorandum to Director, DAR Case 84-183, "Fixed Pricing Reports,"

6. OC-ALC/PMF Pricing Case Process,

7. Price Analysis and Review Technique for Spares (PARTS), and

8. Standard Form 1411.

In general, the majority of the people we contacted felt that the existing Chapter 8B was well written and presented and did not require extensive revision. Suggestions included, but were not limited to, updating terminology and acronyms, and incorporating a discussion on DLA and DCAA Guidance on Spare Parts Pricing, formula pricing agreements, PARTS and SMART.

Using the documentation and information gathered from the previously mentioned contacts, we wrote a revised preliminary draft of Chapter 8B. The revised chapter was then mailed to the personnel in Figure 4 for their comments and/or recommendations. We received replies from the personnel with an asterisk beside their name.

Figure 4. Contacts for Comments on Revised Chapter 8B

1. *Mr. Richard J. Bearr
   Chief, Pricing Division
   Directorate, Contracting and Manufacturing
   SA-ALC/PMF
   Kelly AFB, TX

2. Mr. Pete Bryan
   Procurement Analyst
   Directorate, Cost, Pricing and Finance
   OUSD(R&E)/AMCPF
   Washington, DC

3. *Mr. Don Crow
   Deputy Director, Competition Advocacy
   Directorate, Competition Advocacy
   OC-ALC/CR
   Tinker AFB, OK

4. Mr. J.W. Hollaway
   Deputy Director, Competition Advocacy
   Directorate, Competition Advocacy
   SA-ALC/CR
   Kelly AFB, TX

5. *Major Tom Holubik (via Mr. Jeremy Olson)
   Staff Officer, Contract Pricing and Financial Office
   Directorate, Contracting and Manufacturing Policy, DCS/RD&A
   HQ USAF
   Washington, DC

6. Mr. Bob Johnson
   Supervisory Contract Price Analyst
   Directorate, Contracting and Manufacturing
   OC-ALC/PMF
   Tinker AFB, OK

7. Mr. Tom Moran
Chief, Pricing Branch
Deputy Chief of Staff for Procurement and Production
HQ AMC/PP-SC
Alexandria, VA

8. *Cpt John Mullen
Competition Director
Spares Competition and Logistics Technology Program
NAVSUP/PML550
Washington, DC

9. Mr. Mervin Shreve
Branch Head, Electronics and Ordinance Systems
Contracts and Business Management Branch
HQ NAVMAT/0223
Washington, DC

Additional comments from personnel listed in Figure 5 were forwarded to us by Cpt Edward Mitchell (AFBRMC/RDCB), Contract OPR and Mr. Jeremy Olson (HQ USAF/RDCP).

Figure 5. Personnel Providing Comments on Revised Chapter 8B

1. Col David B. Germann
Director, Contracting
DCS/Logistics
HQ ATC/LGCA
Randolph AFB, TX

2. Col William J. Hentges
Director, Contracting and Manufacturing
Directorate, Contracting and Manufacturing
OC-ALC/PM
Tinker AFB, OK

3. Mr. Richard J. Kowalski
Deputy Director, Contract Administration
HQ Air Force Contract Management Division/TM
Kirtland AFB, NM

4. LTC Theodore J. Novak, Jr.
Head, Department of Cost Analysis and Pricing
School of Systems and Logistics
AFIT/LSQ
Wright-Patterson AFB, OH

5. Mr. Robert A. Sands
Deputy Assistant to the Commander for Competition Advocacy
HQ AFLC/CR
Wright-Patterson AFB, OH

6. Mr. Richard F. Shomper
Deputy Director, Logistics Contracting
DCS/Contracting and Manufacturing
HQ AFLC/PMP
Wright-Patterson AFB, OH

7. Col James O. Strickland
Director, Contract Management
DCS/Contracting
HQ AFSC/PKM
Andrews AFB
Washington, DC

After reviewing the comments that we received on the revised preliminary draft of Chapter 8B, we rewrote the chapter. Material that pertained to a single DOD service or component was deleted, and the format was revised to present a more logical flow of subject matter. A copy of the final document was forwarded to Mr. Jeremy Olson (HQ USAF/RDCP) for additional comments. The final revision of Chapter 8B, "Spare Parts," is presented in Appendix B.

4. STATISTICAL ANALYSIS

4.1 STATISTICAL ANALYSIS RESEARCH

4.1.1 Part Family Candidates

Our approach to developing a nomograph depended upon being able to identify families of parts within existing AFLC data systems. These families were composed of parts whose manufacturing approaches were sufficiently similar so that relationships could be established for relative costs of parts within each family. We encountered extensive difficulty in identifying the data systems which could provide the requisite information. Meetings and numerous telephone contacts within the AFLC indicated that no such system existed. However, after contacting the AFLC Cataloging and Standardization Center (CASC) and the Defense Logistics Support Center (DLSC) at Battle Creek, Michigan we determined that the cataloging handbook H-6 identified parts by an approved item name. We then selected the following five approved item names to submit to the Air Force: cables, circuit card assemblies, tubes, valves, and wire harnesses. The Air Force selected valves for the illustrative nomograph.

4.1.2 Valve Procurement History Data

The next phase of our study involved obtaining procurement history data on valves. The specific data required for the part family valves was: item name, national stock number, PIIN, SUPP-PIIN, contract line item, contract line item quantity, contract line item price, actual method of procurement, procurement method code and award date. However, we discovered that a system which contained all of this data did not exist.

Through our investigation, we found that the Master Item Identification Control System (D043) and D062 system could be interrogated by approved item name; however other pertinent information such as contract line item price and quantity could not be extracted. We found that the J041 system contained all the information required except the item name. Therefore, we concluded the only

way to obtain all of the information needed was to write a computer program which would link the D062 system and J041 system. Otherwise, the D062 would have been interrogated by item name (valves) to obtain the corresponding national stock number. Then, these national stock numbers would have been manually inputted to the J041 in order to obtain the price, quantity and other information. This process would have been time consuming and very labor intensive.

The D062 was to have been interrogated for the item name, valve, and the corresponding national stock numbers. Then, using the national stock numbers from the D062, the J041 system was to have been interrogated for the PIIN, SUPP-PIIN, contract line item, contract line item quantity, contract line item price, actual method of procurement, procurement method code and award date.

We were invited to work on the computer program at the SA-ALC/CR office since this office had been conducting research with respect to nomographs. A draft COBOL program, designed to merge the two data files by using the national stock numbers, was written during our visit at the SA-ALC. However, we were not allowed to implement the program and, therefore, its ability and accuracy remain unknown. A copy of the program is provided in Appendix C.

During our visit at the SA-ALC, we obtained a printout of 114 line items from the D062 tape contained within the San Antonio Data Services Center (SADSC) system. A copy of the printout we received is in Appendix D. Even though the system was interrogated by using the item name valves, there was no way to distinguish whether one line item was a powered valve, nonpowered valve, butterfly valve or any other type of valve.

After obtaining the valve national stock numbers from D062 tape, the remainder of the information required to develop a nomograph was obtained from the San Antonio J041 tape. An effort was made while we were at the SA-ALC to obtain the J041 data; however the J041 printout we received did not contain contract line item prices, quantities or the award dates. The pull from the J041 had not been correctly carried out. Therefore, we had to request HQ AFLC/PMXS to pull the remainder of the data from their copy of the San Antonio J041 tape.

HQ AFLC/PMXS manually inputted the national stock numbers obtained from the D062 tape into the J041 system. HQ AFLC/PMXS suggested we eliminate from the interrogation the following: items involved in foreign military sales, items used for provisioning, items with estimated prices and items that were repaired. The printout we received from HQ AFLC/PMXS contained the following information: national stock number, PIIN, SUPP-PIIN, contract line item, contract line item quantity, total contract line item price, actual method of procurement, procurement method code and award date. A copy of the printout is presented in Appendix E. After receiving the J041 data, we proceeded to conduct an automated linear regression analysis. The intention of the linear regression analysis was to determine if a common factor, in this particular case the slope of the regression line, existed. If such a common factor did exist, a valve nomograph could be constructed.

4.1.3 Linear Regression Analysis

In performing the linear regression analyses, the total quantity for each national stock number was designated as the independent or predictor variable plotted in the X dimension, and the unit price for each national stock was designated as the dependent or predicted variable plotted in the Y dimension. Unit prices were escalated to May 85 dollars using the Producer Price Index (PPI) Projections obtained from OC-ALC, see Appendix F.

The first linear regression analysis performed contained the entire grouping of national stock numbers from the J041 printout. Results of this analysis indicated that the coefficient of correlation was negligible, -0.17435. In addition, the percentage increase and/or decrease between the original unit price, Y, and the predicted unit price, Y', was not always within the 25% limit. See Appendix G for the computer printout of this linear regression analysis. Therefore, we concluded that there was no common relationship among the data points and further analysis should be performed.

The next step involved an iteration of linear regression analyses for each of the four digit groupings of national stock numbers illustrated in Figure 6.

Figure 6. Four Digit Group Numbers

1. 1560
2. 1650
3. 1660
4. 1680
5. 1730
6. 2810
7. 2835
8. 2840
9. 2915
10. 3655
11. 4220
12. 4810
13. 4820
14. 4930

Figure 7 provides a summary of the data which was used or calculated while implementing the linear regression analyses.

Figure 7. Results of Linear Regression Analysis for National Stock Number Groupings

Group Number	Number of Data Points	Absolute % Change in Unit Price Range	Coefficient of Correlation	Slope of the Regression Line
1560	6	25 to 532	-0.55999	-0.60198
1650	2	0	1	0.024420
1660	8	12 to 27	-0.16705	-0.00006
1680	3	.5 to 1	-.99427	-0.46678
1730	10	2 to 99	-0.88667	-0.01691
2810	9	.3 to 41	0.478697	0.006934
2835	3	.1 to 2	-0.99501	-0.37699

Group Number	Number of Data Points	Absolute % Change in Unit Price Range	Coefficient of Correlation	Slope of the Regression Line
2840	8	.6 to 78	-0.12938	-0.01134
2915	22	6 to 1583	-0.44151	-0.03991
3655	3	3 to 7	-0.33851	-0.00080
4220	2	47 to 124	-0.53287	-0.08296
4810	34	31 to 250	-0.10512	-1.93670
4820	168	.2 to 586	-0.40771	-0.45089
4930	12	13 to 288	-0.85751	-1.96653

As indicated in Figure 7, 10 of the 14 group numbers had percent increases and/or decreases in unit price of more than 25%. The slopes of the regression lines ranged from .024420 to -.00006. Again, the regression analysis resulted in determining no common factor or slope for use in developing one nomograph. Appendix H contains copies of the computer printouts gathered during this phase of our study.

Next, we performed a linear regression analysis for each individual national stock number to see whether or not a common factor existed. Results of these analyses are shown in Figure 8. Computer printouts obtained during this analysis are in Appendix I.

Figure 8. Results of Linear Regression Analysis for Individual National Stock Numbers

National Stock Number	Number of Data Points	Absolute % Change in Unit Price Range	Coefficient of Correlation	Slope of the Regression Line
1560000271050XJ	2	0	1	0.504652
1560008880107XE	4	7 to 24	0.138916	0.005550
1650003562129LH	2	0	1	0.024420
1660002265334LS	5	11 to 22	-0.13317	-0.00009
1660011147208LS	3	.2 to 4	-0.79688	-0.00005
1680006002596	3	.5 to 1	-0.99427	-0.46678
1730006295632	2	0	-1	-0.00159
1730007097485	3	8 to 17	-0.49129	-0.11185
1730009986565	5	.6 to 20	-0.65916	-0.00380
2810002038640PA	5	.8 to 17	0.364289	0.001774
2810006591581PA	4	.4 to 5	0.004261	0.000009
2835005713555	3	.1 to 2	-0.99501	-0.37699
2840000556778RW*	5 4	1 to 9 .1 to 2	-0.06812 -0.95034	-0.00603 -0.02070
2840003407296PT	4	4 to 18	-0.79808	-0.04080
2915000513810	2	0	-1	-14.8121
2915000703547	6	.6 to 6	0.629852	0.000101
2915003359045	3	5 to 22	0.859319	1.647418
2915005611109	3	.3 to .6	-0.96936	-0.02115
2915006123875	4	.7 to 16	-0.85775	-0.00548
2915008029358RX	2	0	-1	-0.01488
2915009919232RX	2	0	1	0.335197
3655007969680YD	3	3 to 7	-0.33851	-0.00080

National Stock Number	Number of Data Points	Absolute % Change in Unit Price Range	Coefficient of Correlation	Slope of the Regression Line
4220002332536LS	2	0	1	22.48906
4220006655172LS	6	2 to 18	-0.75456	-0.00691
4810001164585PS	2	0	-1	-10.2622
4810001594293YP	5	2 to 10	-0.66307	-3.23962
4810001693495YP	4	8 to 17	-0.66060	-0.57872
4810004884186	3	.2 to .7	-0.99685	-8.97569
4810005582022	4	.1 to 5	-0.91072	-14.8674
4810005757614	8	.2 to 5	0.042830	0.131626
4810005757615	6	2 to 11	-0.19961	-0.10995
4810006185528FS	2	0	-1	-2.30060
4820000035559AX	2	0	1	0.091292
4820000328191FS	2	0	-1	-0.09417
4820000678500	2	0	-1	-1.82931
4820000855840	4	.5 to 2	-0.99723	-5.52331
4820001233499	3	3 to 8	-0.90087	-0.45416
4820001235576FS	2	0	-1	-0.81313
4820001355470	5	.2 to 4	0.026814	0.001645
4820001757709YZ	2	0	-1	-0.70517
4820001851052	3	.8 to 3	-0.34271	-0.88464
4820001913810RX	3	.4 to 2	0.179100	0.004427
4820002191965AX	4	9 to 20	-0.85223	-0.02054
4820002034861YZ	5	.4 to 12	-0.78733	-0.05086
4820002034862YZ	3	.3 to .5	-0.99816	-0.01302
4820002533559	2	0	-1	-0.39765

National Stock Number	Number of Data Points	Absolute % Change in Unit Price Range	Coefficient of Correlation	Slope of the Regression Line
4820002748351	8	.2 to 18	-0.59423	-0.38346
4820003253121	3	3 to 5	-0.81811	-3.72700
4820003650485	3	.5 to 2	0.927602	0.125244
4820004063859YP	3	.8 to 3	-0.39531	-0.52667
4820004202807	6	3 to 13	-0.35676	-0.11401
4820004324886	3	0 to 1	-0.97828	-0.39776
4820004423842	3	.1 to 1	0.880466	0.016875
4820005457380YZ	2	0	-1	-0.55936
4820005807054	3	.1 to .7	0.959775	0.052592
4820006274777FS	5	.3 to 4	-0.79468	-0.11633
4820006401524YD	3	1.7 to 4	0.108971	0.086537
4820007309311FS	4	.1 to 2	-0.97598	-0.02114
4820007329442YD	2	0	-1	-0.36758
4820007542941FS	3	.1 to 2	-0.74956	-0.10369
4820007644737YD	2	0	1	1.027877
4820008523719	6	.1 to 18	-0.57540	-0.07932
4820009442998	5	.8 to 17	0.058829	0.238981
4820009488042	4	.5 to 25	0.390056	1.510078
4820009785077SE	3	1 to 12	-0.33721	-0.39783
4820010037391	4	.1 to 6	0.259349	0.045619
4820010046585	8	.7 to 25	-0.87678	-0.11337
4820010130405XJ	3	.5 to 1	-0.99161	-0.23912
4820010130406XJ	4	.3 to 20	-0.97459	-0.44616
4820010132646XJ	10	.7 to 14	-0.69650	-0.60517

National Stock Number	Number of Data Points	Absolute % Change in Unit Price Range	Coefficient of Correlation	Slope of the Regression Line
4820010148223XJ	3	.1 to 12	-0.36744	-0.13108
4820010739923	7	2 to 10	-0.79622	-0.01744
4820010833032	7	.3 to 9	-0.04371	-0.03148
4820011358553	3	.7 to 2	0.027979	0.011679
4930009442927	5	1.1 to 10	-0.21891	-2.19013
4930009442994	3	2.1 to 9	0.158867	0.029125
4930009487622	4	7 to 13	0.171494	0.019159

*This particular national stock number appeared to have two different types of parts. Therefore, two iterations of the regression analysis were performed.

As shown in Figure 8, extensive slope variations were obtained ranging from 22.48906 to -.00005. However, the percent difference between the actual unit price and the predicted unit price was 25% or less which is within the 25% increase in price limitation. Due to these extensive slope variations, one nomograph that represented the part family valves was impossible to develop. However, nomographs for each individual national stock number could be developed. An example of a nomograph for one national stock number is presented in detail in Appendix J.

4.2 FINDINGS AND CONCLUSIONS

The linear regression analysis performed using all of the J041 data resulted in extreme increases and/or decreases in unit prices that were not within the 25% threshold. Therefore, the slope of the regression line would not have been an appropriate factor to use for developing a nomograph. Also, the linear regression analyses performed using four digit groupings of national stock numbers resulted in extreme increases and/or decreases in unit prices. And, there was no common value for the slope. While the linear regression analyses performed for the individual national stock numbers resulted in unit price increases and/or decreases of 25% or less, the values for the slopes were extre-

mely uncommon. Thus, the development of one nomograph for valves was unrealistic and impossible. Nomographs could be developed for each national stock number; however this process would be labor intensive, time consuming, expensive and impractical.

4.3 RECOMMENDATIONS

Based upon the specific findings and conclusions of the statistical analysis, the following recommendations are offered:

> Recommendation 1: Nomographs should not be developed to represent families of parts.

Based on our statistical analyses, we found that from the D062 and J041 data a common factor or relationship among of the valves did not exist. The only way to obtain viable predicted unit prices would have been to develop a nomograph for each national stock number; however this concept was unrealistic.

> Recommendation 2: Further investigate the applicability of the least squares learning curve method for predicting unit prices of other part families and implement a user-friendly least squares learning curve program on the Contract Information Data Base System (J018).

For example, a buyer would enter the national stock number, quantity and purchase date of the item being investigated. Using the national stock number, the program would pull previous quantities, prices and award dates. At this point, the program would check for two data points. If there are two data points, the program would continue; however if two data points are not pulled, a message would appear on the computer screen indicating that the learning curve analysis cannot be performed. Assuming two or more data points are gathered, the program would then escalate the prices to current year dollars using a set of indices. Then, the mathematical calculations would be performed to calculate the variables A and B which are used in the equation, $Y' = AX'^{B}$. (Y' is the predicted unit price for X' quantities. A and B are merely constants used in this calculation.) The program would check for a negative B value. If B is positive, the program cannot be used. Otherwise, the program would continue and calculate the predicted unit prices for the previous buys and the respective percentage difference between the actual price paid and the predicted price.

Next, the program would perform a check to verify that the percentage differences are within 25%. If the percentage differences are not within 25%, the program deletes the line entry with the greatest percentage difference and repeats the learning curve analysis. This "point plucking" process would continue until the percentage differences are within the 25% limit. Finally, the program would calculate the unit price, Y', for the quantity, X', that the buyer entered at the start of the program using the equation mentioned earlier, $Y' = AX'^{B}$. Finally, the price would be displayed on the computer screen. An example of the least squares learning curve approach is presented in Appendix L.

APPENDIX A

Armed Services Pricing Manual Topical Areas
Suggested for Revision.

Topical Area

Architectural and Engineering (A&E) Contracts

ASPM References

None.

Specific Problems With Current Text

A&E contracts are a growing area for pricing involvement. They are unique in that pricing follows selection of a winner of the competitive phase. Uniform pricing procedures should be established for A&E contracts and guidance should be established for determining that A&E prices are fair and reasonable.

Sources of Data for Rewrite Material

Negotiated A&E contracts.

Points of Contact Within DOD

Pricing focal point at Service headquarters and field organizations dealing with large numbers of A&E contracts.

Topical Area

Computers and Cost Models

ASPM References

Chapter 2D (starting on page 2D35).

Specific Problems With Current Text

With the increased usage and availability of microcomputers, some discussion should be included in the ASPM concerning the use of automated spread sheet programs. These programs offer to the analyst significant increases in computational efficiency and the ability to rapidly reflect changes in positions during the negotiations process. A description of some of the typically available programs and the methods by which they may be used could make a significant contribution to the pricing task.

Sources of Data for Rewrite Material

System descriptions of the generally available spread sheet models.

Points of Contact Within DOD

Pricing organizations at acquisition agencies.

Topical Area

Contract Pricing Proposals

ASPM References

Chapter 2E.

Specific Problems With Current Text

The text in Chapter 2E describes the basic DD Form 633, but the form described is not that currently in use. The section needs to be restructured based upon the new forms, SF-1411 and SF-1412.

Sources of Data for Rewrite Material

SF-1411 and SF-1412.

Points of Contact Within DOD

Headquarters pricing organizations and Air Force Institute of Technology (AFIT), Department of Cost Analysis and Pricing.

Topical Area

Contractor Cost Reporting

ASPM References

Chapter 9D (starting on 9D8).

Specific Problems With Current Text

The current ASPM gives a very brief overview of the contractor cost data reporting system which is used to provide specific information on actual costs of contract activities to the DOD. In many cases, the pricing of follow-on contracts is extremely dependent upon the data submitted in the contractor cost reports. It would appear appropriate to expand the discussion of the cost reporting system so that the price analyst would have a basis for understanding how the costs are formulated for reporting, the specific instructions on accumulation of those costs, and how they may be used in developing a follow-on price objective with specific reference to the issue of major changes in the trend of cost over time. All too often, it is assumed that as soon as a trend is established for cost (learning curve during production), that trend establishes a mandatory constraint on the government estimate for future follow-on production contracts. With the increasing emphasis on reducing cost during production, this may be an inappropriate constraint and issues such as this should be included in the ASPM.

Sources of Data for Rewrite Material

Joint Implementation Guide for the Cost/Schedule Control System Criteria and DOD Directive on Contract Cost Performance Reporting.

Points of Contact Within DOD

The Performance Measurement Joint Evaluation group and Comptroller function within each of the services.

Topical Area

Cost Accounting Standards

ASPM References

Chapter 3B (starting on page 3B7), and Chapter 9D (starting on page 9D1).

Specific Problems With Current Text

It appears that the cost accounting standards currently in effect will not be increased and yet will stay as a basic element of the pricing environment. It would appear appropriate to describe the cost accounting standards currently in effect and the areas which are affected by them.

Sources of Data for Rewrite Material

Existing cost accounting standards.

Points of Contact Within DOD

Service headquarters pricing organizations.

Topical Area

Data Pricing

ASPM References

Chapter 8D.

Specific Problems With Current Text

There has been increased attention to the issue of specific pricing of individual items of data or groups of data on DD Form 1423. While the ASPM does indicate that separate pricing should occur, the practice recently has been to regularly treat data as not separately priced. In addition, the cost of specific types of data, such as acquisition or reprocurement data packages, is becoming a separate specific issue. The ASPM text should be updated to specifically treat the data groups, such as acquisition data, to provide to the price analyst/contracting officer the necessary visibility of this area.

Sources of Data for Rewrite Material

Current study sponsored by AFBRMC on Methods for Pricing Acquisition Data and Service and OSD logistics data functions.

Points of Contact Within DOD

AFBRMC and Air Force Acquisition Logistics Center.

Topical Area

Defective Pricing

ASPM References

None.

Specific Problems With Current Text

DOD Directive 7640.2 has made significant and substantial changes in the area of defective pricing and the role of audit reports in the development and negotiation of prices. The ASPM needs to be changed to reflect these new procedures. The scope of the change is such that this may require a separate chapter within ASPM. This should be determined.

Sources of Data for Rewrite Material

DOD Directive 7640.2.

Points of Contact Within DOD

OSD and Service Comptroller organizations and Contract Pricing Staff offices.

Topical Area

Factory Labor

ASPM References

Chapter 4B.

Specific Problems With Current Text

There is a strong and growing emphasis on the application of MIL-STD-1567, Work Measurement, within the system acquisition environment. There is a need to provide information to the price analyst describing the purpose of this MIL-STD, the expected results of its application, and, most importantly, the need for variance analysis on realization or efficiency factors. It is estimated that attention to identification of the cause of variance from standard can provide industry with the capability to reduce system costs. However, without aggressive implementation of the standard and the use of the results of the variance analysis in the negotiation of follow-on contracts, much of the benefit of MIL-STD-1567 will not be realized.

Sources of Data for Rewrite Material

MIL-STD-1567 and current OSD action group on MIL-STD-1567 Implementation Guide.

Points of Contact Within DOD

Dr. Richard Stimson, Office of Industrial Productivity OSD.

Topical Area

Foreign Military Sales

ASPM References

Chapter 8C.

Specific Problems With Current Text

There has been a rapid explosion in the amount of Foreign Military Sales (FMS) and a change in the nature of many of the agreements under which the FMS are consummated. There should be some specific discussion of some of the newer techniques used in pricing foreign military sales as well as a treatment of the roles that offsets play in the negotiation of prices and intercountry agreements. There should also be some treatment of the problem of currency transfer from the standpoint of prices being quoted in the foreign currency but being budgeted and accounted for in U.S. dollars. Some discussion on the method by which payments are to be made should also be treated to the extent that they will influence the negotiation price for the basic contract.

Sources of Data for Rewrite Material

DSMC Handbook for the Management of Joint Service Programs.

Points of Contact Within DOD

The Defense Security Assistance Agency, DSMC, and the FMS points of contact within the Service Comptroller and Contract Pricing organizations.

Topical Area

Funding Issues

ASPM References

None. Should be added to Part 2.

Specific Problems With Current Text

The issue of funding, funds planning, and identification of types of appropriations is not currently treated in the ASPM. In doing analysis of major proposals which may involve different kinds of money (3600, 3010, etc.) it is important that the price analyst and contracting officer understand the differences between the types of money and the constraints on their usage. The PCO or buyer should also have some understanding of the budget process by which the funds are approved for use in the contract vehicle.

Sources of Data for Rewrite Material

AFSC/PMP letter entitled, "AFSC Budget and Accounting Guide for Contracting Officers," dated 13 June 1984. Guide written by Cpt James McGinley.

Points of Contact Within DOD

AFSC/PMP, AF/AC, Comptroller of the Army, and Comptroller Organization within the Navy.

Topical Area

Index Numbers

ASPM References

Chapter 2D (starting on page 2D7).

Specific Problems With Current Text

There is no discussion currently included on the OMB/DOD Price Indices which are published and distributed within the services. There should also be some discussion dealing with the choice of particular sets of indices with specific reference to situations in which the OSD/DOD Price Indices may not be appropriate for use.

Sources of Data for Rewrite Material

Comptroller functions within OSD and the individual services.

Points of Contact Within DOD

Comptroller functions within OSD and the individual Services.

Topical Area

Indirect Costs

ASPM References

Chapter 5A.

Specific Problems With Current Text

There is an increase in emphasis on the magnitude of indirect cost pools, particularly as they relate to changes in the overall business activity facility. Each of the Services has developed some new techniques to be used in the analysis of indirect costs and the negotiation of the indirect costs to be charged to specific contracts. The current approaches should be researched and modifications made to the ASPM to reflect these changes. The treatment of PIECOST in the ASPM should also be reviewed in terms of the degree to which PIECOST is being and should be used within DOD.

Sources of Data for Rewrite Material

DOD and Service Comptroller activities and DOD and Service Pricing Staff organizations.

Points of Contact Within DOD

DOD and Service Comptroller activities and DOD and Service Pricing Staff organizations.

Topical Area

Interim Pricing

ASPM References

Chapter 9B.

Specific Problems With Current Text

There have been a number of changes in the FAR guidance on the use of forward pricing rate agreements. There has also been a substantial amount of activity within the contract administration office (CAO) business management functions in their treatment of the forward pricing rate agreements. The text should be updated to describe the changes in procedures currently in being and the way these changes may effect interim price adjustments and the pricing of initial buys.

Sources of Data for Rewrite Material

AS/RDCP

Points of Contact Within DOD

AFCMD business managment function and AS/RDCP.

Topical Area

Labor Rates

ASPM References

Chapter 6A.

Specific Problems With Current Text

There is a high degree of dissatisfaction within the Services on the current methods of projecting and accounting for labor rates. Part of the Air Force "War on Cost" thrust is driven by a perception that industry has minimal motivation to hold down labor costs as a result of the way in which OSD estimates and allows for labor costs. The text should be revised to reflect the more aggressive approaches currently being taken by the Services. This modification should probably be an addition to the existing text as opposed to a replacement.

Sources of Data for Rewrite Material

Service Comptroller and Pricing Staff organizations.

Points of Contact Within DOD

Service Comptroller and Pricing Staff organizations.

Topical Area

Learning Curve

ASPM References

Chapter 2D (starting on page 2D25).

Specific Problems With Current Text

There is a corresponding shortage of information on some of the more fundamental issues in the use of the learning curve such as the conditions under which the learning phenomenon would be expected to occur, the causative factors in learning, and discussion of the conditions under which the unit curve theory may be more appropriate than the cumulative average curve theory and vice versa. There should also be some discussion of the available learning curve models which can be accessed through time sharing systems such as Copper Impact or through the DCAA computer system.

Sources of Data for Rewrite Material

Air Force Institute of Technology texts on Learning Curve, Copper Impact System Description and the DCAA Computer System Description.

Points of Contact Within DOD

AFIT, Department of Cost Analysis and Pricing, and Manufacturing and Comptroller personnel at each of the services.

Topical Area

Leases

ASPM References

None.

Specific Problems With Current Text

Leases are being used in more areas within the DOD. The pricing of leases has some significant differences when compared with pricing of purchases and these should be discussed within the ASPM.

Sources of Data for Rewrite Material

Negotiated lease agreements.

Points of Contact Within DOD

GSA and DOD organizations utilizing ADP and non-ADP equipment leases.

Topical Area

Preproduction Costs

ASPM References

Chapter 4E (starting on page 4E2).

Specific Problems With Current Text

There should be some discussion added on the use of production engineering and planning or producibility engineering and planning (PEP) during full scale development for planning for production. The nature of the PEP costs and methods for analysis of the magnitude of those costs should be included. There should also be some treatment of the methodology for estimating the cost of the carry over effort from FSD to the production phase.

Sources of Data for Rewrite Material

Service PEP regulations, DOD Directive 4245.6, DOD Directive 4245.7, and the DOD Manufacturing Management Handbook for Program Managers.

Points of Contact Within DOD

Mr. T. Baldwin/OSD and DOD and Service PESO organizations.

Topical Area

Pricing Arrangements

ASPM References

Chapter 2C.

Specific Problems With Current Text

The pricing arrangements described in the text should reflect the risk assessment/risk analysis, which occurs prior to establishing share ratios. There is no discussion of risk assessment or risk analysis. Since the share has been based upon equitable apportionment of the risk between the government and the contractor, it would be appropriate to describe, for the price analyst, the methods to be used for the risk assessment in preparation for development of the contract pricing provisions.

Sources of Data for Rewrite Material

DSMC Handbook on Risk Analysis and Risk Assessment, various articles appearing in Program Manager Magazine, and papers delivered at the Federal Acquisition Research Symposia.

Points of Contact Within DOD

DSMC faculty and Headquarters pricing organizations in each of the services.

Topical Area

Pricing of Contract Changes

ASPM References

Chapter 9A.

Specific Problems With the Current Text

On page 9A 6 in the discussion of the value of changed work, ASPM currently states that the value is figured by estimating the cost as of the time the change is to be made. This may or may not reflect an equitable adjustment for the particular contract action and the particular work being removed. It may be appropriate to price deleted work and to reflect contract price change for that work based upon the estimate for that work appropriate for the time of contract signature. This basis, for some specific situations, may reflect equitable adjustments to the cost. This area should be explored to determine if there should be an option in the text to price the work at its estimated cost at the time of deletion or on the basis of its estimated cost at the time of original contract signature. The discussion should give some examples of the equity issue and how it may be affected by the selection of a time period to base the cost estimates.

Sources of Data for Rewrite Material

AS/RDCP

Points of Contact Within DOD

AS/RDCP

Topical Area

Profit Analysis

ASPM References

Chapter 3C.

Specific Problems With Current Text

The text included in the ASPM is very specific to the weighted guidelines methodology which was in effect at the time of publication of the ASPM. Weighted guidelines approach has been modified at least twice since issuance of the ASPM and a study is currently in being to potentially modify it again. It would appear appropriate to make the discussion in the ASPM more general and less related to the specific elements, weights and ranges of the current weighted guidelines. Reference could be made within the ASPM to the source for up to date guidance which should be used by the anlayst when accomplishing a profit analysis.

Sources of Data for Rewrite Material

Revisions to profit policy published in Defense Acquisition Circular and Defense Procurement Circulars. Profit '82 study, Air Force Systems Command, and Analytics Technical Report for DSMC, "Evaluation of the Effectiveness of Weighted Guidelines."

Points of Contact Within DOD

Col R. Finkbiner/OSD and pricing organizations within each of the services.

Topical Area

Residual Inventory

ASPM References

Chapter 9C (starting on page 9C5).

Specific Problems With Current Text

The majority of the residual inventory under many contracts lies in the special tooling and special test equipment which remain after the completion of the contract. Some specific discussion of the treatment of these residual inventories should be included especially as they may affect the price for follow-on contracts or allow for increased capability for competition on future buys.

Sources of Data for Rewrite Material

FAR special tooling and special test equipment clauses and the DOD Manufacturing Management Handbook for Program Managers.

Points of Contact Within DOD

AS/RDCP

Topical Area

Standard Forms 1411 and 1412

ASPM References

None.

Specific Problems With Current Text

Current Standard Forms 1411 and 1412 are designated for use in order to obtain cost or pricing data. However, the ASPM discusses using DD Forms 633. The ASPM needs to be changed in order to discuss Standard Forms 1411 and 1412.

Sources of Data for Rewrite Material

Current Standard Forms 1411 and 1412, and FAR 53.215-2.

Points of Contact Within DOD

Headquarters pricing organizations and AFIT, Department of Cost Analysis and Pricing.

Topical Area

Tooling Cost

ASPM References

Chapter 4D.

Specific Problems With Current Text

There are a number of techniques for the analysis of tooling that are not currently described in the text. There should be some additional comments on the use of CERs for tooling and estimating tools by tool type and quantity. In addition, there should be at least a short discussion of the issue of disposition of tooling at the end of a production contract and the retention of tools during planned breaks in production.

Sources of Data for Rewrite Material

AFCMD/PM and the DOD Manufacturing Management Handbook for Program Managers.

Points of Contact Within DOD

Mr. J. Storrs/AFCMD.

APPENDIX B

Revised Chapter 8B, "Spare Parts," of the Armed Services Pricing Manual.

CHAPTER 8B
SPARE PARTS
CONTENTS

I. INTRODUCTION

Spare parts are defined as items (repairable and consumable) purchased for use in the maintenance, overhaul or repair of equipment such as aircraft, guns, missiles, ships, tanks, ground communication and electronic systems, ground support, and associated test equipment, whether or not purchased as provisioned items or replenishment spares. Both the character of the parts and the way they are bought influence the way they are priced.

Large dollar items, such as certain electronic items, structural parts and vendor designed and manufactured components will generally be estimated and priced in the same manner as the end-items of which they are a part. Prices of lesser value items may be estimated and priced on another systematic basis.

If the parts are initial spare parts for the particular equipment, the relationships between the pricing of end-item and spare parts and the production and procurement of end-items and spare parts must be considered. The relationships may tell you what costs are to be considered in estimating. The relationships also may tell you how to buy. They may help decide whether to go to the end-item manufacturer, to the vendor, or to compete.

On the other hand, if the parts are replenishment spares, the circumstances and questions may be different. Does the requirement represent an economic order or production quantity with adequate procurement as well as production lead time? If lead times are short, can you price and place the orders rapidly? Does the requirement come to contracting as a long list of many different items or does it come piecemeal, by individual items? Much of the special nature of spare parts pricing is based on the negotiation of prices and delivery schedules for a multiple-item buy.

If the spare parts are acquired as a result of effective competition, most pricing problems disappear. However, competition alone does not automatically guarantee a fair and reasonable price; a contracting officer should be assured that the requirements for a competitive market price have been met before determining the price fair and reasonable.

The Department of Defense (DOD) is particularly concerned with pricing of spare parts that must be bought sole source from the manufacturer or from the weapon system prime contractor. The DOD is also concerned with the pricing of spare parts that are acquired competitively. There is a continuous increase in the total number of individual parts needed to support maintenance, repair, and overhaul activity. Consequently, DOD logistic support policy, as it relates to spare parts, is designed to restrict inventory investment and to reduce loss due to parts obsolescence. It has increased the number of individual pricing actions and it is this volume that has led to formula pricing methods and catalog contracting arrangements in dealing with major weapon and equipment manufacturers. Both formula pricing and catalogs are discussed in this manual.

Time and timeliness are two important factors in spare parts pricing and procurement. To reduce the likelihood of overbuys and obsolescence, inventory managers may wait to pass the requirement to contracting for action. Acquisition methods must be responsive to this situation. It is relatively easy to issue an order, priced or unpriced, to the contractor. The job gets tougher when the following conditions are added: the contract delivery schedule must conform as nearly as possible to the time requirements of the agency or activity that needs the parts; the prices must be fair and reasonable; if the order is unpriced and the contractor is permitted to start to work before agreement is reached on prices, the prices must be agreed to as soon afterward as possible.

II. FAIR AND REASONABLE SPARE PARTS PRICES

A. The Meaning of Fair and Reasonable

Fair and reasonable describes the conclusion that the price is acceptable and fair to both the DOD and the contractor. Competition is the preferred method of obtaining a fair and reasonable price. However, if an item must be acquired by a noncompetitive contracting method, price or cost analysis must be used. When price analysis techniques are used, fair and reasonable means that the price equates with the intrinsic value of the items, and with previous prices paid for similar quantities of the item or other similar items

if they were previously purchased at fair and reasonable prices. When cost analysis techniques are used, fair and reasonable means that the price is acceptably close to what it should cost to make or acquire the item based on an extrapolation of actual cost history for the particular contractor under consideration.

Price analysis is the process of examining and evaluating a prospective price without evaluation of its internal cost elements and profit. Some examples of price analysis are: comparison of competitive bids or proposals; comparison with a prior price paid that was considered fair and reasonable; comparison with current quotations for the same or similar items; use of a catalog or price list for items sold in substantial quantities to the general public; the use of parametric pricing standards (such as dollars per pound); or a comparison of proposed prices with independently developed government estimates. Cost analysis, on the other hand, is the review and evaluation of a contractor's cost estimate and the use of judgment to determine whether the estimated cost represents what the item should cost, assuming reasonable economy and efficiency. Cost analysis includes verification of estimating rationale and evaluation of all elements of cost.

Use of the formal "should cost" technique for pricing a spares buy is not likely to be cost effective unless the requirement is quite large and/or substantial repetitive future acquisitions of the same items from the same contractor can be predicted. This is due to the cost of assigning a team of specialists to do the engineering and financial analyses which form the basis of the "should cost" report. Further guidance on "should cost" analysis is contained in Federal Acquisition Regulation (FAR), paragraph 15.810 and the DOD FAR Supplement (DFARS).

For spare parts, then, it is usually necessary to back off from the should cost approach and settle on the following definition: a fair and reasonable spare part price is one that is close to what it is likely to cost the seller to make or otherwise acquire the item.

Some companies do not estimate or account for the cost of producing individual parts. All of these companies do, however, use some systematic method of arriving at proposed selling prices for spare parts. Such methods normally are designed to generate a certain management specified return on sales of parts over a given time period or production run. The company's objective in those instances would be to end up with a predicted relationship between spare parts revenues and the cost of sales. Our objective would be first to determine whether this predicted relationship is acceptable in terms of profit on cost, and second to verify that the system is actually generating returns close to the predicted value. A third objective is to establish a distribution of prices to individual spare parts which, when taken on an item-by-item basis, yields individually reasonable spare part prices.

An acceptable percentage relationship between sales and cost of sales cannot be defined for universal application, but rather must be defined for each spares procurement. You can get some idea, in a relative sense, from the principles embodied in the weighted guidelines technique for establishing profit objectives: a manufactured part warrants a higher profit, and thus a wider spread between cost and price, than does a purchased part, and a labor intensive production situation merits more profit than a material intensive one. Also, bear in mind that cost risk associated with production of spares is generally lower than that involved with production of a complete functioning system.

B. General Recommendations for Ensuring Fair and Reasonable Prices are Paid for Spare Parts

1. Use competitive acquisition methods whenever possible.

2. Procure the majority of a system's spares once a year. Procure the spares as part of the production contract if in production.

3. Use price lists and formula pricing whenever they are available and applicable.

4. Review the procurement history on contractor purchased parts from the prime contractor prior to item breakout.

5. Review the contractor's procurement history on individual items or require that this be done during the field pricing review if applicable.

6. Ensure that actual manufacturers, including the current manufacturer, are among the companies solicited for a requirement.

7. Ask prospective contractors about:
   (a) Quantity/price breaks.
   (b) Minimum pricing policies.
   (c) Who the actual manufacturer is.
   (d) Whether the items will actually be produced in conjunction with production of other items.

8. When a contractor is discovered using poor procurement practices, inform the Administrative Contracting Officer (ACO) of the discovery so that he can attempt to correct the problem through the Contractor's Procurement System Review procedures and so that field pricing reports for other Procurement Contracting Officer (PCO) offices can alert them to possible overpricing.

III. THE CONTRACTOR'S SYSTEM OF PRICING

When adequate price competition is not present, it is necessary for the DOD price analyst to gain a thorough understanding of the methods the contractor uses to price a spare parts order. With large companies such as major weapon system manufacturers, a formal arrangement should be established. The contractor should provide a written statement of how spare parts are priced and what policies and procedures apply. The government procedures that will be used to review the priced spare parts list and to document the results of the review should be established and coordinated with Defense Contract Administrative Service (DCAS) and Defense Contract Audit Agency (DCAA). This pricing procedure would be part of the cost data and subject to the certification.

How this formal arrangement comes into being will vary depending upon the identity of the principal buying offices, how many there are, and how much spare parts business they do with the company. It is not critical whether the ACO starts it with a statement of intent to the buying office and an invitation to participate or whether one of the PCOs starts it by notifying the ACO. In

any event, the principal buying offices, working with and through the administering activity and the cognizant DCAA auditor should establish and agree upon the procedures to be followed in pricing and reviewing the spare parts bought from the company. They should put together a spare parts pricing package, somewhat as follows:

a. Written agreement between the company and the government representatives describing how spare parts will be priced.

b. Written description of how the government personnel check priced spare parts lists. (Objective: to determine that the contractor followed agreed procedures and that the results were fair and reasonable within their cost system. Statistical sampling techniques will usually be used.)

c. Price Negotiation Memorandum (PNM) covering pricing factors.

d. Certificate of current cost or pricing data executed by the contractor at the completion of negotiations with clear identification of what it covers.

The written agreement and description will be revised when necessary to include changes in procedures. New negotiation memoranda will be written periodically, as required by new rate negotiations. This will usually be at 6 or 12-month intervals, depending on the agreed methods. Copies of these documents, and of the estimating methods report made by the auditor, will be sent to the government buying offices that do significant business with the company.

The purpose of these procedures and agreements is to make sure the contractor has a method for pricing spare parts that will produce acceptable results. Having both the method and the review procedures a matter of record makes the task of pricing documentation a manageable one. With these already in writing and on file, all the administration activity has to do is verify that the system was followed by applying its own standard and written procedures, and inform the buyer that this is the case.

For each individual spares proposal the buyer will have a proposal from the company supported by a Standard Form (SF) 1411, cost breakdowns for selected items, a certificate of current cost or pricing data that relates to the factors

used to compute the price of all items, and a statement from the ACO that the standard methods were followed and the results acceptable. After a review to satisfy himself that all is in order, the buyer can accept the proposal package and award without further negotiation of price. But, price analysis should be performed before simply accepting the price. After identification of the procurement, documentation can be something as simple as this: "Contractor proposed prices computed in accordance with approved methods described in document dated 5 Dec 19X5. Review by the DOD contract administration office confirms this and indicates results are acceptable. Certificate executed applies to this procurement. All documents referenced herein are on file in our pricing office. Accordingly, contract prices are found to be fair and reasonable." Keep in mind that the contractor is not above error, and all DOD buying personnel have an obligation to ensure that each price is fair and reasonable.

IV. REVIEW TECHNIQUES AND SPECIAL CONSIDERATIONS

A. Evaluation of Cost and Prices

In general, spare parts prices are evaluated using the same techniques used in analyzing end-item prices. As with end-items, the specific techniques will depend on how the spare parts are being bought (competitive or sole source), the dollar value of the procurement, and how the contractor priced the parts. If the pricing can be supported by competition, catalog, or market prices, price analysis techniques will be used. If cost analysis is required, the method used to develop the proposal will determine the type and extent of analysis. It may be on a spot check, sampling basis or on a total review basis. Consideration must be given to costs that usually are not needed to produce the spare part or are not allocable to both the end-item and the spare parts. For example, assembly labor, start-up costs, rework, and tooling and development engineering may be allocated to end-item cost only. In contrast, costs of packaging, packing, and container rework are incurred in the conduct of spare parts business and may not be allocated to end-items. Allocation of direct and indirect costs is discussed at paragraph B below.

Replenishment spare parts may require consideration of such charges as removal of tooling from storage, repair or replenishment of tooling, preparation for production, and other charges relative to reactivation of the production tooling.

Frequently, individual spare parts may appear on a succession of exhibits over a period of months or years. Comparisons of spare parts with priced parts in the end-item and with prior spare parts should be made in testing the reasonableness of prices in a current exhibit. Trend analysis can be a valuable tool in testing prices, but price trends can be misleading when the quantity of parts involved and the conditions surrounding the individual procurements differ.

Markups (indirect cost allocations plus profit) sometimes may seem high in relation to efforts directly associated with acquisition of particular parts. Certain efforts vital to the continued operation of a company will result in costs that cannot be associated with any product. The method of allocating these costs to products will be a compromise between the number of cost centers used to segregate only like items from each base and the practical limitations on the number of burden centers that can be handled economically. The compromise will produce costs of individual items that will appear high in some cases and low in others. The effects of this distortion should be weighed against the added cost needed to achieve a more precise allocation. Where individual item prices are clearly distorted, consider establishment of a separate item for such costs which are not directly associated with the manufacture of the spares. See paragraph C below for a further discussion of unit price integrity.

Two principles must be observed in reviewing priced exhibits:

1. Agreement will be reached with the contractor on how a list or series of lists is to be priced before the pricing is done.

2. The contractor is responsible for arithmetical and clerical accuracy of a priced exhibit.

Both rules are invoked to assure the most efficient use of time and manpower. Advance agreement on the method and factors will reduce the need for recomputation and rerun of priced lists to a minimum. If the contractor accepts

responsibility for accuracy it saves time for correction and rerun and reduces the time required for analysis and acceptance of lists.

The large number of details in a typical list presents an opportunity for arithmetical and clerical mistakes that may result in serious errors in the aggregate dollars involved. Some testing for details on each list is essential to a determination that pricing is fair and reasonable. For plants with large spare parts procurement, a review and periodic testing of the contractor's pricing methods represents the principal safeguard against frequent clerical errors in lists, but even in such cases some testing should be made of the detail in each list. For smaller contractors and vendors or for other contractors with infrequent spare parts orders, a prior review of the accounting system and pricing methods may not have been made. Consequently, a larger percentage of the details included in the list should be tested. Tests of details on a priced spare parts list, if done selectively, should be done on a random basis. The test of individual items should be completed regardless of the difficulties encountered. If the test of a list discloses numerous errors, it should be returned to the contractor for complete recheck and correction.

Production and shipment of spare parts may be significant in terms of dollars and unpredictable in terms of time. Consequently, the experience of prior periods and the basis of forecasts must be analyzed with careful consideration of the interest of both the contractor and the government. Estimated costs, pricing factors, estimated volume, and other forecasts used in developing and negotiating spare parts prices should be tested periodically against actual results. Loading factors used in pricing formulas should be tested against experienced costs at least annually and the experience of the contractor should be reviewed more frequently if important fluctuations in volume occur. Auditors should make these reviews. Contracting officers should work with DCAA to be sure this job gets done. When given enough notice, the auditor can generally schedule such reviews without trouble.

Contractors do not account for and recover the costs of preservation, packaging and packing in any one standard way. The earlier examples of pricing

formulas show three different ways of handling these costs. The SF 1411 suggests preservation, packaging and packing as an example of the type of cost that should be entered in the "Other Cost" category, but this is not mandatory.

Companies do not even agree on what to call this effort. One calls it "preparation for shipment," another "boxing and crating," and a third "packing." The important thing is to find out what the contractor calls the act of packaging and how he collects the costs. Packaging does not present any special pricing problems once the costs have been identified. Most companies recover the cost by factoring; the factor is, or should be, supported by historical costs.

Packaging specialists are available to most procurement and contract administration activities. They should be included on the negotiation team when the magnitude of packaging costs indicates a real or a potential problem. You should use these specialists to assure that the packaging requirements are adequate but not excessive and to get expert opinion on the quantities and prices of labor and material needed to conform to the requirements.

B. Allocating Direct and Indirect Costs to Contracts and Contract Line Items

Until 1984 the DOD had no regulation prescribing how indirect costs, once allocated to the contract, would be distributed to contract line items. So, even though direct and indirect costs may have been properly allocated to contracts, distribution of such costs to line items could greatly distort the integrity of unit prices. For example, a common practice has been to distribute support costs evenly among line items. In addition to this problem, Congress has been critical of situations where the DOD buys an item from a prime contractor who buys the item from the manufacturer and does not contribute significant value to the item. The following guidelines, which are based on policy requirements, should prevent allocation problems:

1. Direct and indirect costs should be allocated to contracts in accordance with Cost Accounting Standards and Contract Cost Principles and Procedures of Part 30 and 31, respectively, of the FAR.

2. For the purpose of line item pricing, distribution of program support costs, e.g., engineering and purchasing support, training, configuration control, program management, etc., should be on a basis, such as cost, purchase price, etc., to ensure that unit prices are in proportion to the item's cost or purchase price. Any method of distributing such costs to line items that distorts the integrity of line item prices shall not be used. For example, distributing costs evenly among line items is not acceptable except when there is little or no variation in base cost (e.g., manufacturing or acquisition cost).

3. Solicitations should require that an offeror's price proposals reflect the allocation and distribution of the aforementioned costs in accordance with 1 and 2 above.

4. Solicitations should require that offeror's identify those supplies which they will not manufacture or to which they will not contribute significant value. Such identifiction shall include the name and address of the vendor, the national stock number of the item (if any), and the estimated price to be paid to the vendor for each item.

5. When price history is obtained from an offeror pursuant to 17.7203(e)(3), the solicitation shall require that the offeror provide a listing by line item showing the lowest unit price during the most recent 12-month period, the percent change in proposed price compared to the lowest price, and the rationale for each increase of 25 pecent or more.

Further discussion of the concept of unit price integrity, and a concrete example of support cost allocation are included in the next part.

C. Unit Price Integrity

Spare parts unit prices, and associated Contract Line Item Number (CLIN) prices, have many uses. For a price to have real meaning in each of its uses it has to be fair and reasonable by itself, apart from the total price of the contract. Some of the uses of a unit price are: payments; termination settlements, particularly partial ones; budget estimating; comparative price

analysis; and foreign military sales. CLIN prices are also often used to quantify stock fund transfers between the Services. It is therefore essential to analyze and negotiate in such a way that spare parts line-item prices have this integrity.

This integrity may be difficult to achieve when analyzing and reviewing spare parts proposals. When performing this job, first be sure the contractor's method of pricing spare parts has been reviewed and found to be acceptable. This is important because reliance will be placed, to a certain extent, on the method to turn out prices which, in turn, are acceptable. Contractors should submit spare proposals on a unit price basis. Contractors should not submit spare proposals which include equal allocation of spare parts support costs to each item. Equal allocation of support costs was barred from use by the Principle Deputy Under Secretary of Defense for Research and Engineering in a memorandum dated 24 February 1984. Contractors should be advised to submit prices that approximate reasonable valuations for the spare parts involved, since any individual item on a spare parts proposal may be subjected to an in-depth analysis. In the past, bottom-line negotiations have been common for buys that contain many individual parts. However, the bottom line approach to pricing spare parts orders is only appropriate if the total price can be fairly and accurately allocated to individual parts, thereby establishing reasonable unit prices. If such a proper allocation cannot be made, bottom-line pricing should not be used. Bottom-line pricing provides for direct materials, direct labor, and overhead costs to be reviewed in the aggregate. After completion of the review, a decrement factor is developed to adjust the proposed item prices to the recommended position. While the bottom-line price for the entire buy may be fair and reasonable, improper allocation of direct cost to individual parts can result in distortions to individual unit prices. An example of item price distortion by equal allocation of material handling hours is provided in Table 8B-1. The proper allocation method, based on value, is shown at Table 8B-2. Table 8B-3 summarizes and compares the two methods. Note that the total price of this hypothetical order is the same under both allocation methods.

The final point that must be made is that the goal of proper cost allocation and price distribution is to arrive at reasonable final prices. However, proper allocations and distributions do not guarantee reasonable prices. Even when proper allocation and distribution techniques are used, the final price of an item might significantly exceed the intrinsic value of the item. In such cases the contracting officer should reject the derived price and negotiate a price that does reflect the intrinsic value of the item. Consideration of reasonable intrinsic value should be the final test of price reasonableness for any item.

MATERIAL HANDLING LABOR HOURS ALLOCATED EVENLY
TO EACH SPARES LINE ITEM

	Diode		Power Supply
Purchased Parts 2 @ 4¢	$ .08	6 @ $100	$ 600.00
Direct Labor Negotiated 4.5 hrs @ $18	81.00		81.00
Overhead @ 94%	76.14		76.14
Total Mfg Cost	157.22		757.14
G&A @ 21%	33.02		159.00
Subtotal	190.24		916.14
Profit @ 16%	30.44		146.58
Total Price	$220.68		$1,062.72
Unit Price	$110.34		$ 177.12

TABLE 8B-1

MATERIAL HANDLING LABOR HOURS PRORATED ON BASIS OF
TOTAL PURCHASED PARTS COST

	Diode		Power Supply
Purchased Parts 2 @ 4¢	$ .08	6 @ $100	$ 600.00
Direct Labor	.02		161.98
Overhead @ 94%	.02		152.26
Total Mfg Cost	.12		914.24
G&A @ 21%	.03		191.99
Subtotal	.15		1,106.23
Profit @ 16%	.03		176.99
Total Price	$ .18		$1,283.22
Unit Price	$ .09		$ 213.87

TABLE 8B-2

TOTAL PRICE COMPARISON

	Diode	Power Supply	Total
Example A	$220.68	$1,062.72	$1,283.40
Example B	.18	1,283.22	1,283.40

NOTE: Under either method of allocating material handling hours, the total price is the same.

TABLE 8B-3

V. FORMULA PRICING

Because of the large volume of repair parts purchased from systems contractors and the labor intensive nature of cost analysis, pricing on other than an individual item basis is often used. Formula pricing is one such technique. Many contractors use some type of formula when pricing spare parts. Formula prices are usually based on historical actual labor hours and material costs which have been escalated to the current performance period. The current forward pricing rate agreements are then applied to these direct costs.

The primary objective of formula pricing is to handle the workload in an efficient manner, with minimum manpower, and at the same time to achieve sound and equitable pricing. It simplifies pricing procedures and reduces company and government administration costs. Fewer personnel are needed to perform pricing functions than if each individual item were negotiated separately.

A pricing formula conforms with the contractor's disclosed practices in accounting for and treating costs. Formulas are subject to analysis and review by audit and pricing personnel before negotiation by the contracting officer for use in pricing. Because accounting and cost treatments differ among companies, there can be no standard format for pricing formulas.

The concept of a pricing formula starts with estimated costs of the material and labor needed to produce an item. The addition of allowances for direct expenses incident to manufacturing the product, plus indirect expenses such as material scrappage, material handling, and manufacturing overhead determine total cost. A selling price results when profit is added.

Detailing of each and every element of cost, starting with the procurement of material and following the part as it goes through manufacturing, packaging, and shipping may provide a price that will bear a very close relationship to actual costs. However, a cost detailing is time-consuming and becomes impractical when hundreds and sometimes thousands of items must be priced within a restricted time period. Accordingly, a formula pricing has been developed to speed the process.

In its basic form, formula pricing is the application of previously agreed-to factors, such as material handling, factory overhead, administrative expense, and profit, to the labor and material costs estimated for each item. With realistic estimating of basic costs, including any setup and tooling charges, this method should produce sound pricing of a large groups of items. However, this techique may not yield good prices when standards are built on lesser quantities than being purchased. Also, variance factors detract from unit price integrity.

The basic data needed are an estimate of labor hours required to perform each machine or hand operation or assembly and the estimated cost of the material necessary to produce the quantities ordered. The machine time which represents net operating time is modified by normal expectations or idle unproductive time, tool rehabilitation, rework, and replacement. The setup time may be modified to account for the estimated number of production releases that experience indicates are apt to be required to produce the items. This data requirement is greatly simplified if the company uses a standard cost system.

The modifying factors are rate projections tested against both expectations and experience. As an example, if total annual direct labor hours were estimated at 1,000,000 and 10,000 of these hours could be expected to be charged to nonproductive time, the ratio of nonproductive to direct labor hours would be 1%. With ratios established for each modifying factor, the labor formula would be develoepd as follows:

Estimated direct labor hour	100.0
Tool rehabilitation	1.5
Setup	10.8
Rework and replacement	2.6
Nonproductive time	1.0
Labor factor	115.9

Manufacturing overhead, at a cost per hour of direct labor, may be added to the average labor rate to determine a labor-hour rate, as follows:

Average labor rate	$2.50
Manufacturing overhead	4.50
Labor-hour rate	$7.00

The average labor-hour rate may be adjusted to incorporate rate upgrading, anticipated wage increase, cost of living and similar items.

Total labor cost would be estimated in the following manner:

Labor cost = hours x factor x rate.

The material factor may be developed in a similar manner by establishing ratios for such cost items as material loss or shrinkage, price fluctuation, functional test, inbound transportation, material procurement, stock handling and packing and crating. These various cost items may be treated separately or grouped, as determined by the contractor's cost accounting system, in the following manner:

Basic material cost		100.0
Price variance and shrinkage	2.3	
Test	1.4	
Inbound transportation, handling, packing, and crating	8.3	12.0
Material factor		112.0

Total material cost would be estimated as follows:

Material cost = base material x factor.

Using the factors and rates thus developed for material and labor, a hypothetical price development for an item with base material cost of $20, labor estimated at 15 hours, and General and Administrative (G&A) at 4% would be as follows:

Material ($20 x 112%)	$ 22.40
Labor (15 x 115.9% x $7)	121.70
Manufacturing cost	144.10
G&A 4%	5.76
Total cost	149.86

This cost breakdown can be analyzed using the "Weighted Guidelines Profit/Fee Objective" technique, assuming Cost Accounting Standard (CAS) 414 costs are known, to generate net profit and total selling price.

This pricing action also may be done by complete factoring which means combining all separate rates into single factors for material and for labor and multiplying the base material and labor costs by such factors. The following are factors computed using the same figures as in the preceding example:

Base material		1.000
Loadings	12%	.120
		1.120
G&A	4%	.045
Material factor		1.165
Base labor		1.000
Loadings	15.9%	.159
		1.159
Overhead	180%	2.086
		3.245
G&A	4%	.130
Labor factor		3.375

Using the same base costs, $20 for material and $37.50 for labor (15 hours x $2.50 average rate per hour), the result of complete factoring would be:

Material ($20 x 1.165)	$ 23.30
Labor ($37.50 x 3.375)	126.56
Total Cost	$149.86

Both methods give the same results. Complete factoring is an effective method of combining the various elements of cost and profit and is especially useful when large numbers of individual spare parts are to be priced.

The prime contractor usually prices subcontracted items by using a formula. The formula would include loading factors that represent costs incurred by the prime in his dealings with the subcontractor. A pricing formula for subcontracted items is as follows, assuming a 9% profit had been obtained from Weighted Guidelines:

Vendor price		1.000
Material factor (rework and replacement, test articles, tool service, test, and plating)	.9%	.009
Material cost		1.009
Packing	4.1%	.041
Subtotal		1.050
Profit	9.0%	.094
Total pricing factor		1.144

An example would be:

Vendor price	$20.00
Factor	x 1.144
Selling price	$22.88

With one large prime contractor, one overall pricing formula is used for all spare parts whether the parts are manufactured, subcontracted, or vendor designed. The same pricing formula is used on initial and replenishment spare parts. The formula consists of three steps: negotiating "parts costs"; negotiating parts cost loading factors; and multiplying the loading factor by the parts cost to determine selling price. One year's negotiated formula is as follows:

Base material cost	1.0000
Tooling	.0005
Unapplied material	.0005
Manufacturing losses	.0021
Unreported losses	.0015
Obsolete and overrun inventory	.0212
Total material	1.0258
Direct labor	.0117
Indirect manufacturing expense	.0744
Production engineering	.0015
Shop costs	1.1134
Engineering cost and expense	.0369
Field service	.0400
Boxing	.0074
Manufacturing cost	1.1977
G&A expense	.0849
Total cost	1.2826
Profit	.1379
Selling price	1.4205

The price derived by multiplying the "parts cost" ($12.35 for example) by the loading factor (1.4205). In this case the price would be $17.54.

The reasonableness of prices derived through formula pricing depends on the way in which base costs for material and labor are developed and upon the realism of the mark-up factors. Analysis must confirm the applicability of each loading factor and the factual basis for direct material and labor costs. An error in computing material or labor costs will be compounded in the application of the formula.

This approach to pricing has been questioned by those who have a hard time accepting pricing on other than an individual item basis. Formula pricing distributes costs systematically over all items on an order or for all items ordered during a period. Because of this, an item may be assessed a share of

certain costs not applicable to it and may seem overpriced. For example, contractors have sold items such as screwdrivers and wrenches for ridiculous sums such as $400 to $500 each. Conversely, an item may not be assessed its full share of some other costs and may seem underpriced. However, when costs are allocated on a value or "worth" basis, each part receives its fair share of allocated costs. This is the key to unit price integrity -- value based cost allocation. Pricing equity must be based on both the total pricing arrangement and on the individual item prices.

Formula pricing can be a valid pricing technique, but the formula must be carefully negotiated and monitored. Some maintain that formulas remove the risk from pricing and assure the company the percentage of profit included in the formula as a minimum. This criticism assumes that because formula factors and rates are derived from an averaging of the contractor's estimate of costs (the estimate is projected from a base of actual costs) the contractor is ensured against any loss, profit is guaranteed, and risk is removed from the pricing results.

This criticism is valid only to whatever extent the parties delay in establishing or applying a formula. If the formula is intended for the 12-month period 1 Jan - 31 Dec but is not developed until 15 Apr and is applied to the costs of parts already manufactured or purchased, the probabilities are strong that the company will make close to formula profit on the sales of those parts. The only real uncertainty would be the accuracy of the estimated loadings in the formula. On the other hand, a well-analyzed and negotiated formula, properly applied, also relieves the government of the risk of paying too much for the spares covered by the formula, as well as the administrative costs of separately analyzing each proposed spares procurement from the same contractor.

VI. CATALOG PRICING

A. Sales Catalogs

There are two general classes of catalogs for the purposes of spare parts pricing. A sales catalog generated by a company falls in the first class of catalogs. A manufacturer or other seller lists in the publication items and prices for these items. Often, there are supplemental lists or documents that show the adjustments to the basic list, either discount or premium, that is currently being quoted. How these prices were calculated is not known, generally, nor is it a matter of concern to commercial buyers. If a part is needed, it is purchased at the best terms available. If there are other manufacturers selling the item, or selling similar items, each of which will do the job, the buyer gets it from the one offering the most favorable terms. If only one seller is offering the required item for sale, the buyer bargains with that seller, if possible, and agrees upon terms.

However, to be useful to us the prices in this class of catalogs must be tested against the FAR criteria for identifying "established catalog or market prices of commercial items sold in substantial quantities to the general public." An established catalog price is a price included in a catalog, price list, schedule, or other form that is regularly maintained by the manufacturer or vendor. The catalog or other form must be published or otherwise available for the customer's inspection, and it must state prices at which sales are currently or were last made to a significant number of buyers representing other than affiliates of the seller. Determination that the number of buyers is significant is a matter for your judgment. The DD Form 1412 is the tool to use in making this determination.

B. Special Catalogs

Catalogs developed between the DOD and contractors for special use by the DOD are the other broad class of catalogs. This section discusses these special catalogs in detail.

A catalog arrangement is not a separate type of contract. It is the term we use to identify an agreement with the following characteristics:

a. A list of specific spare parts that are covered by the contract.

b. Price or prices for each spare part item. (Prices in the event there are quantity price differentials.)

c. Schedule of delivery of items, if ordered.

d. Commitment by the government that during the life of the contract all DOD components and agencies will buy from the contractor all their requirements for the spare parts items listed.

A number of these arrangements are in use now. To date, almost all the contracts have been limited to sole source items and have been used to buy replenishment spare parts. However, even though this has been the experience and these have been virtual prerequisites to the development of the catalogs, there is no reason why future catalog arrangements must be limited to this situation. Nevertheless, the rest of this discussion will be based on experience and will have a distinct sole source bias.

The initial step is the selection of sole source spare parts for inclusion in the catalog. The success of this approach, and particularly its impact on pricing workload, depends on the ability to select a list of parts that for sound technical reasons must be bought noncompetitively. To be considered for inclusion, an item must be screened under the DOD Replenishment Parts Breakout program and must not be a likely candidate for breakout within the time period of the contract.

The contract should usually be an indefinite delivery, requirements type. The contract will be the document from which parts will be ordered, as needed, at the prices set out in it. The format may vary, depending on the equipment to which the parts relate, because of the accounting and estimating methods of the company and other circumstances peculiar to the situation. However, the following information should generally be furnished for each part listed:

- national stock number,
- contractor's and manufacturer's part number,
- nomenclature,
- unit prices and quantity or quantities to which they relate,
- production lead time and guaranteed rate of delivery, and
- noncompetitive procurement identification code.

Unit Prices

The quantity/price relationships must be expressed in some fashion. The idea that the higher the quantity the lower the price is a sound one. The concepts of discounted prices for quantity can be made to work where an increase in quantity broadens the base for amortization of fixed and semi-fixed expenses, permits use of more economical production methods, allows more orderly scheduling of procurement and production of parts, or leads to a more rapid turnover and thus more efficient use of capital. This quantity/price relationship can be treated in several ways, three of which are:

1. A single unit price with a prospectively negotiated discount schedule applicable to individual order quantities or to a cumulative quantity.

2. Unit prices for each of several quantity ranges. Ranges should be based on economic ordering or production quantities suitable to the particular part.

3. A price per unit with a fixed total setup charge.

If the contractor uses a standard cost accounting system, the standards may have been set on assumed quantity bases in which case a single unit price may express the relationship to quantity in acceptable fashion.

The contractor can help you develop an approach that will fit the circumstances; however, this is usually difficult. You can usually get information from requirements personnel; the auditor and production specialist can also help. If quantity discount schedule or quantity ranges are used, they can be different for different items; they do not have to be the same for every item in the contract.

Production Lead Time and Delivery Rate

The contract should include the agreed-to production lead time and rate of delivery for each item. Prices should be established on the basis of those schedules, and orders should be placed so as to accommodate those dates as much as possible. However, the parties should recognize in the contract that it may be necessary, from time to time, to compress lead time or accelerate delivery.

Noncompetitive Acquisition Method Code

Each catalog item should carry a symbol to identify the principal criterion that dictated that the part be bought sole source. Each reason (incomplete data package, reliability control, or proprietary process, for example) should be given a separate code. An item should be coded at the time it is selected for catalog coverage. The sole source criterion must be consistent with the policies of the DOD Replenishment Parts Breakout program. The contract will include a key to explain the symbols used.

Price Arrangements

The contract types you use should be those best suited to the situation. The situation is governed by such things as the end-item supported, its stage in production, and the contractor's accounting and estimating methods and practices.

The prices should be firm fixed price (FFP). However, the use of quantity discounts is an acceptable departure from this principle. In exceptional cases, when firm fixed prices would be impossible or undesirable, another authorized type of fixed price arrangement would be an acceptable alternative. If fixed price incentive (FPI) is to be used, the line item prices will identify both target cost and target fee as well as target prices. The share arrangement will apply to the total of all the parts ordered; the contract target cost will be the sum of all line item target costs multiplied by the quantities ordered, and the contract target profit will be computed similarly. Total cost, for the purposes of the incentive clause, will be the total cost of all items ordered under the contract.

The following pricing provisions should be the basis for negotiating a catalog and should be made a part of the resulting contract.

a. Prices will be established for a specified future time period. We suggest 12-months.

b. For the period of the contract, all DOD procurement of a cataloged part will be made from that contractor and the contractor will furnish the part at the price established in the contract.

c. The prices are for parts placed on order during the period. The date of the order governs even when the part is to be delivered after the expiration of the contract period.

d. The procuring activity, not the contractor, is responsible for pooling requirements to take advantage of quantity discounts. Unless cumulative discounts have been negotiated, quantity discounts should be based on the quantities on the individual order. If several procurement activities can be expected to order the same parts, it may be a good idea to ask the contractor to batch all orders received in a specified period. For example, all orders received within a defined period of time (like 30 days) would be considered together for the purpose of pricing them.

e. A requirements-type contract will be used. The contract will identify, by name, the activities authorized to order against it. These activities will pay the prices in the contract and otherwise abide by the agreement. Each activity identified will be given the opportunity to participate in the negotiations and will be sent a copy of the contract.

VII. LIMITATIONS ON PRICE INCREASES

Section 1215 of the 1984 DOD Authorization Act directed the Secretary of Defense to issue a regulation limiting the purchase of spare parts when the price of such parts had increased dramatically.

The resultant DFARS coverage provides that, unless certification is made to the head of the contracting activity, a contracting officer shall not award a contract for any spare part when the price of the part has increased by 25 percent or more, within the most recent 12-month period. However, neither the 1984 DOD Authorization Act, nor the DFARS coverage discriminates between competitive and sole source acquisitions.

Section 1244 of the 1985 DOD Authorization Act states that the Secretary of Defense may waive the provisions of Section 1215 of the 1984 DOD Authorization Act for spare part purchases, "made through competitive procedures." The revised DFARS coverage at 17.7203(e) implements this change.

VIII. CERTIFICATION OF COST OR PRICING DATA

Even if you go by total rather than line item price, a great number of spare parts buys will not aggregate to exceed the $100,000 level that makes it mandatory to get and use certified cost or pricing data. Unless there is a history of procurement of a given item that provides a sound basis for comparison of present with past prices, it is very difficult to price sole source military spare parts using techniques of price analysis. Rarely will it be feasible to develop an independent estimate of costs. In this circumstance, cost analysis may be the only effective tool for evaluating an offer, regardless of dollar value, and certified cost or pricing data may be necessary on contracts of $100,000 and less.

However, the formula approach to pricing spare parts means cost analysis can be used without imposing a burdensome requirement on either company or government personnel. Once the method has been described in writing, agreed to, and put into operation, both parties meet periodically to examine actual cost experience and project costs for future periods and to agree upon the factors for the formula in the stated forward period. These factors then can be used in any negotiation.

The contractor executes a certificate of current cost or pricing data at the completion of the negotiations for the initial spare parts buy. This certification is good for use on subsequent orders as long as the formula is used in the approved manner. Updated certificates are not required for individual orders priced out subsequently using the formula and the method.

When there is no spare parts pricing arrangement with a company, the limited cost analysis concept may be applied to those procurements under $100,000. The company would be asked to use SF 1411, but requests for addi-

tional cost or pricing data would be restricted to one or two critical areas, most likely in the direct cost categories.

The preceding paragraphs are directed at the use of cost analysis in pricing sole source military use spare parts with emphasis on those buys under $100,000. If items fall in the commercial category (established catalog or market prices of commercial items sold in substantial quantities to the general public), cost or pricing data and cost analysis are, of course, unnecessary. You will want to ask the offeror to send along certain data to support a claim of commerciality; you will probably do this in the request for proposal (RFP) when you anticipate this sort of response from the offeror. The contractor should use the SF 1412 when he makes a claim of commerciality.

IX. REMEDIES FOR OVERPRICING

Overpricing is not a simple single problem of paying more than we should. In fact, overpricing is the result of a number of other shortcomings in:

- requirements determination,
- inventory management,
- automated data support,
- cataloging,
- use of technical data,
- poor use of nomenclature,
- failure to standardize,
- proprietary designations,
- uneconomical quantities purchased,
- personal attitudes, and most importantly
- lack of cost incentives.

What actions are required after an item has been determined to be overpriced? The answer is not always clear. However, taking no action is not an option.

Depending on the amount involved and the circumstances surrounding each overpricing case, alternative actions range from an internal commitment not to repeat the same mistake all the way to a criminal prosecution of persons involved. How does one know which remedies are available, and which of the available remedies to pursue?

The following paragraphs list many actions that may be taken to correct overpricing and briefly discuss each so that managers faced with choosing appropriate corrective actions can see their alternatives. Actions that should be considered to correct overpricing generally fall into one of three areas:

1. Remedies built into the contract through special clauses.
2. Remedies available by law.
3. Remedies available through exercise of the government's unique business position.

Prior to initiating action to correct a suspected overpricing case, the matter should be thoroughly reviewed within the contracting activity. Items which appear to be overpriced are not necessarily so and "dunning" a contractor with groundless claims may destroy our ability to take effective action when bonafide cases are presented. This principle is the primary reason that authority to seek voluntary refunds is placed at such a high level. Do some preliminary fact finding to be sure that you have a good understanding of the nature of the part, the production process involved in making it, and the applicable quality standards which it must meet.

The following list discusses many avenues that can be taken to correct overpricing. It is in no particular order of preference and is not necessarily the exclusive list. However, it may be useful to review when an overpricing case is being pursued in order to put prospective actions into context with available techniques.

Remedies Available in Contract Clauses

1. Defective Pricing - Certain negotiated contracts (usually over $100,000) where certified cost or pricing data is obtained from the contractor contain a price reduction clause. This clause allows the government to unilaterally reduce the contract price if it is determined that the cost data provided by the contractor in support of the price negotiation was not current, accurate, and complete as of the date of its certification. See the FAR and DFARS 15-800 for detailed guidance. Although a price reduction may be obtained through use of this clause, if the defective data is fraudulent or purposely misstated, further criminal action may be appropriate in addition to the contractual remedy provided by the clause.

2. General Services Administration Schedule Items - Many General Services Administration (GSA) schedules have special clauses to protect the government in the event of mispricing by the contractor. In the event overpricing is suspected on items obtained on order from a GSA schedule, the GSA contracting office should be contacted immediately. One of the clauses allows a price reduction to be made if the contractor's discounts are reduced or sales are made to other equivalent customers at prices lower than would be paid through the GSA schedule. Another clause allows a price reduction to be made if the contractor provides defective price support data during negotiation of the GSA schedule prices.

3. Most Favored Customer Clause - Some DOD contracts may contain provisions which allow reduction of prices when it is determined that sales made to other customers contain either better terms or lower prices. Because not all of these clauses are the same, each must be interpreted to determine the government's rights.

4. Disputes Clause - Each DOD contract contains a clause which gives the contracting officer the authority to make unilateral determinations of fact in accordance with the Disputes Act of 1978. This authority extends to determining whether the price of some contract actions is appropriate. Where the contract provides for determination of a final price either during or after contract performance, the contracting officer can unilaterally determine what that price should be if there is any disagreement with the contractor. Examples of these actions are: final pricing of a cost type or incentive type contract; pricing a change order; pricing an unpriced BOA order, pricing a letter contract, or pricing a redeterminable contract. The disputes clause also gives the contracting officer the authority to determine whether the contractor is properly discharging the contractual respon-

sibilities. This may come into play on contracts where the contractor is supposed to apply predetermined discounts to authorized items in order to set the price paid by the government when the items are provided. If the contracting officer believes that the invoices submitted by the contractor are based on factors that are inconsistent with the contract, even though the contractor may disagree, the prices may be unilaterally reduced by the contracting officer in accordance with the disputes clause. The contractor is required to continue performance consistent with the contracting officer's determination but may appeal either to the Armed Services Board of Contract Appeals (ASBCA) or to the Court of Claims.

5. Repricing Options - Often contracts will contain options for extended periods of perfomance or additional items. They can be included in negotiated or formally advertised contracts and give the government the unilateral right either to obtain the additional items or not to obtain them. The FAR requires the contracting officer to determine that the option prices continue to be fair and reasonable before an option can be exercised. When overpricing has been identified on a contract with options, the option should not be exercised unless appropriate adjustments are made. The government is under no obligation to exercise an option solely because it exists. At the discretion of the contracting officer, in the place of exercising an option, the government may either obtain the items from another source, negotiate a revision to the option price, or not obtain the item at all.

6. Repricing Indefinite Quantity Contracts - These contracts are similar to contracts with options in that the government is not obligated to obtain all items listed in the contract if it chooses not to. Whenever overpricing is discovered, all ordering should cease until satisfactory arrangements can be made to correct the overpricing. Even if there is no clause authorizing unilateral repricing by the contracting officer to correct the overpricing that was discovered, the contract should be renegotiated before additional orders are placed. This renegotiation can include retroactive repricing of items already ordered if the contractor agrees. Anytime circumstances surrounding the indefinite quantity contract changes significantly, repricing should be considered. This is particularly important when quantities expected to be ordered are significantly increasing.

7. Cost Type Contracts - This type contract requires that an initial total amount be negotiated and that, after contract performance is complete, a final price be set based on the actual cost incurred. The final price is the total of the fee, if any, and the portion of the cost incurred that is allowable, allocable, and reasonable.

The test as to whether actual costs are allowable, allocable, and reasonable are normally applied by the DCAA auditor. When overpricing is suspected or confirmed during performance of the contract, the contractor is not always entitled to reimbursement solely because an actual cost has been incurred. If the contracting officer determines an actual expense to have been unreasonable, no reimbursement is required. Action can be taken prior to completion of the contract by issuance of a "notice to disallow or not recognize costs." This can be done either before or after the cost is incurred and provides an avenue for the contractor to appeal through the ASBCA if there is a disagreement.

8. Termination and Stop Work Orders - In the event of gross overpricing and when all else appears to offer no hope of a remedy, the contract can be terminated for the convenience of the government by use of the termination clause which is required to be in every DOD contract. While this procedure is a relatively drastic one which places many new responsibilities on the government, it will nevertheless remove the responsibility to pay for undelivered items. It allows the contracting officer to determine the termination amount due to the contractor based primarily on costs incurred. This would allow the government to avoid paying unreasonably high prices that may be contained in a contract if the contractor refuses to make any other adjustments to the contract. Caution must be exercised when using this technique in that the need for the items may outweigh the gains made by correcting the overpricing situation.

9. Payment - When a contract price is deemed to be unreasonable or to have been based on improper activity, the contracting officer can direct the payment officer to withhold payment of the contract price even if the contractor has submitted a proper invoice. This is an interim measure that should be taken only in close coordination with legal advisors and when the next step in correcting overpricing has been planned because it is a purposeful default of the government duties under the contract. However, management may decide that it is preferable to force the contractor to sue or take other action against the government to obtain payment rather than condone the overpriced contract by making payment without making a last ditch attempt to avoid overpricing. There is no contract clause that authorizes this action.

Remedies Available Through Law: Fraud and False Claims

In order to form a contract, essential elements must be present. Among these is lawful purpose. Consequently, the presence of fraudulent activity

either to obtain the contract or during its performance renders the contract void and the government's duty to pay the contractor changes from what is written in the contract to that determined by a court. Thus, unless management and the appropriate investigative and legal bodies decide to pay in accordance with the contract terms, payment need not be made until payment is later required by a court. False representation in bids and on negotiated procurements are included in this category. If there is only suspicion of illegal acts but no confirmation through either investigative or judicial means, payment can still be withheld pending completion of further actions (see the above discussion of Payments).

Remedies Available Through Exercise of the Government's Unique Business Position

1. Voluntary Refunds - Pursuant to the FAR, the government may request that a contractor refund a portion of a contract price if the price is unreasonable and unfair. Normally the decision to make this request can be made only by the Secretary. Because other rights of the government may be jeopardized by acceptance of a voluntary refund, legal counsel should be consulted prior to acceptance of an unsolicited voluntary refund.

2. Debarment and Suspension - A contractor may be denied consideration for award of prime contracts or subcontracts if the Secretary determines that the contractor's actions violated the standards listed in the FAR. Causes for debarment include conviction of fraud on a government contract, embezzlement, willful failure to perform a contract and other actions indicating lack of integrity or honesty. This remedy should not be pursued alone but rather in concert with other remedies to appropriate disposition of an overpricing case.

3. Contractor Management System Approval - In order to accommodate large numbers of actions taken by contractors with an efficient amount of government oversight, many contract actions are not reviewed individually but rather they are reviewed using a systems approach. The management systems that are most likely to be affected by a case of overpricing are: estimating system, purchasing system, quality system, and accounting system. When overpricing is discovered, it may be of sufficient magnitude or occur with such frequency that revocation of the contractor's system approval is appropriate. Threat of a system disapproval, if it is credible, may be sufficient to convince a contractor to reconsider an overpriced contract if the overpricing occurred because of a deficiency in the management system.

4. DOD Inspector General Audit (Subpoena Power) - In cases where overpricing is strongly suspected but there is no contractually authorized method of obtaining access to the contractor's records and the contractor will not cooperate, the DOD/Inspector General (IG) may be employed to assist. The Inspector General Act gave the DOD/IG power to subpoena contractor records and employees during investigations. If access to contractor records is essential in pursuit of an overpricing remedy, DOD/IG assistance may be obtained in certain cases.

5. Demand for Payment - Establishment of a debt by the contractor to the government is governed by FAR 32.6. If a finding in overpricing is correctable by contract terms (e.g., defective pricing, best customer clause, etc.), the contracting officer should pursue the remedy as quickly as possible. If the contractor does not cooperate, unilateral action should be taken and a demand for payment made. This allows an offset to be made from other payments due the contractor on other contracts if prompt payment of the debt does not occur. In cases where the contract does not provide a remedy for correcting overpricing, establishment of a debt and making a demand for payment may not be available. However, depending on the severity of the overpricing and the circumstances surrounding it, the contracting activity may want to consider demanding payment of the overpriced amount on the basis the contract price is unduly excessive or unreasonable. Obviously, since this action would be taken without a contractual right to do so, it should be done with care and only in those cases where the harm or embarrassment is so great that it is preferable to be sued by the contractor rather than making payment.

APPENDIX J

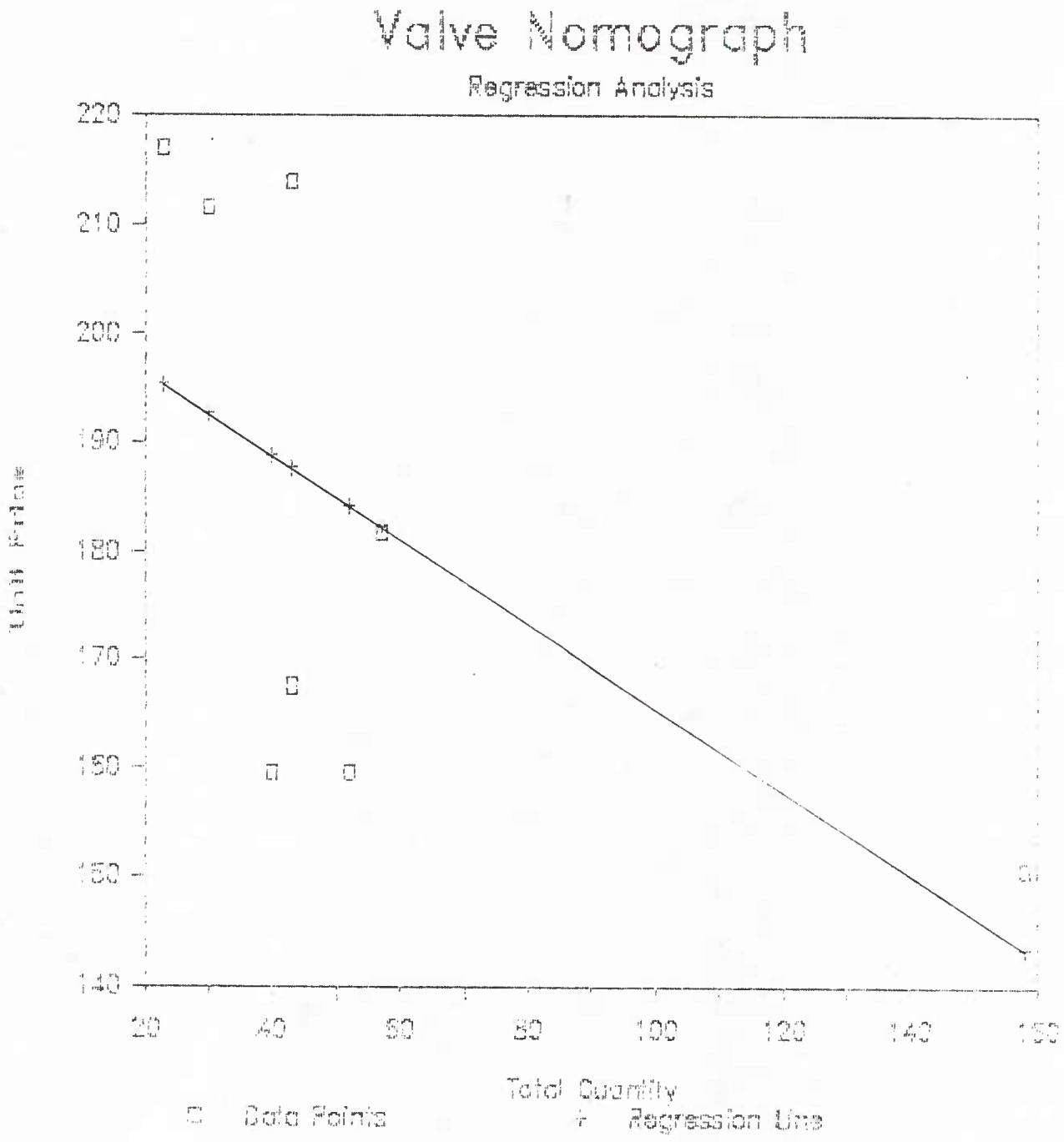
Nomograph for National Stock Number 4820002748351.

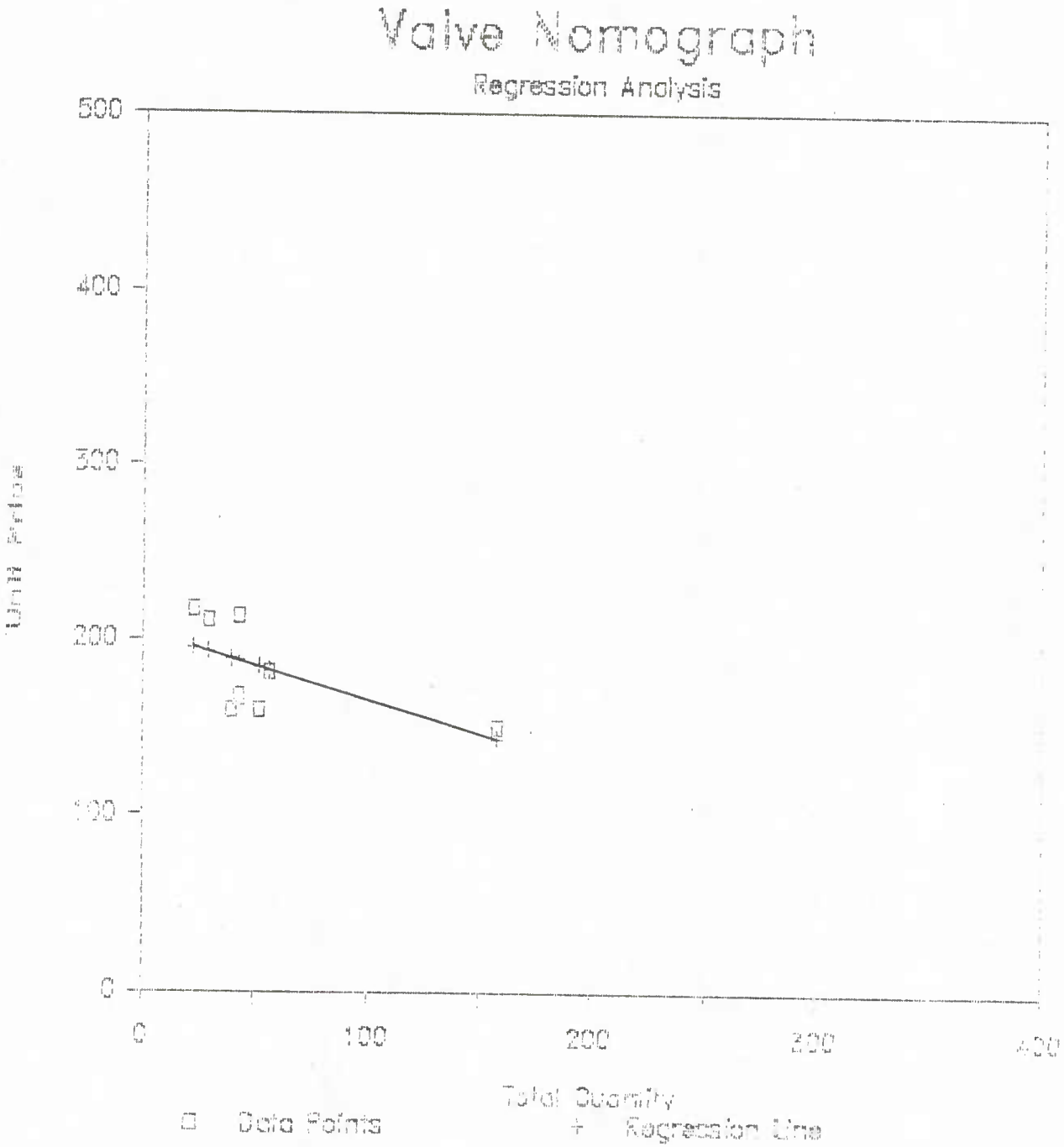
NOMOGRAPH FOR NATIONAL STOCK NUMBER 4820002748351

Two types of nomographs were developed for the valve national stock number mentioned above. The first type of nomograph developed, an XY graph, is illustrated on pages AJ-2 and AJ-3. The second type of nomograph developed, a parallel/vertical scale graph, is illustrated on page AJ-4. The data that was used to develop these graphs is presented on pages AJ-5 through AJ-7.

To use the nomograph on page AJ-2, find the present quantity of valves that are being bought along the X axis, and then read the corresponding unit price from the regression line and Y axis. For example, the unit price for 80 valves would be approximately $174.00.

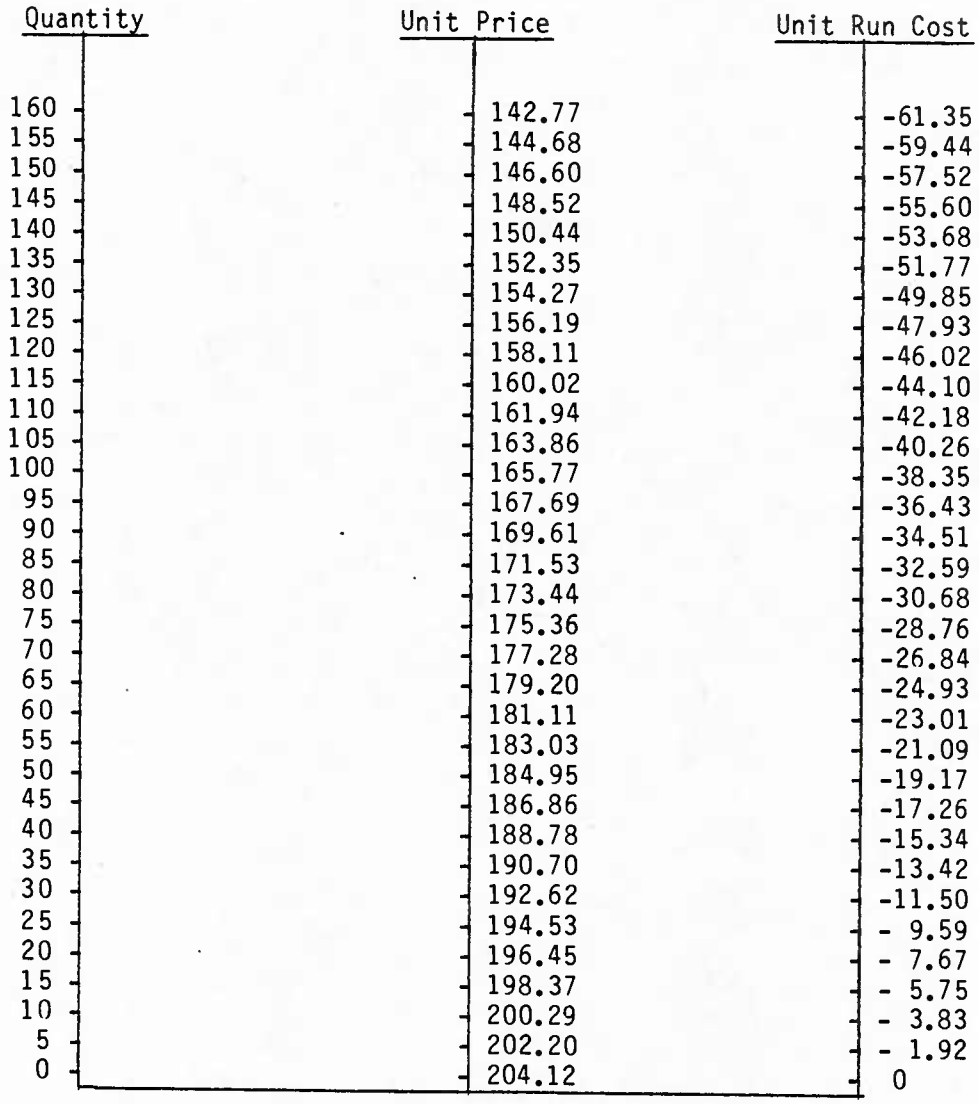
To use the parallel/vertical scale find the quantity under investigation along the first vertical line and then read the corresponding unit price from the second vertical line. For example, the unit price for 80 valves would be $173.44.


Valve Nomograph
Regression Analysis
220
210
200
190
180
170
160
150
140
Unit Price
20
40
60
80
100
120
140
160
Total Quantity
Data Points
Regression Line


Valve Nomograph
Regression Analysis
500
400
300
200
100
0
0
100
200
300
400
Total Quantity
Data Points
Regression Line

VALVE NOMOGRAPH FOR

NATIONAL STOCK NUMBER 4820002748351



COEFFICIENT OF CORRELATION = r = -0.59423

SLOPE OF REGRESSION = b = -0.38346

Y INTERCEPT = a = 204.1222

REGRESSION EQUATION Y= -0.38346 X + 204.1222

NSN	X	Y	X^2	Y^2	XY	Y'	Y' - Y	%
4820002748351	40	159.5967	1600	25471.13	6383.871	188.7835	29.18680	18.28784
	23	217.1024	529	47133.46	4993.355	195.3025	-21.7999	-11.1621
	30	211.5921	900	44771.22	6347.763	192.6182	-18.9738	-9.85050
	52	159.5967	2704	25471.13	8299.032	184.1819	24.58521	15.40458
	43	214.0096	1849	45800.14	9202.416	187.6331	-26.3764	-14.0574
	158	150.6862	24964	22706.35	23808.43	143.5346	-7.15165	-4.74605
	57	181.8307	3249	33062.42	10364.35	182.2646	0.433901	0.238629
	43	167.5371	1849	28068.70	7204.099	187.6331	20.09600	11.99495
4820003253121								
4820003650485								
4820004063859YP								
4820004202807								
4820004324886								
4820004423842								
4820005457380YZ								
4820005807054								
4820006274777FS								
4820006401524YD								
4820007309311FS								
4820007329442YD								
4820007542941FS								
4820007644737YD								
4820008523719								
4820009442998								
4820009488042								
4820009785077SE								
4820010037391								
4820010046585								

4820010130405XJ

4820010130406XJ

4820010132646XJ

4820010148223XJ

4820010739923

4820010833032

4820011358553

4930009442927

4930009442994

4930009487622

N	SUM X	SUM Y	SUM X^2	SUM Y^2	SUM XY
8	446	1461.952	37644	272484.5	76603.32

MEAN X = 55.75
MEAN Y = 182.7440

APPENDIX K

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   Equipment Specialist
   Directorate, Competition Advocacy
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