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MILITARY HANDBOOK

A Guide for MIL-STD-1520C Corrective Action and Disposition System for Nonconforming Material

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DISTRIBUTION STATEMENT A. Approved for public release; distribution unlimited.

FOREWORD

1. This military handbook is approved for use by all Departments and Agencies of the Department of Defense.

2. Guidance in the handbook was developed from actual experience during implementation of MIL-STD-1520C, Corrective Action and Disposition System for Nonconforming Material. It provides information useful in training personnel involved in or responsible for tailoring and implementing the standard. The handbook is not to be used as a contractual requirement nor does it supersede any specification requirements or written direction from the procuring activity or the Contract Administration Office (CAO).

3. The handbook includes information relevant to implementation of Statistical Process Control (SPC) and establishing Quality Improvement Projects (QIPs) for achieving continuous process and product quality improvement as required by MIL-STD-1520C.

4. Successful implementation of MIL-STD-1520C requires knowledge of the Federal Acquisition Regulation (FAR) Part 46 (and the Defense Federal Acquisition Regulation Supplement (DFARS) Part 246), Quality Assurance, and an understanding of the applicable quality system requirements. Knowledge of quality management and quality engineering concepts is also important. There are many sources of information available on these topics. One useful reference, which also provides information on other sources, is Juran's Quality Control Handbook, fourth edition, by Dr J. M. Juran.

5. MIL-STD-1520C is used with contract quality system requirements described in the FAR 46.202-3 (and DFARS 246.202-3), Higher-level contract quality requirements. MIL-STD-1520C is intended to supplement those requirements.

6. Facilities, products and management techniques vary widely among DOD contractors. This handbook does not provide detailed guidance for all

situations but offers acceptable approaches and alternatives that have been used successfully by Government and the defense industry in implementing MIL-STD-1520C.

7. Teamwork is vital between the contractor, CAO and procuring activity. Clear communications on key processes, verification methods, delegations and program objectives is needed to establish an effective, economical and efficient system.

8. MIL-STD-1520C is subject to tailoring. Tailoring is an activity that occurs prior to award of a contract and consists of the deletion or modification of those requirements which are not applicable or not cost-effective for a given acquisition. Specific tailoring guidance is contained, where appropriate, in the tailoring notes following the quoted portion of the standard.

9. When tailoring is applied to production contracts, few, if any, changes to the standard may be necessary. For other acquisition scenarios (e.g., research and development contracts, cost reimbursement contracts, low volume or limited production efforts, etc.), tailoring should be considered. Suggestions for tailoring in some of these scenarios is contained herein.

10. Records and documentation referred to in MIL-STD-1520C may be in the form of computer displays or electronic data processing, provided they are readily available for review and properly safeguarded to prevent unauthorized alteration.

11. The handbook uses the following format: each paragraph (or group of paragraphs) of MIL-STD-1520C is quoted verbatim *in italicized print*. This is followed by tailoring notes and/or implementation notes. Each quoted portion of the standard, together with any applicable tailoring and/or implementation notes, is set off from the rest of the text by solid horizontal lines. Care has been taken to quote portions of MIL-STD-1520C in the handbook verbatim. Any errors in these quotations are inadvertent and do not alter or affect the requirements of MIL-STD-1520C in any way.

12. Beneficial comments (recommendations, additions, deletions) and any pertinent data (e.g., illustrations and actual examples of where guidance is needed) which may be of use in improving this document should be addressed to: Office of the Assistant Secretary of the Air Force (Acquisition), Chief, Manufacturing and Quality Division, ATTN: SAF/AQXM, Washington, DC 20330-1000, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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"FOREWORD.
The premises upon which this standard is based have not changed and are stated as follows. It is Department of Defense (DOD) policy to reject material and supplies that do not conform to all contractual requirements. Deviation from this policy is permissible only when the Government determines that acceptance of such material and supplies is in its best interests. Acceptance of nonconforming material is the sole prerogative of the Government. The act of offering nonconforming material to the Government should be an exception and the consistent offering of nonconformances is indicative of a degradation in the contractor's control over quality."

"1. SCOPE
1.1 Purpose. This standard sets forth the requirements for a cost-effective corrective action and disposition system for non-conforming material. It defines requirements relative to the interface between the contractor and the contract administration office on nonconforming material. This standard sets forth the DOD contracting activity requirements for a properly constituted Material Review Board. The primary purposes of the corrective action and disposition system are to identify and correct causes of nonconformances, prevent the recurrence of wasteful nonconforming material, reduce the cost of manufacturing inefficiency, and foster quality and productivity improvement."

Implementation notes:

1. MIL-STD-1520C sets forth the DOD procuring activity requirements for a properly constituted Material Review Board (MRB) as referred to in MIL-STD-480B, Configuration Control--Engineering Changes, Deviations and Waivers, paragraph 5.4, Requirements for waivers.

2. Application of this standard provides a means for improving quality and productivity, thereby reducing losses associated with nonconforming material. When effectively implemented, it results in fewer nonconformances, lower nonconformance costs and better first-time pass rates.

3. MIL-STD-1520C recognizes that investigation and corrective action for every instance of nonconforming material as if they are of equal significance or consequence is not cost-effective. Focusing corrective action effort is one

extremely important feature of this standard. Nonconformances impacting safety, performance, high rate manufacturing processes or delivery schedules require immediate corrective action to prevent further recurrence. While every nonconformance can offer an opportunity to improve, for isolated nonrecurring nonconformances the cost of investigation and corrective action could exceed the loss. An effective corrective action and disposition system directs resources toward those nonconformances with the greatest impact and potential for quality improvement. Pareto analysis (see figure 2, page 5) offers one effective method for focusing on the significant few with the greatest potential return.

"1.2 Application. When referenced in a contract, this standard applies to material and supplies (excluding computer software) to be delivered to the Government which fail to conform to contractual requirements. Requests for specification changes, engineering changes, and major and critical waivers and deviations are not applicable to this standard."

Implementation notes:

1. As is the case with computer software, this standard is not intended for the disposition of nonconforming technical or engineering data to be delivered to the Government. Nevertheless, the corrective action provisions of the standard do apply to computer software and technical or engineering data (or anything else) when it is a cause of nonconforming material.

2. The standard is not intended for approval or disapproval of deviations, minor or otherwise (as defined by MIL-STD-480B).

3. MIL-STD-1520C is also not intended for application to equipment during field use. Once equipment is "delivered" for use, whether material was accepted by the Government or not, nonconformance reporting is normally accomplished by Product Quality Deficiency Report or Service Report. However, these reports and other sources of field use data when analyzed by the Corrective Action Board (CAB) or other personnel can provide a valuable source of information for use in improving the design, development and production processes.

"1.3 Change notices and revisions. Whenever this standard is changed or revised subsequent to its contractually effective date, the contractor may follow or authorize its suppliers to follow the changed or revised standard provided no increase in price or fee is required. The contractor shall not be required to follow the changed or revised standard except as a change in contract. If the contractor elects to follow the changed or revised standard, the contractor shall notify the contracting officer in writing of this election. When the contractor elects to follow the provisions of a change or revision, the contractor must follow them in full unless otherwise authorized in writing by the contracting officer."

"2. REFERENCED DOCUMENTS
Not Applicable."

"3. DEFINITIONS"

Tailoring note:

1. As a result of tailoring the requirements of this standard, some definitions may no longer be applicable. Since they contain no inherent action, tailoring the definitions is optional.

"3.1 Control charts. A graphic representation of data used to detect, identify, analyze, and eliminate unacceptable variation in a given characteristic, process, or product. Computer software programs may be used for this purpose without a need to display the control chart itself. Commonly used control charts include variables or attributes process data and associated control limits, scatter plots of trends, histograms, and graphic displays of nonconformances by category. Control charts facilitate analysis of the process yield leading to potential changes in processes, methods, machines, and requirements documentation; evaluation of defect distributions to focus on significant causes of nonconformance; analysis to distinguish between chance and assignable causes of variation; and monitoring of the effectiveness of corrective action."

"3.2 Control limits. Control limits are criteria that establish maximum variation beyond which action must be taken to investigate and when feasible correct the cause(s) of nonconformance. Control limits do not preclude corrective action when abnormal patterns of variation occur without any individual data exceeding the control limits. Control limits are developed using standard statistical methods or other approved techniques

and are based on documented process history. They are established to assist in fulfilling the contractor's responsibility for submitting a conforming item, identifying necessary corrective actions, and reducing nonconformance levels."

Implementation notes:

1. Control charts (paragraph 3.1) are used in process capability studies, in statistical process control (SPC), and in data analysis and problem solving (e.g., design of experiments, variability reduction, etc.).

2. Control limits (paragraph 3.2) or "action limits" may be used depending on the nature of the control chart and its application. Control limits may refer to the individual process level (micro sense) or to the summary or organizational level (macro sense).

3. Contractors may use a variety of approaches for control charts and control limits to implement MIL-STD-1520C. The exact methods for charts and graphic approaches are not specified by MIL-STD-1520C. It is the responsibility of the contractor to determine how, where and when they will be used unless otherwise specified by the contract. Control charts are kept at the process operator and/or higher organizational levels as needed. In some cases data may be periodically sampled and analyzed. In others, data may be collected over time and then periodically analyzed. The objective is to understand the operation and provide indicators of quality that will facilitate meaningful decisions about nonconformances and corrective action.

4. Control charts typically are used to measure nonconformances per unit, a manufacturing operation, process or area, with control limit standards to provide an alert if an adverse trend develops. Contractors may include daily, weekly, monthly, quarterly or annual summarization depending on the application, need for review and purpose of the information. Normalization by labor hours, product complexity and opportunity for errors may be needed to provide meaningful comparisons. Nonconformances per thousand opportunities or labor hours are common normalization factors. Timeliness of open

material reviews and corrective action, nonconformance rates in receiving, test and field operation, including those of supplier products, may be displayed. Work station or data for work operations may be "rolled up" into summarizations for higher level management visibility and action. The number and status of internal and external corrective action requests, including requests sent to suppliers, may be charted. Scrap, rework and repair cost trends, first pass yield, engineering errors, purchasing and other nonconformance business indicators may be charted for management.

5. Some simplified examples of charts and graphic approaches used for process analysis, process control and corrective action follow.

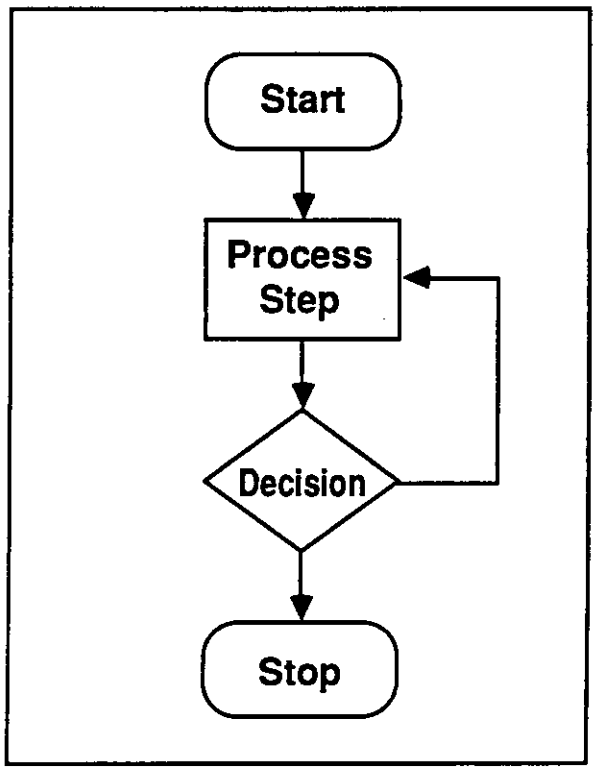

FIGURE 1. FLOW CHARTS visually depict the steps in a process and can be used to analyze the process and identify critical process variables.

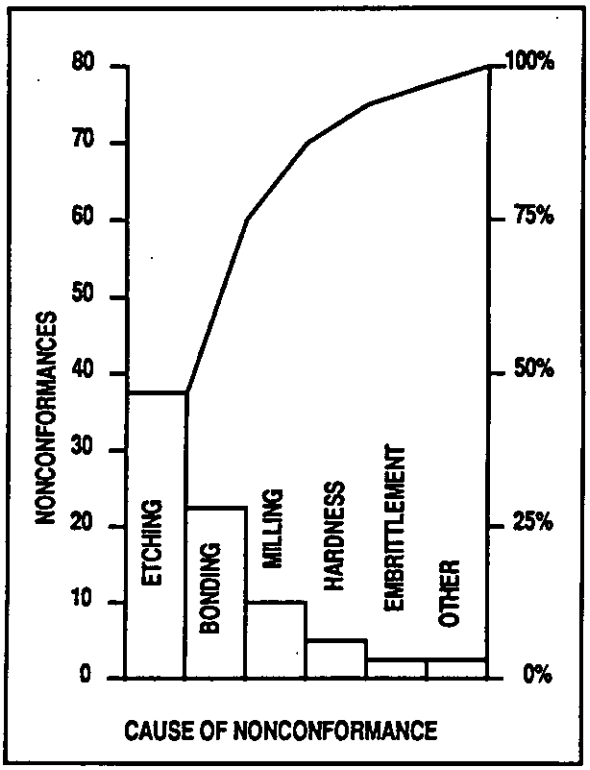

FIGURE 2. PARETO CHARTS display categories of parts, processes or problems. The categories are ordered according to their relative importance in terms of cost or events.

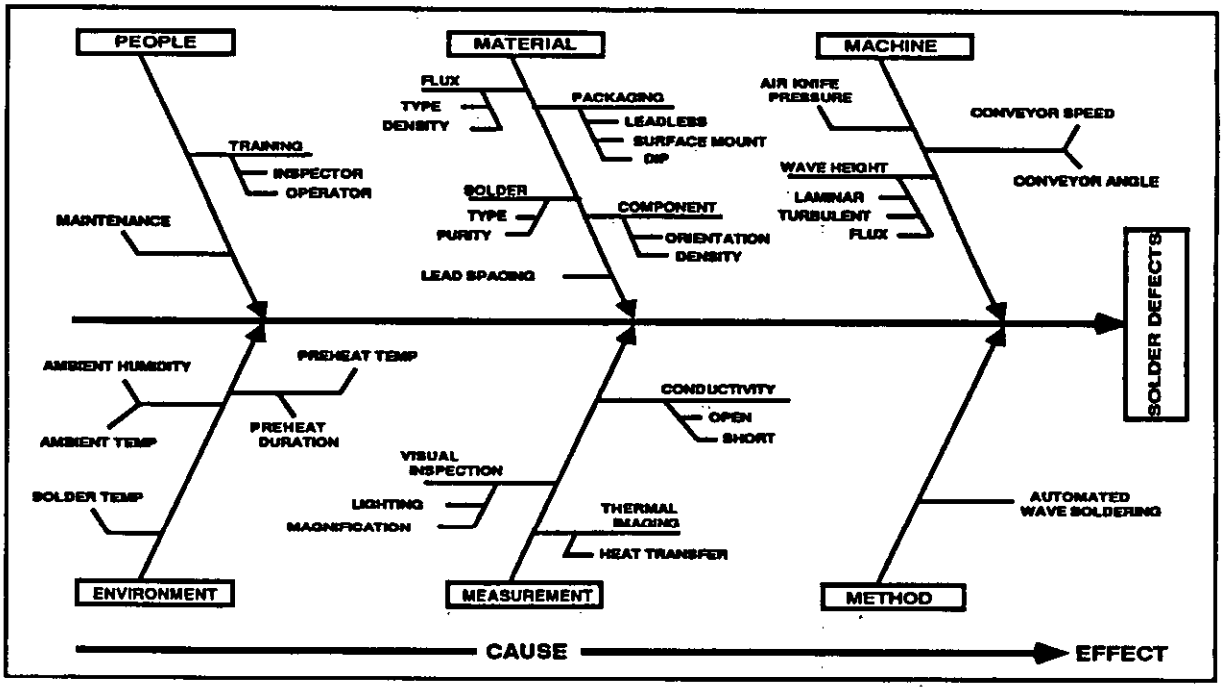

FIGURE 3. CAUSE AND EFFECT DIAGRAMS (Fishbone Charts) are used to identify and analyze the relationships between the nonconformances (i.e. the effects) and the potential sources of the nonconformances (i.e. the causes).

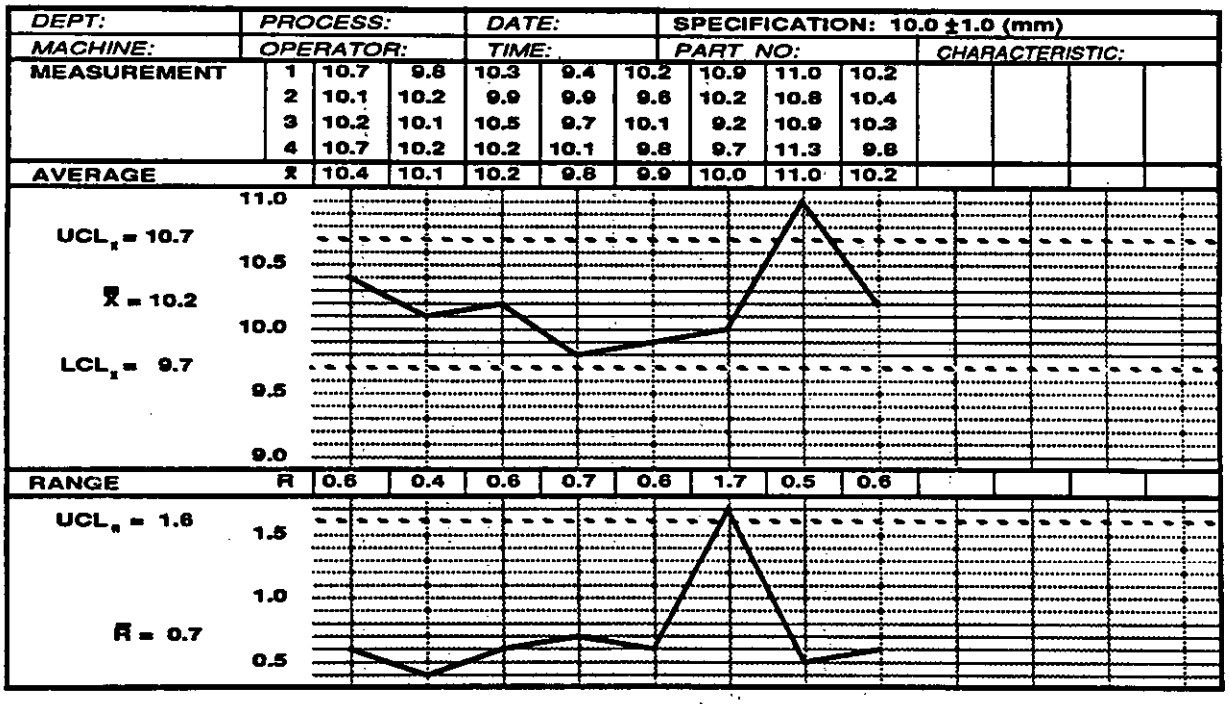

FIGURE 4. CONTROL CHARTS display process measurement data and the control limits. The charts are used to monitor critical processes and identify "special" causes of variation.

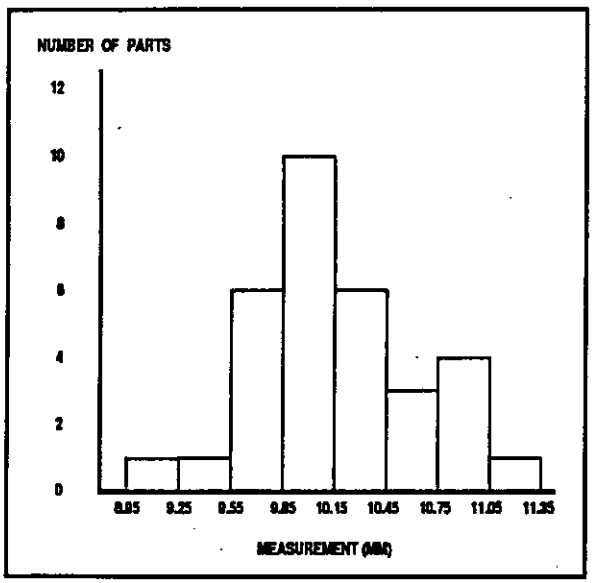

FIGURE 5. HISTOGRAMS display frequency distribution of numerical data and are used to observe the statistical characteristics of the data.

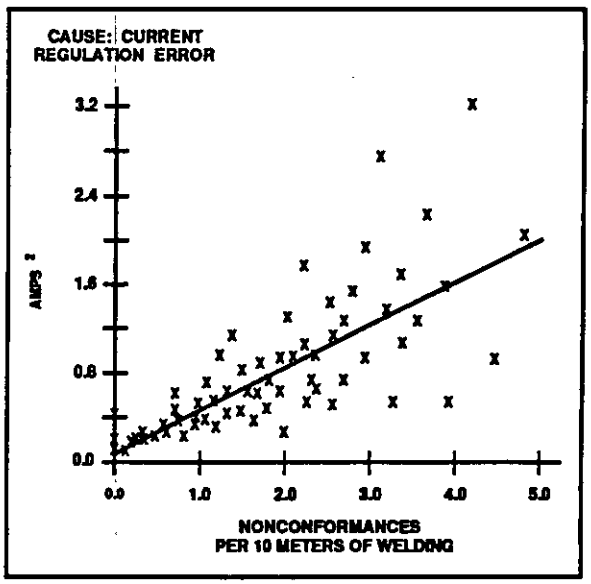

FIGURE 6. SCATTER DIAGRAMS display the interrelationship between two characteristics and can be used to show the correlation between a potential cause and the nonconformances.

"3.3 Corrective action. Changes to processes, work instructions, workmanship practices, training, inspections, tests, procedures, specifications, drawings, tools, equipment, facilities, resources, or material that result in preventing, minimizing, or eliminating nonconformances."

"3.4 Corrective Action Board (CAB). A contractor board consisting of management representatives of appropriate contractor organizations with the level of responsibility and authority necessary to ensure the prevention of nonconformances, to manage quality improvement efforts as appropriate, to assess and manage nonconformance cost elimination, to ensure that causes of nonconformances are identified, and that corrective actions are effected throughout the contractor's organization."

"3.5 Material Review Board (MRB). A board consisting of representatives of contractor departments necessary to review, evaluate, and determine or recommend disposition of nonconforming material referred to it."

"3.6 Nonconformance. The failure of a characteristic to conform to the requirements specified in the contract, drawings, specifications, or other approved product description."

Implementation note:

1. Simple manufacturing incompletions or omissions that are identified and successfully restored to fully conforming condition at the work station where the error occurred and prior to movement to another work station or submittal of hardware for appraisal to specification, normally are not considered nonconformances. A simple manufacturing incompletion or omission is a required operation that (1) can be successfully completed or performed; (2) results in elimination of the nonconformance; (3) uses essentially the same procedures as were originally required to perform the incomplete or omitted operation; and (4) does not involve destructive or potentially destructive disassembly. On the other hand manufacturing incompletions or omissions detected out-of-station (i.e., downstream beyond the originating work station where the incompletion or omission occurred) are considered nonconformances.

"3.6.1 Minor nonconformance. A nonconformance which does not adversely affect any of the following:

a. Health or safety.
b. Performance.
c. Interchangeability, reliability, or maintainability.
d. Effective use or operation.
e. Weight or appearance (when a factor).

NOTE: Multiple minor nonconformances, when considered collectively, may raise the category to a major/critical nonconformance."

Implementation note:

1. The intent of the "NOTE" at the end of the definition is for application to an individual unit when the cumulative effect of multiple minor nonconformances may have a major or critical effect (e.g., dimensional tolerance buildup).

"3.6.2 Major/critical nonconformance. A nonconformance other than minor that cannot be completely eliminated by rework or reduced to a minor nonconformance by repair.

NOTE: Where a classification of defects exists, minor defects are minor nonconformances. Major and critical defects which cannot be completely eliminated by rework or reduced to a minor nonconformance by repair are major/critical nonconformances."

"3.7 Nonconforming material. Any item, part, supplies, or product containing one or more nonconformances."

"3.8 Occurrence. The first time a nonconformance is detected on a specific characteristic of a part or process. All nonconformances attributed to the same cause and identified before the date, item, unit, lot number, or other commitment for effective corrective action are also considered occurrences."

"3.9 Recurrence. A repeat of a nonconformance other than provided for in paragraph 3.8 above."

"3.10 Preliminary Review (PR). An evaluation by contractor-appointed Quality personnel, assisted by other personnel as required, to determine the disposition of nonconforming material after its initial discovery and prior to referral to the MRB. PR may result in an authorized disposition of the nonconforming material without referral to the MRB for final disposition."

Implementation note:

1. PR disposition is limited to scrap, rework, return to supplier and repair using a Standard Repair Process (SRP).

"3.11 Quality Improvement Project (QIP). An activity chartered and monitored by the CAB (or other contractor group senior to the CAB) to investigate technology, methods, and procedures, which is aimed at finding more efficient and effective means of carrying out contractual responsibilities with the objective of enhancing quality and productivity."

Implementation note:

1. QIPs within the scope of MIL-STD-1520C address reducing the rate and quantity of nonconformances. They target process and product quality

improvement. Contractors may have other quality improvement activities which are not related to reducing nonconformances. These need not be considered QIPs within the scope of MIL-STD-1520C.

"3.12 Repair. A procedure which reduces but not completely eliminates a nonconformance and which has been reviewed and concurred in by the MRB and approved for use by the Government. The purpose of repair is to reduce the effect of the nonconformance. Repair is distinguished from rework in that the characteristic after repair still does not completely conform to the applicable drawings, specifications, or contract requirements. Except for SRPs (see paragraph 3.15 below), proposed repairs approved by the Government are authorized for use on a one-time basis only."

"3.13 Rework. A procedure applied to a nonconformance that will completely eliminate it and result in a characteristic that conforms completely to the drawings, specifications, or contract requirements."

Implementation note:

1. An example of a repair is a hole mistakenly drilled oversize that requires filling and redrilling to the correct size. An example of rework is a hole that is undersized and can be redrilled to the correct dimension.

"3.14 Scrap. Nonconforming material that is not usable for its intended purpose and which cannot be economically reworked or cannot be repaired in a manner acceptable to the Government."

"3.15 Standard Repair Procedure (SRP). A documented technique for repair of a type of nonconformance which has been demonstrated to be an adequate and cost-effective method for repair when properly applied. SRPs are developed by the contractor, reviewed and concurred in by the MRB, and approved by the Government for recurrent use under defined conditions. Defined conditions shall include an expiration date or a finite limit on the number of applications, or both."

"3.16 Statistical Process Control (SPC). SPC is a methodology used to measure the average and variability of any given characteristic within a contractor area, department, part, or process, including but not limited to, machine shop, bonding process, heat treat, and assembly. SPC techniques include control charts and control limits. Properly implemented, SPC offers the

ability to improve manufacturing yield and lower production, inspection, and nonconformance costs."

"3.17 Supplier. The terms subcontractor, supplier, vendor, seller, or any other term used to identify the source from which the prime contractor obtains support are considered to be synonymous for the purpose of this standard."

"3.18 Use-as-is. A disposition of material with one or more minor nonconformances determined to be usable for its intended purpose in its existing condition."

"3.19 Definitions of acronyms used in this standard. Acronyms used in this standard are listed and defined as follows:

a.	*CAB*	-	*Corrective Action Board.*
b.	*DOD*	-	*Department of Defense.*
c.	*FAR*	-	*Federal Acquisition Regulation.*
d.	*MRB*	-	*Material Review Board.*
e.	*PR*	-	*Preliminary Review.*
f.	*QIP*	-	*Quality Improvement Project.*
g.	*SPC*	-	*Statistical Process Control.*
h.	*SRP*	-	*Standard Repair Procedure."*

"4. GENERAL REQUIREMENTS
4.1 Corrective action and disposition system. The contractor shall establish and maintain a system which shall identify, segregate (or control if segregation is not practical), and properly dispose of nonconforming material and shall ensure that cost-effective, positive corrective action is taken to prevent, minimize, or eliminate nonconformances. The system shall work toward continual improvement of quality and productivity through the initiation and monitoring of QIPs."

Tailoring note:

1. The requirement for QIPs is intended primarily for production efforts.

Implementation note:

1. See implementation note 3 on corrective action at paragraph 1.1 (page 1).

"4.2 Statistical Process Control (SPC). SPC techniques including control limits and control charts shall be used when appropriate. Control limits must be established statistically or by other methods acceptable to the Government and be based upon the documented history of the process capability."

Tailoring notes:

1. The requirement for SPC is applicable on production efforts. SPC can also be applied selectively on development programs and short production runs.

2. SPC may be applied with or without other requirements of the standard.

Implementation notes:

1. SPC applies statistical techniques to measure and analyze process variation. It provides a means for effective process control and improvement of processes. Statistical quality control uses SPC, diagnostic tools, sampling and other statistical techniques to improve quality and productivity and to reduce cycle time and costs. This employs a scientific approach to achieve continuous quality improvement through centering the process and reducing process variation around a set target value as illustrated in figure 7 below.

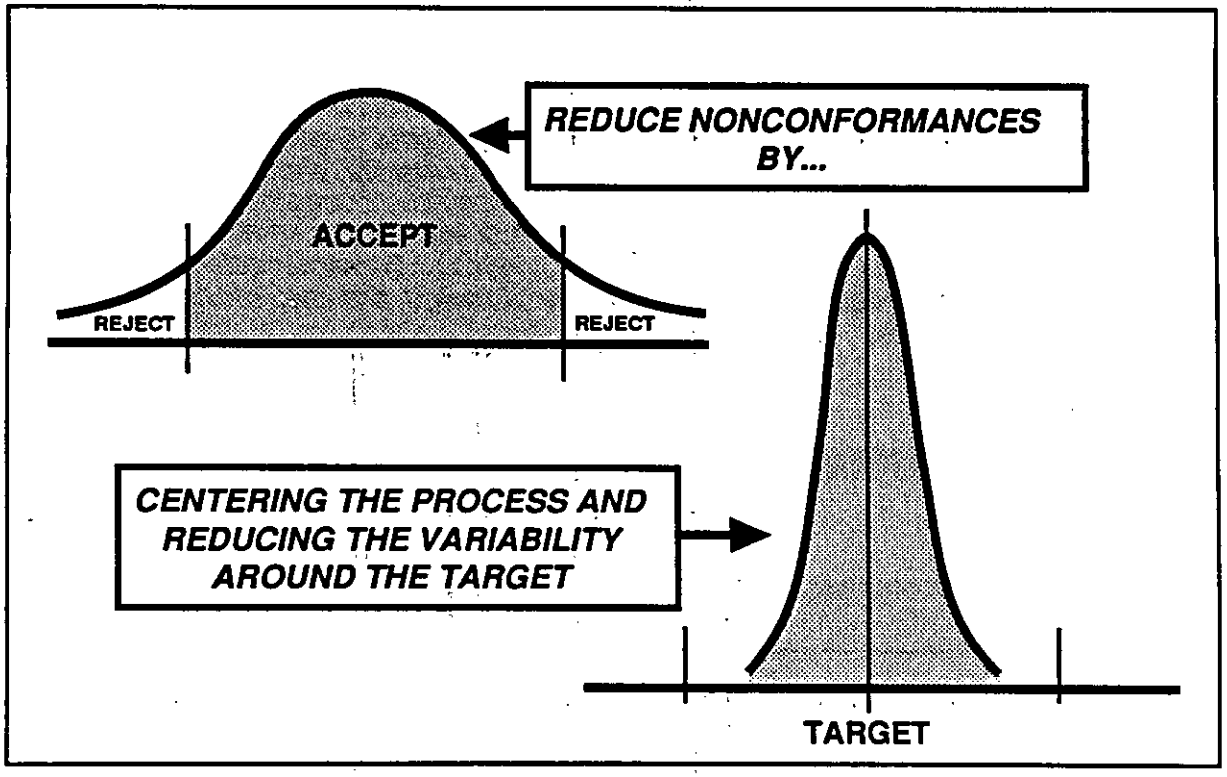

FIGURE 7. The Objective of Effective Process Control.

2. MIL-STD-1520C requires implementation of SPC by the contractor. The exact method for implementing the program, however, is not specified and is the responsibility of the contractor to determine unless otherwise required by the contract. An acceptable approach should be based on standard statistical methods. The following discussion is provided to clarify some general concepts and should not be interpreted as constituting specific requirements of the contractor's program. See a standard textbook or manual on statistical quality control or SPC for a more complete discussion.

3. Statistical quality control may be applied "on-line" (i.e., during actual production) to effectively monitor the process, and "off-line" to find ways to improve product and process design. Useful tools available for these tasks are design of experiments, parameter design, histograms, cause and effect diagrams, scatter diagrams, etc. There are also many useful computer software application programs available that can increase the effectiveness and convenience of statistical techniques.

4. SPC can be applied on most industrial processes and is especially appropriate on key processes. Key processes are identified through analysis of the product design and production system or process characterization studies. Some companies use quality function deployment as a structured procedure for translating customer requirements into design characteristics and target values for product and process design. This links SPC to customer requirements.

5. Once the key processes have been identified, a process capability study can be conducted. A process capability study is a thorough, relatively long-term study of process variation and determines if the process is stable, i.e., in a state of statistical control and capable of producing conforming items. A process is in "statistical control" when process variation is limited to random causes inherent in the process itself. Variables data, where practical, is preferable to attributes data, since variables data contains more information relative to process capability, changes and improvement opportunities.

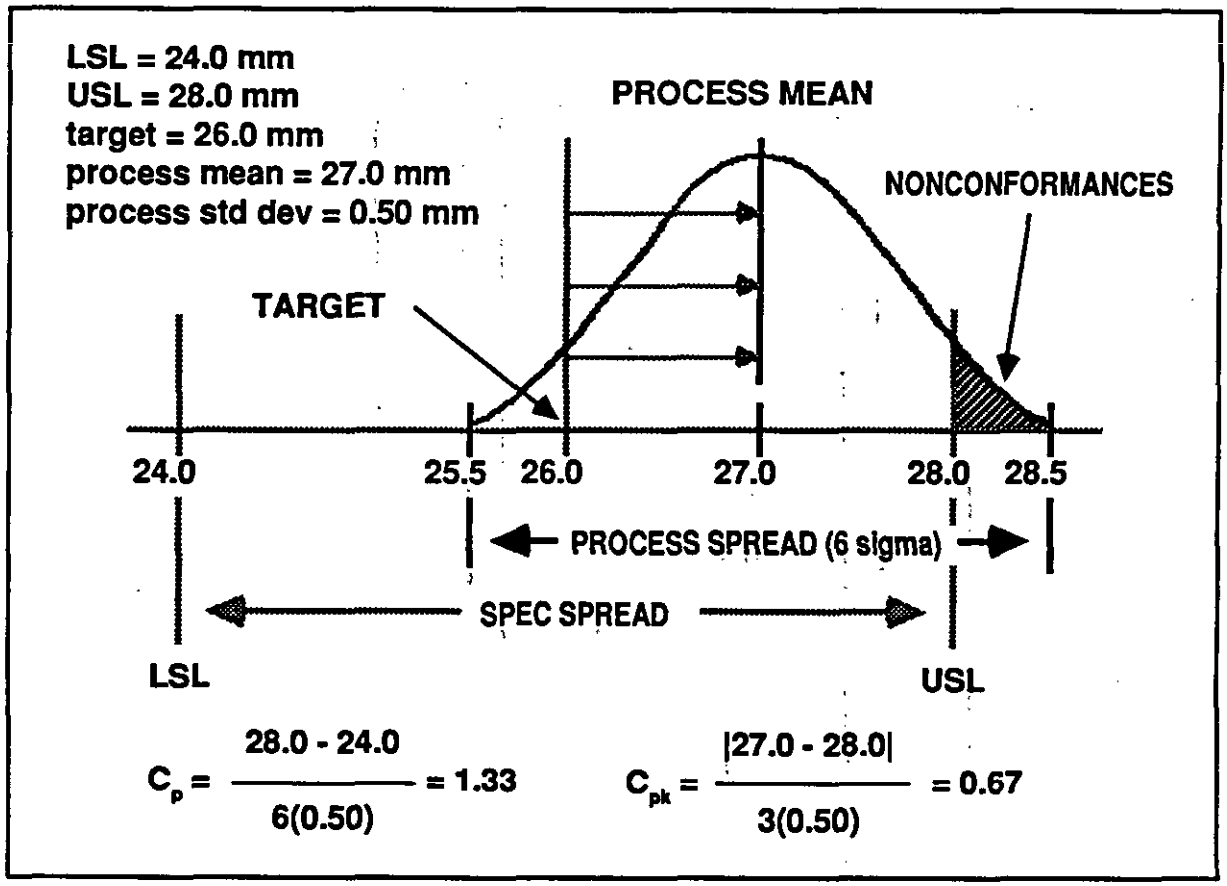

FIGURE 8. Example of C_p and C_{pk} Concepts

6. There are several metrics used as convenient indicators of process variation. Two common ones in some industries are the Process Capability Index (C_p) and the Process Performance Index (C_{pk}). Figure 8 above illustrates the concepts of C_p and C_{pk}.

7. Process control limits and specification limits are not the same. Process control limits are a function of the process variability; specification limits are a function of the engineering requirements for the product. C_p and C_{pk} show the relationship between the two types of limits.

8. Once analysis indicates a stable process, C_p and C_{pk} can be calculated. C_p is defined as the ratio of the specification spread to the measured process variability. Process variability is defined as six times the process standard deviation. C_p is calculated as follows:

$C_p = \frac{USL - LSL}{6 \text{ sigma}}$, where USL = Upper Specification Limit
LSL = Lower Specification Limit
sigma = process standard deviation.

9. C_p does not take into account process location relative to the specification tasrget value (nominal); C_{pk}, however, reflects both the process location and the measured process variability. C_{pk} is calculated as follows (provided the process mean lies between the specification limits):

$C_{pk} = \frac{|\text{process mean} - NSL|}{3 \text{ sigma}}$, where NSL = Nearer Specification Limit.

Note: The above formulas assume a normal distribution; many industrial processes, however, do not have a normal distribution. For these kind of processes, the above formulas may understate or overstate the actual values for C_p and C_{pk} and therefore may not be applicable. The type of distribution should be analyzed periodically using histograms or other analytical methods. For non-normal distributions, other methods may be necessary to calculate C_p and C_{pk}.

10. As a result of these calculations the process can be classified as "capable" or "non-capable". A capable process is usually defined as one that is both stable and operating at a C_{pk} of 1.33 or better. Stable but non-capable processes should be studied further in order to find ways to improve the process and further reduce process variation with a goal of continuous quality improvement and attainment of a C_{pk} of 1.33 or better. There are many tools available for achieving this, including design of experiments, parameter design, cause and effect diagrams, etc.

11. Table 1 illustrates the relationship between C_p, C_{pk}, off-center processes and the number of parts per million (PPM) nonconforming. Notice the effects that centering a process and reducing variability have on the number of nonconformances.

Table 1: Relationship between C_p , C_{pk} and PPM Nonconforming.

	Centered Process		10% Off-Center*		25% Off-Center*	
C_p	PPM Nonconforming	C_{pk}	PPM Nonconforming	C_{pk}	PPM Nonconforming	C_{pk}
4.50	~0	4.50	~0	3.60	~0	2.25
2.00	~0	2.00	0.8	1.60	1,350	1.00
1.67	0.6	1.67	32	1.33	6,200	0.83
1.33	63	1.33	690	1.07	22,750	0.67
1.00	2,700	1.00	8,360	0.80	66,800	0.50
0.90	6,900	0.90	16,000	0.72	88,500	0.45
0.60	71,800	0.60	90,300	0.48	187,600	0.30

* The percentage "off-center" is defined as the percent of the specification spread that the process mean is offset from the target (e.g. for a 4 mm spec spread and a process which is 25% off-center, the process mean will be displaced 1 mm from the target – see Figure 8). The number of nonconformances (PPM) is based on the assumption the process has a normal distribution. Target is assumed to be midway between the LSL and USL.

11. A process must be stable before capability can be calculated. C_p and C_{pk} are meaningless for an unstable process.

12. Process metrics such as C_p and C_{pk} meaningfully relate to individual processes, but not to the collective result of a series of disparate processes.

13. Effective process control upstream will reduce product variability and, therefore, will result in less nonconformance and reduced need for control and corrective action downstream.

"4.2.1 Control limit standards. Nonconformances due to chance causes can occur that may not warrant individual corrective action. As an alternative to individual corrective action, the contractor may develop and recommend to the Government the use of a standard(s) to control such nonconformances. Contractor-recommended standards shall specify the control limits at which corrective action must be taken; describe criteria for determining the control limits; and provide for the accumulation and maintenance of data for monitoring processes and obtaining corrective actions as dictated by collective analyses, trend reviews, or other means acceptable to the Government."

Tailoring note:

1. The requirement for control limit standards is intended primarily for production efforts. Control limit standards are a key to visibility into the contractor's application of control limits and corrective action. The procuring activity may tailor paragraph 4.2.1 to require that control limit standards be coordinated with the CAO and concurred in by the procuring activity.

Implementation notes:

1. Control limit standards establish mandatory limits to signal the need for corrective action and to alert management if an adverse trend develops. They are developed statistically or empirically established through observation, experimentation and analysis of selected processes and historical data.

2. Control limit standards may be assigned to characteristics of a product, process or test, or may be organizationally structured by product line or department. Data is often accumulated as product attributes (e.g., defects per manufacturing operation) as a trigger for an investigation into the causes of nonconformance. The contractor's documented quality program or system should clearly define what is to be considered in the collective or trend corrective action process.

"4.3 Quality Improvement. The contractor shall institute actions to prevent nonconformances and initiate QIPs throughout the contractor's organizations. The contractor shall assign organizational elements, teams, or individuals to investigate technology, methods, and procedures to increase efficiency and conformance to requirements. The contractor shall monitor the QIP progress toward established goals at regular intervals. The requirements of this paragraph shall be the responsibility of the CAB or, at the discretion of the contractor, of a contractor group senior to the CAB."

Tailoring note:

1. The requirement for QIPs is intended primarily for production efforts.

Implementation notes:

1. The contractor's QIPs under this standard are applicable to the nonconforming material and corrective action requirements established or monitored by the contractor's CAB, or contractor group senior to the CAB. Any quality improvement projects related to elements other than nonconforming material and corrective action functions are not a part of the requirements of this standard. MIL-STD-1520C requires the establishment and implementation of QIPs, which are projects directed toward the reduction of significant manufacturing costs which result primarily from costs associated with scrap, rework, repair and return to supplier, or are caused by inadequate production designs and inadequate process control. Off-line SPC (see paragraph 4.2, implementation note 4, page 13) may be needed to identify and analyze causes of excessive process variation and to determine if corrective action is adequate. The CAB may coordinate management goals for process/ product improvement and nonconformance reduction.

2. The CAB is ideally situated within the contractor's organization to identify and initiate QIPs. Under MIL-STD-1520C, data provided to the CAB gives visibility into the cost and consequences of nonconformance that cuts horizontally across functional disciplines and typical vertical lines of

management authority in an organization. CAB insight into process and products can often identify opportunities for improvement to new levels of performance that are not visible to those participating in the process itself.

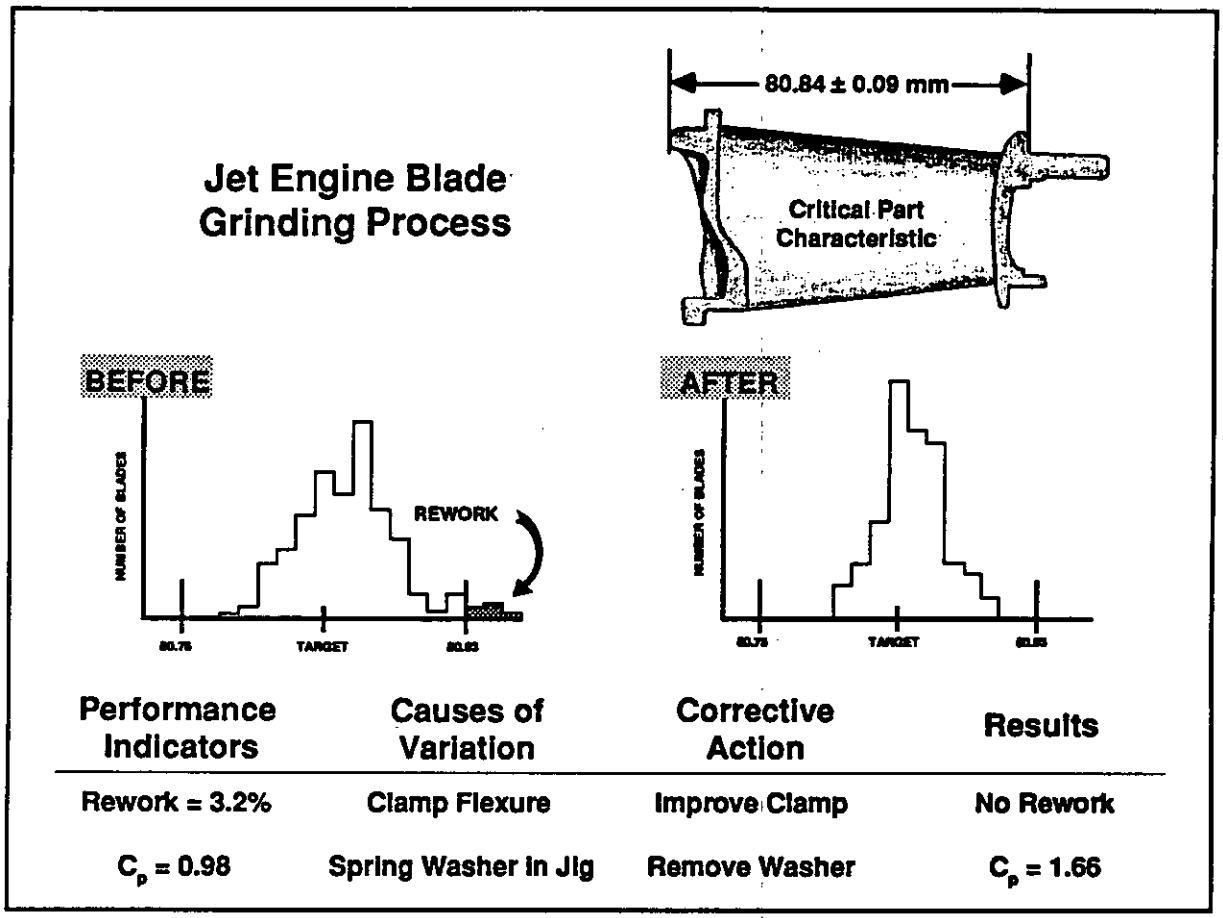

FIGURE 9. An Example of a QIP which Used Variability Reduction to Improve a Grinding Process

3. A simplified example of a QIP on a manufacturing operation is shown in figure 9 above. A contractor was dissatisfied with the scrap and rework in the processes used to manufacture jet engine components. Pareto charts were used to focus the investigation on the grinding processes and the operation with the highest nonconformance rate and lowest C_p was selected for improvement. The employees used histograms, cause and effect diagrams, control charts and scatter diagrams to identify the causes of process variation.

The causes were identified as clamp flexure and the use of spring washers in the jig. These causes were eliminated by designing a new clamp and removing the spring washers. The result was a capable process which produced conforming blades.

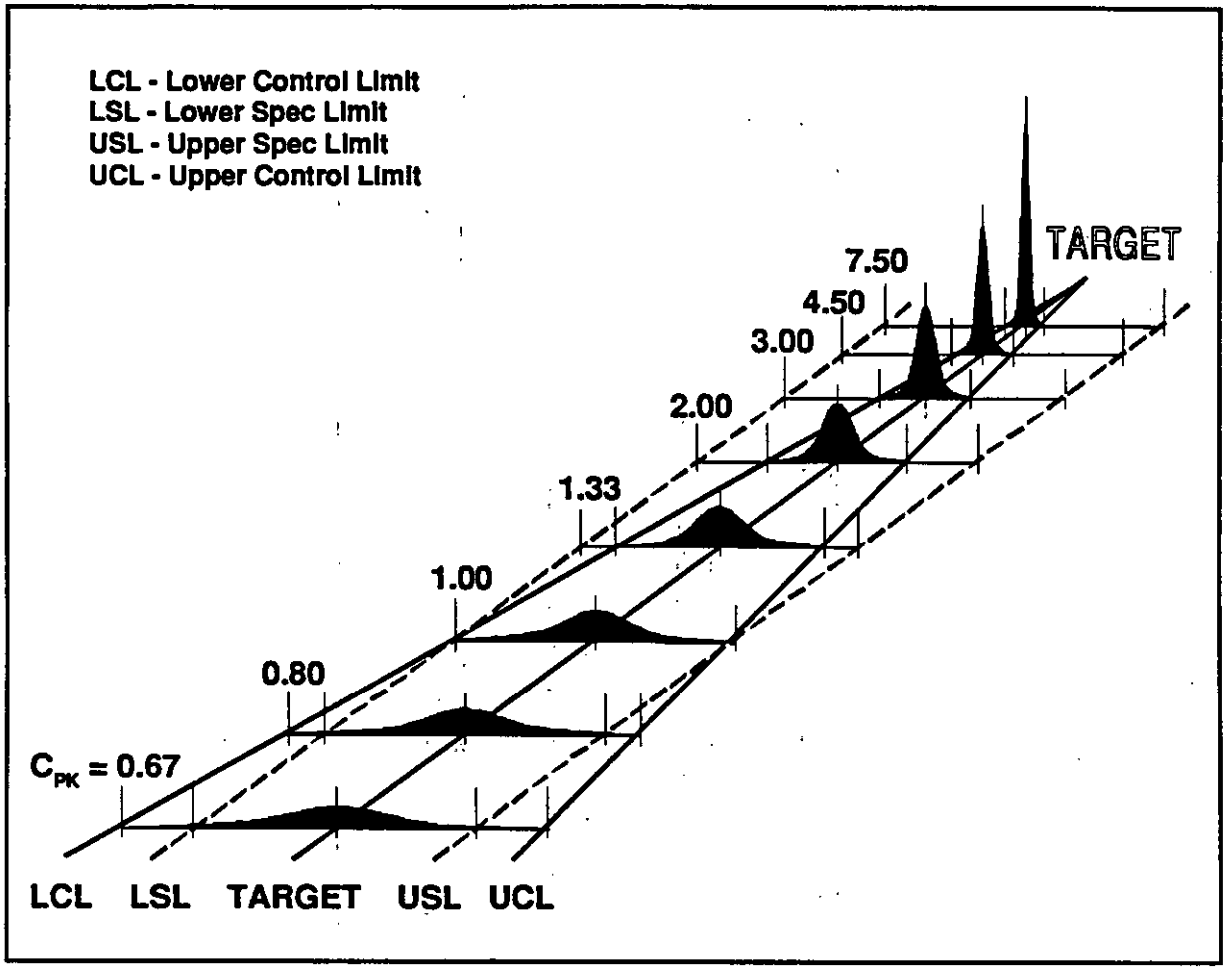

FIGURE 10. An Illustration of Continuous Variability Reduction

4. A company may choose to continue the variability reduction process beyond attainment of capable processes (see figure 10 above). This can lead to very capable, defect-free processes and reduced costs due to shorter manufacturing cycle times, achievement of 100% first time yields, and elimination of unnecessary verification. Other benefits may include shrinking

inventory size and costs, creation of an environment for introduction of just-in-time manufacturing, and decreasing direct labor, overhead and warranty costs.

"4.4 Contractor's written procedures. The requirements of this standard shall be implemented by the contractor through the preparation, publication, and maintenance of detailed written procedures. The contractor shall identify personnel appointed PR authority and those to act on the MRB and CAB, and shall indicate in the procedures the scope or extent of their authority. The contractor's procedures shall also indicate the manner in which documentation is maintained."

Tailoring note:

1. The requirement for a CAB is intended primarily for production efforts.

Implementation note:

1. This paragraph requires contractors to prepare, publish and maintain detailed written procedures describing their corrective action and disposition system for the control of nonconforming material. These procedures should define PR, MRB and CAB responsibilities and authority, levels of management involvement and organizations authorized to participate in PR, MRB and CAB activity. They should also describe methods for PR, MRB and CAB information to be collected, maintained, displayed and reported to various contractor management levels and ensure that information is made readily available to the cognizant Government representative.

"4.5 Material Review Board (MRB). The MRB shall be chaired by a representative of the contractor's Quality organization and shall include, as required, personnel representing other contractor organizations necessary to determine appropriate disposition of nonconforming material. As a minimum, the MRB shall include the chairman and a representative of the contractor's engineering organization responsible for product design. MRB members shall be selected on the basis of their technical competence. MRB members may call upon other contractor personnel for technical advice. If warranted by the volume of nonconforming material or the diversity of work operations, more than one MRB may be established."

Implementation notes:

1. MRB is a contractor responsibility under MIL-STD-1520C. The Government representative is therefore not a member of the MRB and is not required to participate in the MRB unless otherwise directed.

2. The primary concern of the MRB is the quality of products to be delivered to the Government under the contract. The MRB is responsible for timely dispositions in support of production schedules; however, the MRB should ensure that the thoroughness, completeness and integrity of dispositions are not preempted by schedule considerations.

"4.5.1 MRB authority and responsibilities.

a. The MRB shall investigate, in a timely manner, all nonconforming material (except material previously disposed of in PR authorized in paragraphs 5.2 a, b, c, or d) in sufficient depth to determine proper disposition.

b. The MRB shall review and concur in all proposed use-as-is and repair dispositions prior to submission to the Government for approval.

c. The MRB shall review and concur in all proposed SRPs prior to submission to the Government for approval for recurrent use under defined conditions.

d. A written engineering analysis shall accompany proposed use-as-is and repair (excluding SRP) dispositions if requested by the Government. The MRB shall ensure that the Government is kept informed of its investigation and deliberations on these potential dispositions so that the Government may act upon the MRB recommendations in a timely manner.

e. The MRB shall dispose of nonconforming material in accordance with paragraph 5.3."

Implementation notes:

1. MRB members are selected based upon their thorough understanding of the requirements of MIL-STD-1520C and of the applicable technologies and product application. The contractor ensures that personnel involved in material review decision-making have appropriate qualifications including

education, experience and product knowledge. MRB members cannot act independently on matters outside their field of technical competence. Procedures should provide for consultation with personnel not appointed to the MRB when necessary. For example, some deficiencies may require extensive structural analysis before a final MRB decision. Any member of the MRB and the cognizant Government representative may need access to this technical support.

2. A written engineering analysis is not required for most MRB dispositions. These analyses may be needed to ensure that a use-as-is or repair disposition is not likely to result in a failure, in materially reduced usability or in hazardous or unsafe conditions. When requested by the Government they normally address adequacy of dispositions.

3. MRB actions involving the Government representative's approval need clear and prompt communication between the contractor and Government representative.

"4.6 Corrective Action Board (CAB). The CAB shall ensure that an effective corrective action system is functioning throughout the contractor's organization. This function shall be performed through review and analysis of nonconformance data. The CAB shall ensure that records of causes of nonconformances, trends, and individual causes acted upon are maintained and that individual records and summaries of actions taken are prepared. If warranted by the diversity of work operations, more than one CAB may be established."

Tailoring note:

1. The requirement for a CAB is intended primarily for production efforts.

Implementation notes:

1. See implementation note 3 on corrective action at paragraph 1.1 (page 1).

2. The contractor should develop a documented system for prompt, effective corrective action whether caused by a supplier or generated by the

contractor's own operations. The system should emphasize finding and correcting the cause or causes of the nonconformance, not just correcting the nonconformance. Merely segregating nonconforming from conforming material is not adequate. Contractors should make effective use of nonconformance data to prevent recurrence of the nonconformance. Priority should be given to nonconformances with the greatest potential for quality improvement and cost reduction.

3. Contractors have specific methods for detecting and correcting nonconformances. When process control is applied early in the program and the nonconformance data is properly documented, analyzed and acted upon, it is possible to substantially reduce costs by eliminating the cause of nonconformances which would otherwise occur during production. Once nonconformances are found, the CAB should ensure the responsible manufacturing or design personnel, as appropriate, determine and correct the cause. Monitoring the effectiveness of corrective actions is an important CAB responsibility.

4. The contractor may have one CAB with subordinate corrective action organizations to handle day-to-day activities or establish separate CABs in individual facilities as needed for efficient operations.

"4.6.1 <u>CAB authority and responsibilities</u>.

a. The CAB shall have authority to ensure implementation of corrective actions throughout the contractor's organization. The corrective actions shall extend to all contractor operations affecting product quality.

b. The CAB shall have the authority to require investigations and studies by other contractor organizations necessary to define essential corrective actions which will result in reducing nonconformance costs and reducing the amount of nonconformances.

c. The CAB shall ensure that documentation required by paragraphs 5.7, 5.7.1, 5.7.2, 5.7.3, 5.7.4, and 5.8 is maintained.

d. The CAB shall ensure that summary data of nonconformances and associated costs are analyzed and areas of high potential payoff, adverse trends,

exceeding control limits, or out-of-control recurrence of nonconformances are thoroughly investigated to identify appropriate corrective actions and to identify potential QIPs.

e. The CAB is responsible for ensuring that follow-up systems are maintained to ensure that timely and effective corrective actions are taken.

f. The CAB shall ensure that reviews of nonconformance data and PR and MRB disposition decisions are conducted periodically to determine that PR and MRB actions are effective and in compliance with the requirements of this standard.

g. When control limit techniques are used and analysis of cumulative data for an applicable nonconformance reveals that the established limits are being or will be exceeded, the CAB shall ensure that a process evaluation is accomplished and that specific corrective actions are taken to bring the process back into acceptable limits.

h. When corrective action is required due to inadequate process controls or control limit techniques and until such time as it has been demonstrated that the corrective action has been effective, the CAB shall ensure that the contractor documents nonconformances and monitors: yield requirement development, documentation, and evaluation; the process control system for compliance; process improvement activity as it relates to trends; and recurrences of nonconformances.

i. The CAB shall be responsible for the initiation and monitoring of QIPs unless this function has been assigned by the contractor to a group senior to the CAB."

Tailoring note:

1. The requirement for a CAB is intended primarily for production efforts.

Implementation notes:

1. Nonconformances offer opportunities to improve the process and product. The root causes of nonconformances that need corrective action are usually within the province of management and beyond the scope of those employees within a process to correct. Often 80-85% of nonconformance and system problems are caused by the process itself (and not by the operator) and therefore are the responsibility of management to correct.

2. There are no requirements in MIL-STD-1520C on the exact level of organizational management from which the CAB members are selected. A key element is that CAB members have the authority to ensure that corrective actions are taken across all operations affecting product quality.

3. It is the responsibility of the contractor to develop methods of operation and select the most effective arrangement for establishing the CAB. Many contractors establish a CAB consisting of top management individuals who meet periodically to receive middle management or action team briefings on the corrective action and disposition system. Based upon these briefings, actions are directed as required. The contractor's organizational responsibility for CAB information processing should be identified in its documented quality program or system.

4. The CAB oversight role does not normally extend to individual manufacturing process control limits (e.g., upper and lower control limits for process variation) unless the process is causing significant nonconformances.

5. Analysis of nonconformances may identify the need for operator training, but the CAB is not intended as a disciplinary body, nor are actions expected to be punitive in nature. The intent is to bring resources to assist the employees working within a process to correct adverse trends and prevent further nonconformances.

"4.7 Government rights. The Government reserves the right to: review all contractor procedures developed to implement this standard; disapprove the procedures if they do not accomplish their objectives; observe PR, MRB, CAB, and QIP activities; and review documents or other data required by this standard. Acceptance or rejection of nonconforming material presented to the Government is the sole prerogative of the Government. Acceptance of nonconforming material by the Government may involve a monetary adjustment or other consideration. The right of Government disapproval specifically applies but is not limited to the following:

a. Procedures, activities, organization, and reports of PR, the MRB, and the CAB.
b. Contractor standards establishing control limits.
c. Contractor-proposed repair procedures including SRP expiration dates, limits, and extensions.
d. Records and analyses of nonconformances and corrective actions related to those nonconformances.
e. The right to withdraw approval of previously approved SRPs.
f. MRB and CAB members and personnel appointed PR authority at the time of selection or anytime thereafter."

Implementation notes:

1. A premise of MIL-STD-1520C is that the contractor has the responsibility for PR, MRB, CAB, QIP and other activities to control and correct the causes of nonconformance. The standard does not require the Government to be a member of any board or activity, but reserves the right of Government disapproval when procedures do not accomplish their objectives, or when actions and material are determined to be unacceptable.

2. Unless otherwise specified by the procuring activity, Government performance and participation described in this standard is determined by the cognizant CAO. The procuring activity may define particular requirements of Government performance and participation by means of a Quality Assurance Letter of Instruction or written delegation, etc., from the procuring activity to the CAO, or Memorandum of Agreement between the procuring activity and the CAO.

"5. DETAILED REQUIREMENTS
5.1 Identification and segregation of nonconforming material. When material is found to be nonconforming, nonconforming items shall be conspicuously marked or tagged (or otherwise identified if marking or tagging is not practical) and positively controlled to preclude its unauthorized use in production. Nonconforming material to be submitted to the MRB shall be moved to a controlled area designated for storage of nonconforming material unless not practical due to size, configuration, environmental requirements, or other conditions authorized by the Government. The designated area shall be protected to preclude unauthorized removal of nonconforming material."

Implementation notes:

1. Material found to be nonconforming requires proper control. Control can be achieved by segregating the nonconforming material in controlled storage, clearly marking the nonconforming material, marking accompanying documentation, use of conspicuous tags, or through identification in electronic data systems. The primary purpose, through actions appropriate to the contractor's operation, is to control material pending disposition and to prevent the incorporation of rejected material into deliverable products.

2. Once nonconforming material has been properly dispositioned as acceptable, it may be processed as normal material unless otherwise directed by the contract, the MRB or by the Government representative.

3. The contractor's procedure should describe the following:

a. The physical identification means used such as tags, labels, identification on accompanying paperwork or through identification in electronic data systems.

b. The authorized personnel and methods used to apply and remove the tags, labels, etc.

c. Controlled areas such as cribs, cabinets and bonded areas, and when and how used.

"5.2 PR disposition. When material is initially found to be nonconforming, it shall be examined by contractor-appointed Quality personnel, assisted by other contractor personnel if necessary, to determine if the nonconformance:

a. Requires scrapping of the material because it is obviously unfit for use and cannot be economically reworked or repaired.
b. Can be eliminated by rework.
c. Requires return of the material to the supplier.
d. Can be repaired using SRPs which have been concurred in by the MRB and approved by the Government.

e. Meets none of the above criteria and shall be referred to the MRB.

PR action does not negate the requirement for identification, documentation, and corrective action associated with nonconformances. It does recognize that some nonconformances do not warrant referral to the MRB and can be handled more economically at the location of initial detection."

Implementation notes:

1. PR is an MRB delegated function and decision-making process performed by the contractor on certain categories of nonconforming material without submittal to the MRB or to the Government representative.

2. Contractor personnel appointed to act as PR representatives can make disposition decisions for rework, standard repair, scrap or return to supplier, and may obtain assistance from other contractor personnel (e.g., engineering) as necessary. PR can sometimes require a higher level of knowledge than that required for original assembly (e.g., if disassembly is required to perform rework) to prevent inducing additional and possibly more serious nonconformance.

3. Management is responsible and accountable for all PR activities and disposition decisions, including ensuring that competent personnel are appointed to act as PR representatives and for monitoring PR dispositions to ensure that appropriate disposition decisions are being made.

4. Nonconformances dispositioned by PR personnel are subject to corrective action consideration to the same degree as those disposed of by MRB.

5. The PR function can be very cost-effective when properly administered by reducing the number of nonconformances submitted to the MRB. Usually, the majority of nonconforming material dispositions are rework and standard repair that can be handled through PR.

"5.3 MRB disposition. All nonconforming material not disposed of in PR shall be disposed of by an MRB decision to:

a. Scrap.
b. Rework.
c. Return to supplier.
d. Repair by an approved SRP.
e. Recommend to the Government for repair by other than an SRP.
f. Recommend to the Government for use-as-is.
g. Request a waiver from the contracting officer."

Implementation note:

1. The most important consideration in the disposition process is that the MRB decision be based on sound technical evaluation. The quality system needs to provide for outside expertise to supplement MRB capability when necessary. Disposition decisions are subject to Government review. The system should define when and how Government approval for use-as-is and repair dispositions are obtained.

"5.4 Use-as-is dispositions. Requirements pertaining to use-as-is dispositions are as follows:

a. All use-as-is dispositions must be approved by the Government.
b. Until the use-as-is disposition has been approved, the nonconforming material shall not be further processed nor used without prior Government authorization, or unless controlled by methods approved by the Government.
c. All use-as-is dispositions shall include a determination of the appropriateness of a documentation change and the method for accomplishing any recommended change (i.e., design change, changes to technical documentation including drawings, specifications, and Technical Orders, or recommended changes to Government specifications)."

Tailoring note:

1. This paragraph may be modified by the procuring activity when determined appropriate to specify approval of use-as-is dispositions at the time of end

item acceptance, major assembly acceptance or at anytime in the manufacturing process prior to acceptance.

Implementation notes:

1. Approval of a use-as-is disposition is distinctly separate from acceptance of the material. Dispositions are typically made on incomplete items which need additional work, testing and incorporation into higher levels of assembly. The material may not be acceptable for other reasons. Acceptance is made after the item is completed at the place designated in the contract (see FAR Part 46).

2. Methods approved by the Government in paragraph 5.4.b may include authorizing use-as-is dispositions in advance with approval and acceptance of the material at a later time. This facilitates off-shift and off-site operations or other circumstances where the Government has confidence in the MRB system and approves continued processing. This avoids delay for Government review. It does not, however, authorize deliberate manufacture of any nonconformance.

3. The intent of paragraph 5.4.c is to require a review to determine if a documentation change should be made by the appropriate authority to preclude rejection of items that are afforded a use-as-is disposition because the product is fully usable. It can be more efficient and economical to change the unnecessary requirement than to identify, document, analyze and disposition a recurring nonconformance. This applies when it is clear that the nonconformance is the result of the inability of the manufacturing process to meet the specified requirements due to unnecessarily tight tolerances or process requirements, etc. When the contractor does not have authority for approval of the documentation change (e.g., military specification), then the contractor may satisfy this paragraph by requesting the appropriate authority to make the change. When determined that a documentation change is not appropriate, then the CAB focus should be on improving the process capability for conforming to the tolerance. A QIP may be needed.

4. A documentation change may be listed as corrective action for the nonconformance. If properly released and effective on the item reported with the nonconformance, Government approval for a use-as-is is not required as a nonconformance no longer exists.

"5.5 Repair dispositions. Requirements pertaining to repair dispositions are as follows:

a. SRPs shall be submitted to the Government for approval prior to implementing the SRP.

b. Proposed repair methods (other than previously approved SRPs) shall be submitted to the Government for approval prior to accomplishing the repair action.

c. The Government act of approving the repair technique does not compromise the Government's right to reject the material after completion of the repair. Use of all repair procedures is at the contractor's risk.

d. Prior to any repair disposition decision a judgment shall be made by the contractor that the repair will be cost-effective relative to other disposition alternatives.

e. Instructions for reprocessing of material after completion of repair and before its release shall be included in the SRP or other repair procedure. These procedures shall include the requirement for contractor inspection and test.

f. The contractor shall maintain records detailing the dates of use and number of applications of SRPs.

g. The contractor shall review SRPs periodically to ensure that they are complete, up-to-date relative to current process capability and state-of-the-art, and are being properly applied under the conditions defined for their use.

h. Nonconforming material to which an SRP has been satisfactorily applied is subject to Government inspection when specified in the SRP or as otherwise directed by the Government. All other repaired material shall not be further processed nor used without prior Government authorization or unless controlled by methods approved by the Government."

Tailoring note:

1. The requirement to maintain records detailing the dates of use and number of applications of SRPs is intended primarily for production efforts.

Implementation notes:

1. Approval of a repair disposition is distinctly separate from acceptance of the material by the Government. The discussion regarding use-as-is dispositions in implementation note 1 at paragraph 5.4 (page 31) also applies to repair dispositions.

2. The requirement to establish an expiration date or finite limit on the number of applications of SRPs may be satisfied by establishing an annual review of each SRP for continuation on a specified date. Records detailing dates and number of applications of SRPs are intended to provide information on the frequency of use within a given time frame and does not necessarily require collection of the exact dates that the repair work is performed.

3. Repairs (other than standard repair) may be used more than once, but each application of the repair must be separately authorized for use prior to accomplishment of the repair unless otherwise directed by the Government.

4. Material undergoing overhaul or repair per the contract or as prescribed by the contract specifications is not normally considered to be nonconforming, unless an error occurs in the performance of the work that results in nonconformance to contractual or other applicable requirements.

"5.6 Scrapped material. Scrapped material shall be conspicuously identified and controlled to preclude its subsequent use in a contract item unless approved by the Government."

Implementation note:

1. Nonconforming material disposed of as scrap is conspicuously identified as such. Many contractors metal stamp, mutilate, paint or otherwise permanently identify scrap that is not to be promptly destroyed. Consideration may be given to allocating scrap material that is properly identified to preclude its reintroduction into production for alternate uses such as experimentation, testing or training.

"5.7 Nonconforming material documentation. The contractor system shall maintain records of all nonconforming material, dispositions, assignable causes, corrective actions, and effectiveness of corrective actions. These records shall be organized to permit efficient retrieval for summarization required by paragraph 5.8, knowledge of previous dispositions, and corrective action monitoring. The contractor shall ensure that documentation of nonconformances includes the following:

a. Contract number.
b. Initiator of the document.
c. Date of the initiation.
d. Identification of the document for traceability purposes.
e. Specific identification (e.g., part number, name, National Stock Number) of the nonconforming material.
f. Quantity of items involved.
g. Number of occurrences.
h. The place in the manufacturing process where the nonconformance was detected.
i. A detailed description of the nonconformance.
j. Identification of the affected specification, drawing, or other document.
k. A description of the cause(s).
l. Disposition of the nonconforming item (return to supplier, rework, use of an SRP, scrap, or refer to MRB).
m. Identification of personnel responsible for making the disposition decision."

Implementation notes:

1. MIL-STD-1520C provides a listing of required information to be documented; however, it does not provide a format or prescribe documentation configuration, style, media or processing requirements.

2. A contract number or program identifier and cross reference to the contract number is required for identifiable end items, but it may not be practical or necessary to identify the contract number in all cases or at all levels of assembly. While in many instances the contract number may be readily ascertained, in other instances, such as involving piece parts, common stores of manufacturing materials, multiple contracts or when commercial and military work are being performed simultaneously at the same contractor facility, it may not be practical to identify the nonconforming material to a

specific contract at the time of the disposition. In such cases the documentation, or control by methods approved by the Government, shall ensure that contract requirements are met before tendering the item to the Government for acceptance.

"5.7.1 Additional documentation for MRB items. If nonconforming material is referred to the MRB for disposition, the MRB shall add the following information to the documentation:

a. Reference to or attachment of the written engineering analysis when performed.
b. Final disposition of the nonconforming items.
c. Signature (or personal identification stamp) of disposition authorities."

Implementation notes:

1. A written engineering analysis is not required for most MRB dispositions. The written analysis may be needed to ensure that a use-as-is or repair disposition is not likely to result in a failure, in materially reduced usability or in hazardous or unsafe conditions.

2. The requirement for identification of the disposition authorities can be accomplished by a stamp, handwritten signature or, for an electronic data processing environment, by a personal identification code. Access to stamps or electronic personal identification codes must be properly safeguarded to prevent unauthorized use.

"5.7.2 Additional documentation for corrective action. If corrective action is required on an individual nonconformance, the following information shall be recorded:

a. An analysis of the recorded cause(s) and identification of the true (or root) cause.
b. The actions taken (or planned) to correct the cause(s) of the nonconformance and thereby preclude recurrence.
c. Identification of the individual(s) and contractor functional area(s) responsible for taking the corrective action.
d. Date, serial number, or lot number when corrective action will be completed or is estimated to be completed."

"5.7.3 Recurring nonconformances. If corrective action is not warranted on an individual nonconformance but collective or trend analyses of recurrences of the nonconformance indicate that the process is not within acceptable limits and corrective action is necessary, the contractor shall document the information required by paragraph 5.7.2. This information need not be included on the individual nonconformance records."

Tailoring note:

1. This requirement is intended primarily for production efforts.

"5.7.4 Nonconformance costs. The contractor shall determine and record the costs associated with nonconformances. The objective of generating this cost data is to provide current and trend data to be used by the contractor in determining the need for and effectiveness of corrective action. The resultant cost data shall serve as a basis for necessary CAB and QIP action when appropriate. Nonconformance cost summaries shall, upon request, be furnished to the Government. The cost collection shall consist of scrap, rework, repair, use-as-is, and return to supplier costs, plus other costs as determined appropriate by the contractor."

Tailoring note:

1. The requirement for collection of nonconformance costs is intended primarily for production efforts.

Implementation notes:

1. MIL-STD-1520C requires nonconformance costs to be summarized and reported. It does not prescribe the method to be used to satisfy the requirements. The contractor determines how the cost data is defined, accumulated and used. Contractors may collect nonconformance cost data across homogeneous areas such as machine shops, cable shops and electronics fabrication shops, as well as data appropriate for individual contracts. This approach can increase the likelihood of identifying cost drivers and obtaining corrective action when like hardware is being produced across several contract lines.

2. Cost data includes cost associated with repair, rework, scrap, use-as-is and return to supplier. Individual collection of exact costs of rework in some cases could be more expensive than the cost of correcting the problem. A useful cost collection system enables monitoring or collecting nonconformance costs without creating a complex system. Contractor procedures using combinations of actual accounting costs, time standards data, production engineering evaluations of rework and repair effort, etc., can accomplish the intent of nonconformance cost monitoring more effectively than setting up specialized accounting systems. This is especially true in contractor facilities where highly sophisticated, low volume production is a way of life.

3. Standard cost factors or estimated cost values for actions such as use-as-is or return to supplier may be developed as nonconformance costs. Standard cost factors may also be developed to become a part of other nonconformance costs. In many contractors' facilities, these costs are analyzed in terms of dollars. MIL-STD-1520C, however, does not stipulate a unit of measurement for costs. Labor hours may be an effective unit of measurement under certain circumstances, such as in labor-intensive operations. Costs may be measured indirectly through productivity factors. Methods of determining nonconformance costs should be consistent with the methods used by the contractor for determining other contract cost data in accordance with the Cost Accounting Standards.

"5.8 Minimum data summarization requirements. Nonconformance data shall be recorded to enable summarization of the quantity of nonconforming items, number of recurrences, cause determinations, corrective actions, dispositions, and nonconformance costs as described in paragraph 5.7.4. Nonconformance data shall be used by the CAB to determine the need for and effectiveness of corrective action. The format of the data and the frequency of preparation shall be at the discretion of the contractor but in no case shall the preparation be less frequent than quarterly. As a minimum, the following data shall be included:

a. Quantity of nonconforming items.
b. Number and type of nonconformances.
c. Number and type of dispositions.

d. Cause determinations.
e. Type of corrective actions and status.
f. Delinquent corrective actions.
g. Nonconformance costs.
h. Trend information and analysis thereof."

Tailoring notes:

1. The requirement for collection of nonconformance data is intended primarily for production efforts. On major system development the data may be analyzed as an indicator of progress toward establishing a stable product baseline and ensuring a level of design maturity.

2. Nonconformance data collection, summarization and analysis for efforts other than production may not be cost-effective due to the nature of such work and the small quantities involved. Nonconformance data is most useful after the product baseline has been established.

Implementation notes:

1. The requirements of MIL-STD-1520C in this area reflect a goal of the overall standard which is the reduction of nonconformances to a minimum through a cost-effective corrective action program. The extent of data collection and analysis is linked to the achievement of this goal.

2. Corrective action data may include the number of corrective actions scheduled and taken, the number and type of recurrences, and itemization of delinquent corrective actions.

3. The intent of this standard (i.e., to establish a cost-effective corrective action and disposition system for nonconforming material) is to be considered when establishing the nonconformance data collection system.

"5.9 Control of material review and disposition system at suppliers. The prime contractor has the option to delegate to suppliers the authority for material review and disposition of nonconforming material. If the prime contractor elects to delegate such authority, the procedures of this standard shall apply either in full, or as

appropriately tailored, to the suppliers. Tailored requirements applied to suppliers shall be in consonance with the requirements of this standard and must be acceptable to the Government. Furthermore, the authority to present nonconforming material to the Government for approval of recommended dispositions is limited to the prime contractor's MRB unless specific authority has been delegated to the Government agency having contract administration responsibility for the subcontract by the Government agency having contract administration responsibility for the prime contract. The prime contractor shall review and approve material review and disposition systems of suppliers."

Tailoring note:

1. This requirement is intended primarily for production efforts.

Implementation notes:

1. The prime contractor determines the appropriate flow down of MIL-STD-1520C requirements to suppliers. The decision may be to flow down all, part or none of the requirements as appropriate. Major subcontractors may have all requirements of the standard, whereas small suppliers may have only a minimal system with no MRB authority at all.

2. The prime contractor and CAO examine the need and extent of MRB disposition authority at suppliers at the earliest practical time. If the prime contractor elects not to delegate material review authority to a supplier, or if the prime does delegate such authority to the supplier, but the Government does not include MRB approval authority in the delegation to the CAO, the supplier is precluded from presenting recommended repair and use-as-is dispositions directly to the CAO cognizant at its plant for approval. If needed, the supplier would then submit these types of dispositions through the prime to the CAO at the prime's plant for approval.

3. When material review authority is delegated to a supplier, purchase orders or subcontracts should include a statement of limitations on redelegation to lower tier suppliers. Generally, material review authority is delegated when the subcontractor has design authority and/or the effort is sufficiently large to

make it cost-effective. Supplier personnel involved in material review decision-making must have qualifications including background, education, experience and product knowledge. Continuation of delegation is dependent upon the supplier's performance of the applicable flow down requirements.

"5.9.1 Corrective action at supplier facilities. Supplier organizations shall be notified of material nonconformances and the requirement, when necessary, for corrective actions. The contractor shall perform follow-up review of the corrective action taken by suppliers."

"5.9.2 Records of nonconforming material received from suppliers. The contractor shall maintain a record of any nonconforming material received from each supplier. This information shall be used in the contractor's vendor or supplier rating system."

Tailoring note:

1. This requirement is intended primarily for production efforts.

"5.10 Audits. The contractor shall periodically audit, or have audited, the corrective action and disposition system for nonconforming material (both in-house and at suppliers where appropriate) for compliance with the requirements of this standard and to ensure effectiveness. If an audit is conducted by a party other than the prime contractor, the contractor should notify the Government and remain primarily responsible for that performance."

Tailoring note:

1. The requirement for audits is intended primarily for production efforts.

Implementation notes:

1. Audit schedules and frequency are at the discretion of the contractor. Contractor records of audits are available for on-site Government review upon request.

2. Supplier audits conducted by third parties for the prime contractor do not relieve the prime contractor of responsibility for that performance but may provide an economical and efficient approach. Notification to the Government

may be in the form of a statement on the audit report clearly indicating when and by whom the supplier audit was performed.

"6. NOTES
6.1 Intended use. This standard is for use on production contracts. It also applies to developmental and limited production contracts with appropriate tailoring. It is not meant to be a "stand alone" document but should be used in conjunction with a higher-level contract quality requirement as described in FAR 46.202-3."

Tailoring notes:

1. Tailoring involves examination of each section, paragraph and sentence of the standard. After completion of the tailoring process, it may be that no deletions or modifications are appropriate. Tailoring is performed by the procuring activity and should consider any tailoring proposed by the contractor and CAO.

2. MIL-STD-1520C is most effective on contracts where production rates provide a data base and a return on time invested to analyze processes and the causes of variation to prevent the recurrence of nonconformance. However, development, low volume and limited production contracts also offer opportunities, and the extent to which this standard will apply is determined by the procuring activity for the specific contract application.

"6.2 Changes from previous issue. Asterisks or vertical lines are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes."

CONCLUDING MATERIAL

Custodians:
Army - AR
Navy - OS
Air Force - 05

Preparing activity:
Air Force - 05

(Project QCIC-0125)

Review activities:
Army - AV, ME, GL, CR, AR, MI, AT
Navy - SH, EC, AS, SA, TD
Air Force - 10, 23
Marine Corps - MC
DLA - DH

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

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I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER	2. DOCUMENT DATE (YYMMDD)
	MIL-HDBK-350	910607

3. DOCUMENT TITLE: A Guide for MIL-STD-1520C, Corrective Action and Disposition System for Nonconforming Material

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (If applicable)	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY

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