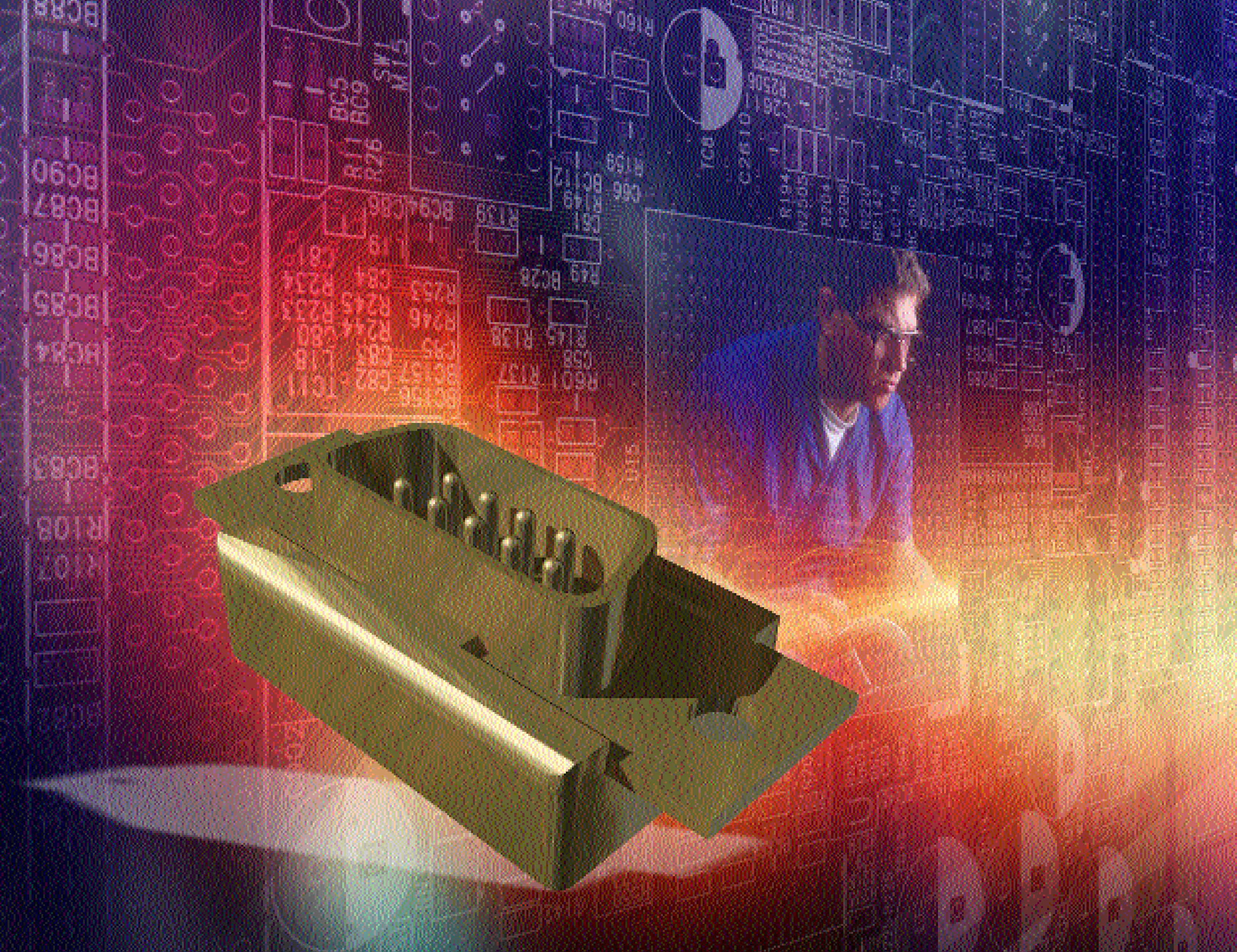
Reduce Program Costs Through Parts Management

Researched and written by
The Parts Standardization and Management Committee

The goal of parts management is to improve operational readiness and reduce life-cycle costs by promoting the use of common, widely available, reliable parts and processes.



This business case, written by parts management professionals, can help managers determine the value of having a comprehensive parts management program.

The approach presented here is a conservative method for estimating the cost savings over a program's life cycle when a viable parts management program is used. Costs factors may vary depending on the organizational and operational structure of a given program or company. This method for estimating costs uses very conservative values for the factors it includes and does not include values for many non-recurring and intangible cost factors. Therefore, although the method is a useful framework for estimating the value of a comprehensive parts management program, it is not a finite method for calculating actual program savings.

Introduction

Parts management helps program managers achieve their objectives for improving logistics support, enhancing supportability, and managing obsolescence. Parts management saves money, enhances logistics readiness and interoperability, increases system reliability and safety, and reduces acquisition lead-time.

The average total cost for adding a new part into a system is about $20,000. An effective parts management program will avoid this cost every time it precludes introducing an unnecessary new part into the system. For example, by not introducing a single new part as trivial as a nut or bolt, parts management can save approximately $20,000 during a weapon system's life cycle (see Table 1). A program with 10,000 parts can easily save $5 million, a not insignificant amount, through parts management. Cost avoidance represents money not spent, materials not handled, facilities not required, labor not expended, and time not used.

Government and industry program managers and contractors must manage their scarce resources carefully to procure the advanced technology systems and equipment needed to retain and improve capabilities. They are properly reluctant to invest in marginal programs that add little value or little return on investment.

Although many of the benefits are intangible, our analysis of historical parts management data shows clearly that the tangible benefits alone are substantial. The Parts Standardization and Management Committee (PSMC) researched the effects of parts management programs. This brochure describes PSMC's results.

Today, a parts management program, tailored to your program's needs, supports your program's best interest: performance, schedule, budget, and helping reduce program life-cycle costs. This brochure illustrates the potential recurring cost avoidance that you can achieve by managing parts and standardizing in six specific areas. The overall benefits of a parts management program to these areas, such as design, engineering devel-


COSTS FOR ADDING A NEW PART INTO THE INVENTORY

ACTIVITY	COST INCURRED
Engineering and Design	$9,300
Testing	700
Manufacturing	1,750
Purchasing	3,800
Inventory	875
Logistics Support	3,750
TOTAL	$20,175

opment, acquisition, and logistics support functions, throughout a program life cycle are tangible and substantial.

In today's acquisition environment, characterized by rapidly changing component designs, part obsolescence, and a preference for commercial items, the need for suppliers to manage their parts standardization efforts is greater than ever before. Parts management is critical for reducing total ownership costs and achieving the performance required of systems and equipment. In this brochure, we help define and validate the need for parts management.

Parts management, integrated into the engineering process, also helps effectively mitigate and manage part obsolescence problems. Avoiding the extremely high cost of resolving part obsolescence problems is another reason why parts management helps control life-cycle costs.[1]

The $20,000 cost related to adding a new part into the inventory accumulates in six different program areas: engineering and design, testing, manufacturing, purchasing, inventory, and logistics support. Figure 1 summarizes costs for adding one new part into a system.

[1]For example, costs range from $1,800 for parts reclamation to a high of $400,000 for a major redesign effort. On page 17, we illustrate the range of costs for resolving diminishing manufacturing sources and material shortages.

Opposite Page: Figure 1

Costs for Adding a New Part into the Inventory


RN54
BC155
C1702
R2506
R1606
R262
R1607
R243 R1605
R214 BC131
R215 BC132
R196
R184
R197 C75

Parts Management Explained

What Is Parts Management?

Parts management is an integrated effort to streamline the selection of preferred or commonly used parts during the design of systems and equipment. Parts management is a process for determining the optimum part while considering all the factors that may affect program outcomes. The factors considered include application, standardization, cost, availability, technology (new and aging), logistics support, diminishing sources, and legacy issues.

Key Objectives

Improving Logistics Support

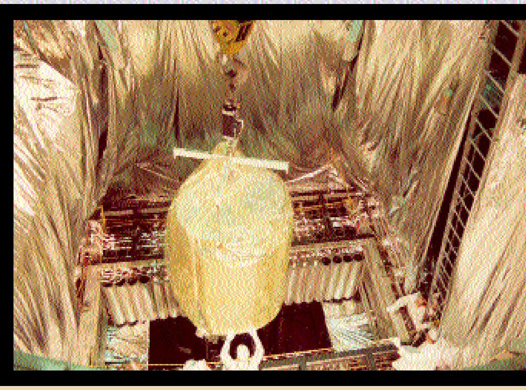
Reducing the number of unique parts used in a system enhances its suitability and simplifies logistics support. Introducing fewer parts into the logistics system translates into savings in procuring, testing, warehousing, and transporting parts. Parts management also helps the program identify and acquire reliable and documented parts at an economical price. By reducing the number of new or unique parts in a design, parts can be standardized. And, by reducing the proliferation of parts, operational effectiveness is improved, resources conserved, and costs avoided.

Enhancing Reliability

Using proven parts with a history of quality makes the end item inherently reliable. Promoting the use of standard or commonly used parts ensures that the program uses reliable and documented parts purchased at an economical price. Using standard parts minimizes the number and variety of new parts and part types introduced into an end item, reducing design risks. A part's technical characteristics, testing, maintainability, safety, and source of supply should all be factored in when selecting a part.

Managing Obsolescence

An increasing concern in parts management is the effect of diminishing manufacturing sources (DMS) and component obsolescence, especially in electronics. Some product life cycles are so short that obsolescence problems arise during production and sometimes as early as system development and demonstration. A parts management integrated process team (IPT) uses data about component obsolescence from the



system development phase through the logistics support phase to control the costs of part obsolescence. Managing obsolescence should be a factor in developing the design at the earliest possible stage.

Benefits of Parts Management

Cost Savings

Parts management helps save design and life-cycle costs of equipment by promoting the application of commonly used or preferred parts. Standardization of parts, replacing numerous similar parts with one common part, results in larger part-type buys because the common parts are used in multiple applications. Larger part-type buys enable both the contractor and the customer to benefit from the economies of scale. Part standardization also reduces the contractor's cost of maintaining technical data and storing, tracking, and distributing multiple parts.

Enhanced Logistics Readiness and Interoperability

When items or systems share common components, repair time is shorter because parts are more likely to be on hand and technicians spend less time solving individual problems. Furthermore, using common components simplifies logistics support and enhances substitutability because fewer parts are stocked. This translates to savings in procuring, testing, warehousing, and transporting parts.

Increased Supportability and Safety of Systems and Equipment

Preferred parts reduce risk and improve the chances that equipment will perform reliably. Preferred parts have a history of proven reliability, withstanding rigorous testing

and performing at stated levels. Their use decreases the number of part failures, reducing the number of maintenance actions and potentially precluding failures that could cause mission failure or loss of life.

Reduced Acquisition Lead-Time

When preferred parts are used, the government and industry avoid the expenses and delays of designing and developing parts and the issues of acquiring a new item with no available history or documentation. Using preferred parts reduces the time between the purchase request and the receipt of the part.

Elements of an Effective Parts Management Program

SD-19, *Life Cycle Costs Savings through Parts Management*, is a useful guide for implementing a robust in-house parts management program. The document defines the essential elements of a parts management process, including

- establishing an in-house parts management board,
- developing a preferred parts list or corporate parts baseline,
- establishing a process for selecting and authorizing parts,
- establishing a process for qualifying parts,
- managing obsolete parts and DMS,
- establishing a process for managing alternate or replacement parts,
- using IPTs to manage parts,
- measuring standardization effectiveness (metrics), and
- establishing a documented plan for a parts management program.


Myths in Parts Management
Acquisition reform replaced it
Standard part = military part
Design flexibility restricted
Bottleneck
Burdensome process
Cost driver

Six myths surround parts management. Figure 2 lists the myths that we expose below.

Myth: Acquisition reform and the implementation of contractor logistics support (CLS) has removed the need for parts management and the promotion of standard parts.

No policy requires parts management on DoD contracts. However, in today's lean and changing environment, the need for standardizing is more important than ever. Contractors should manage parts to remain competitive, improve logistics readiness, and reduce total ownership cost. Using standard parts increases interchangeability among systems and enhances interoperability between military systems, military services, and coalition forces.

Myth: "Standard" part is synonymous with "military" part.

A standard part is a "preferred" part, designated because of its usage history, established reliability, and availability. It may be a company standard, industry standard, or military standard part.

Myth: A parts management program restricts design flexibility and inhibits the introduction of new parts and technology insertion.

An effective parts management program improves a company's design and manufacturing processes. An effective program team integrates system, design, and parts management personnel who jointly participate in selecting parts. Parts management helps with reviewing new parts for application across a company's entire business base. Introducing new parts and inserting technology become a systematic process.

Myth: Parts management is a bottleneck.

Today's parts management process facilitates and supports real-time part selections, providing for cost-effective design decisions.

Myth: Parts management is burdensome.

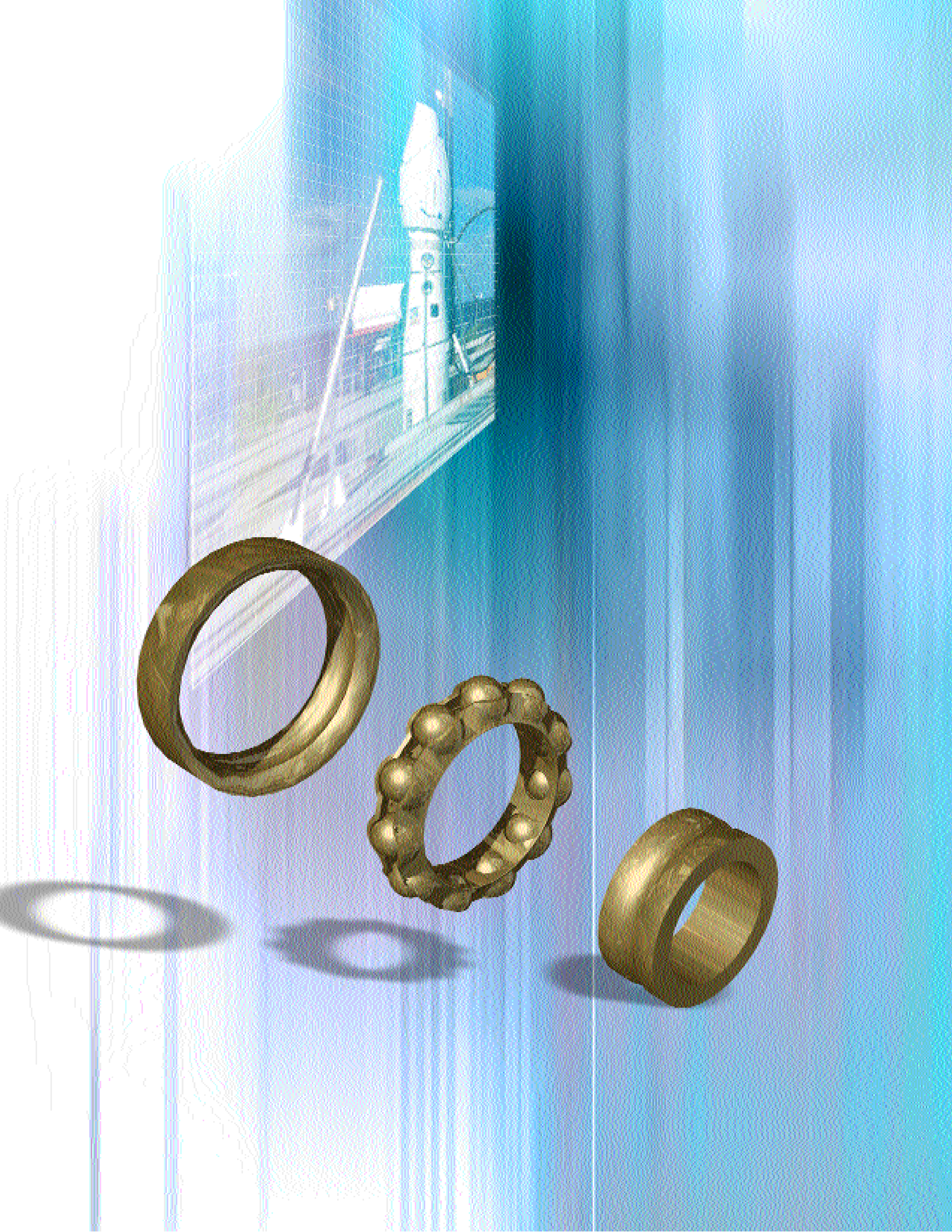
Identifying the right parts during design is much faster than correcting bad decisions after designs are already set. Automated systems allow real-time or near-real-time analysis and provide decision-support tools.

Myth: Parts management is a cost driver.

Parts management saves design, engineering, and procurement dollars and reduces logistics support and parts obsolescence costs over a weapon system's life cycle.

Opposite Page: Figure 2

Myths in Parts Management



Cost-Benefit Analysis

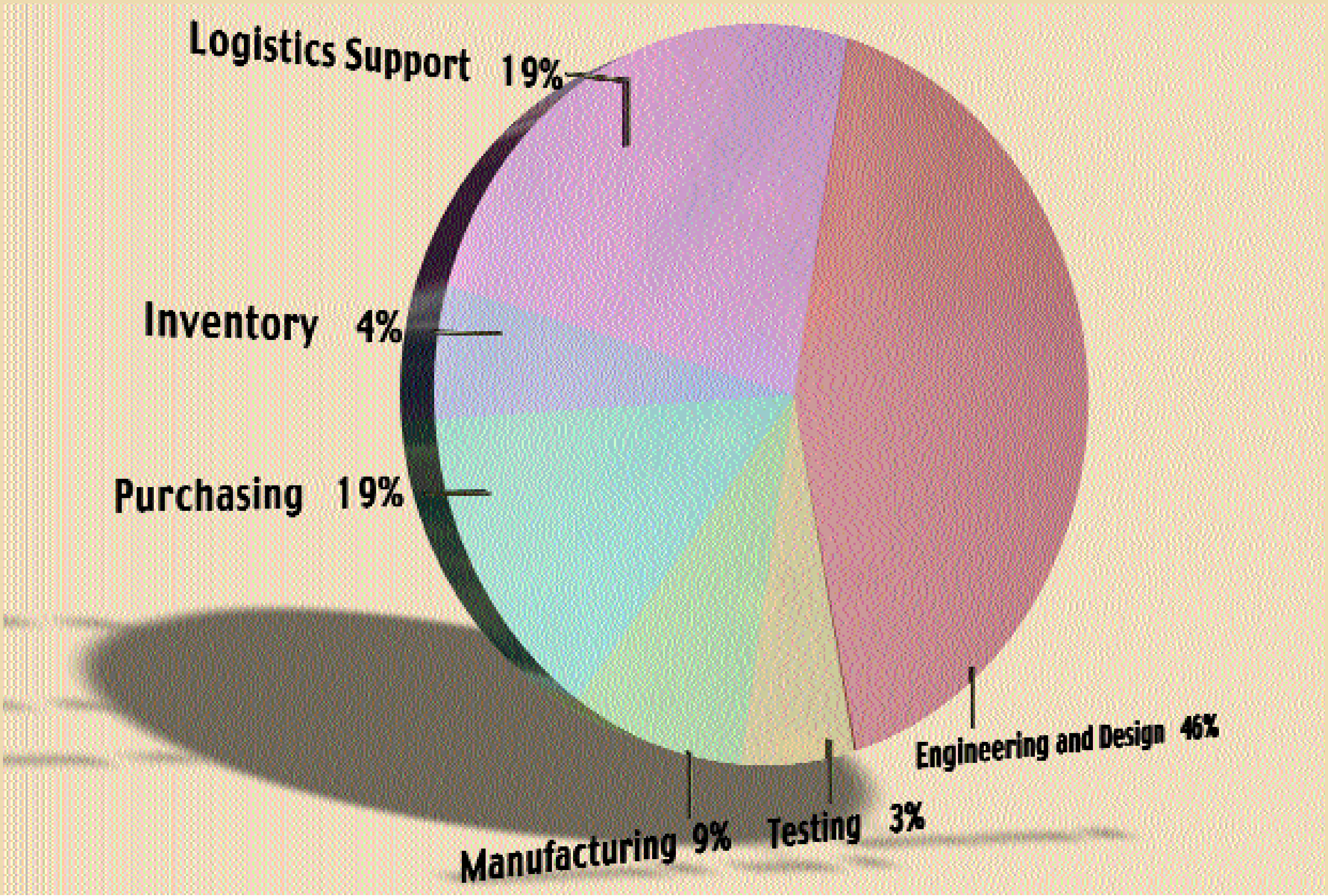
When designing a system, each nonstandard part added can cost an average of $20,000 over the life of the program. Engineering and design of the new part is nearly one-half of the total cost, but even adding an existing but nonstandard part to a system still affects costs significantly. This section examines each of the six cost drivers and demonstrates how parts management mitigates the added cost of designing in new parts without sacrificing design flexibility. The six specific drivers for which parts management provides cost benefits are

- engineering and design,
- testing,
- manufacturing,
- purchasing,
- inventory, and
- logistics support

Figure 3 shows how the total cost for introducing a new part into design is distributed across the six areas.

Figure 3

Distribution of New Part Introduction Costs



1. Engineering and Design

As shown in Figure 3, the majority of the cost of introducing a new part into the inventory is in engineering and design, which is done early in the process. This means that costs can be saved very early when an effective parts management process is in place. Using a parts management process for selecting parts in engineering and design will help

- avoid duplication of work between designers, engineers, and support personnel;
- avoid creating, releasing, and maintaining unnecessary drawings;
- reduce program risk resulting from the use of unknown or untested parts;
- reduce the time required searching for parts;
- enhance part interchangeability; and
- avoid schedule slips caused by unobtainable parts.

Recurring Costs

Table 1 shows the costs for engineering and designing a new part.

Table 1. Recurring Costs for Engineering and Design

Activity	Hours to Support the Task	Cost (@ $100/hr.)
Average search time for a part[a]	4	$400
Duplication of effort	2	200
Cost of Establishing a New Drawing of a Standard Part		
Documentation (creation, review & release time; including part analysis & approval)	60[b]	6,000
Failure rate analysis	12[c]	1,200
Maintenance of standard	15	1,500
	Total	$9,300

[a]NAS 1524, *Standardization Savings, Identification and Calculation*, September 1971:

- NAS 1524-4, *Standardization Savings from Reduced Engineering Search Time.* Savings = [annual number searches for data × engineering rate] × [time to finish search × success rate].
- NAS 1524-6, *Standardization Savings from Using a Stocked Standard Part in Lieu of a New Design.* Savings = cost of releasing and stocking a new part drawing, including all paperwork + cost of quality testing + [hours to engineer new part × engineering rate] + [hours to design and draft new part × engineering rate].
- NAS 1524-2, *Standardization Savings in Paperwork and Handling.* Savings = [cost to process purchase order + reduction in shipments] × cost of paperwork and inspection.

[b]Hours for mechanical parts = 50; hours for electrical/electronic parts = 70; average = 60 (45 hours for creation and 15 hours for review and release; engineering change order signatures: 15–20 persons).

[c]Hours for mechanical parts = 8; hours for electrical/electronic parts = 16; average = 12.

Intangible Costs

Intangible costs may be associated with the following factors:

- Using of a part without performance history
- Technical support (to suppliers, manufacturers, purchasers, etc.)
- Risk to end-item delivery schedule
- Lack of lessons learned
- Lack of technology pool (part experts)
- Procurement lead-time
- Scheduling of parts for end-item manufacturing.

2. Testing

One of the most important drivers of new part selection is qualification and testing. Depending on the complexity and use of the part, different strategic elements need to be considered, such as environmental conditions, operating conditions, and performance. Before introducing a new part into design, the part may need to be qualified, bench tested, and its use validated. Qualification includes determining the optimum test requirements, developing procedures, and documenting the results. Through the application of parts management, the costs of activities of determining that a part is acceptable for an intended use can be avoided. Those activities include

- creation of test procedures,
- test documentation,
- qualification testing,
- component bench testing, and
- quality conformance testing.

Recurring Costs

For every new part added to an inventory, part testing is in most cases essential in determining if the part will meet the specified requirements for the intended application. The creation of test procedures, documentation, quality conformance testing, and component bench testing can be required with the introduction of a new part. The cost of testing will vary depending on the part type (mechanical or electrical) and its application. Table 2 illustrates the average part-qualification-related costs.

Table 2. Average Part-Qualification-Related Costs

Activity	Cost
Audit for those parts on a qualified manufacturers list or qualified products list (QPL)[a]	$2,000
Establish QPL (qualifying part by performing qualification testing)	5,000
Reference Total	7,000
Total[b]	$700

[a] Defense Logistics Agency (Defense Electronics Supply Center), *Cost-Benefit Reporting Technique for Military Parts Control Advisory Groups* CRPCP-88-01, 15 April 1988.

[b] Not every part added to inventory is subjected to a full qualification test or added to a QPL. Each part is, however, evaluated for the application before it is used. This evaluation can include analysis by similarity, a simple bench test, metrology analysis, etc. On this basis, a conservative 10 percent, or $700, is used.

3. Manufacturing

During manufacturing, parts management helps avoid the negative effects of introducing new parts in the manufacturing process. These effects include

- the cost of purchasing and setting up new or special tooling,
- the additional risk of line stoppage and conformance problems from using an unproven part, and
- the cost of additional storage at the manufacturing site.

Recurring Costs

Considering only the cost of additional storage at the manufacturing site, parts management saves $1,750 every time it helps engineering choose an existing or commonly used part instead of adding a new part to the manufacturing inventory.

Factors		
Average number of years a part remains in manufacturing inventory		5
Annual cost of space for one manufacturing inventory storage bin	=$50	$250
Annual part bin maintenance cost for a part in manufacturing inventory	=$100	$500
Stock bin one time setup cost for a part in manufacturing inventory	=$1,000	$1,000
Total[a]		$1,750

[a] New parts incur storage-space-related costs wherever placed into inventory, such as when spare parts are used at intermediate and field logistics support locations. Although a manufacturing operation might require only one additional part bin, a spare part item might require numerous bin locations in the field. For simplicity and to err on the conservative side, we used only the $1,750 cost figure shown above in calculating the subsequent inventory and logistics support costs in Figure 1.

The manufacturing-related costs reflected in Figure 1 are exceptionally conservative. Although additional item storage space is the only manufacturing cost reflected in Figure 1, one could include many other costs.

Nonrecurring Costs

If included, additional tooling and documentation costs related to introducing a new part into inventory would add significantly to the total cost. For instance, a one-time tooling cost of about $10,000 results whenever a new mechanical part (e.g., rivet, screw, bolt) requires a new installation tool. In addition, new documentation created to support the manufacturing or installation of a new part costs approximately $3,000 per document.

Factors	
Typical cost for parts requiring new manufacturing tooling	$10,000[a]
Typical costs for parts requiring new manufacturing or installation documentation	$3,000[a]

[a]Costs not reflected in the estimated $20,000 cost of introducing a new part into inventory.

Intangible Costs

A number of other costs could result from using a new or unproven part, including

- effect of part-related schedule slippage,
- costs of identifying and locating substitute parts,
- costs of part-related line stoppages,
- costs of supporting data requirements (e.g., new manufacturing bill of material),
- costs of part-related engineering support,
- costs related to technical interface with new suppliers, and
- costs related to part shelf life or storage condition requirements.

4. Purchasing

Avoiding the need to purchase a new part avoids procurement-related costs. Adding a new part has a widespread effect on procurement. Costs are incurred for each of the following:

- Market research, audits, and approval of suppliers
- Part number setup
- Preparation of procurement documents (e.g., request for quote or purchase order)
- Analysis of drawing and specification requirements.

Recurring Costs

Table 3 illustrates the cost elements used to compute the purchasing-related costs.

Table 3. Purchasing Recurring Costs

Activity	Hours to Support the Task	Cost (@ $100/hr.)
Part number setup	2	200
Additional purchase-related paperwork	4	400
Increase supplier base (search, audit, contract)	30	3,000
Receiving inspection/quality assurance	1	100
First article inspection	1	100
	Total	$3,800

Intangible Costs

A number of other procurement-related costs could result from buying a new or unproven part. Part availability may create procurement problems. Inadequate availability may limit the ability to purchase needed quantities, reduce competition, and drive up prices. Insufficient competition typically drives up prices. In addition, a new item generally is purchased in small quantities and provides no economy of scale, resulting in a higher purchase price.

5. Inventory

Each new part added to the inventory adds costs for additional warehouse capacity. Earlier, in the manufacturing section, we calculated the cost of additional storage required for each unique part introduced into the system at $1,750. This cost applies to each bin and location stocking the item. Again, being ultraconservative, we assume only one intermediate stock point and one bin. In addition, we discount the $1,750 cost by 50 percent ($875) to accommodate the new items that use just-in-time or direct delivery from a factory rather than intermediate stock.

Nonrecurring Costs

A variety of additional nonrecurring costs can be associated with inventory management. For example, supply items that use just-in-time or direct delivery from a factory may incur expediting fees or other parts management costs.

6. Logistics Support

The addition of a new or nonstandard part affects the follow-on logistics support in the following ways:

- Establishment of a new part number and associated changes to information systems
- Required changes to support documentation, such as spare parts bulletins and maintenance manuals (This issue is more complex if the unnecessary part requires special tools or tooling.)
- Additional segregated storage (parts bins)
- Reduced potential for part substitution of nonstandard parts
- Changes to the bill of material (master database of parts)
- Increased chance of obsolescence with nonstandard parts.

Recurring Costs

Each new part added to the inventory for which spare parts are required adds costs for additional storage of spare parts at field support locations. In addition, each field location must have and maintain parts-related documents, such as maintenance manuals and replacement part documents. The $1,750 storage cost used earlier applies to each field support location that must stock the item. Again, being ultraconservative, we assume only one field support location and only 5 years of logistics support. Table 4 illustrates these costs.

Table 4. Logistic Support Recurring Costs

Activity	Hours to Support the Task	Cost (@ $100/hr.)
Maintenance manual	8	$800
Replacement part documentation	4	400
Associated documentation[a]	8	800
Part storage at one logistics support facility[b]		1,750
	Total	$3,750

[a]For example, illustrated part breakdown, component maintenance manual, or spare parts bulletin.
[b]Based on calculation shown earlier in manufacturing section.

Intangible Costs

Additional nonrecurring costs can be associated with logistics support. For example, there are costs for obtaining a national stock number for new supply items.

Cost of Parts Management Compared to Parts Obsolescence

An effective parts management program assists with managing parts obsolescence in the following ways:

- Allows proactive obsolescence management

- Enables estimating, planning, and budgeting for part obsolescence by providing relative information about prospective parts
- Provides visibility of suitable replacements for obsolescent parts.

Because of the high costs of resolving obsolescence problems, the capability to plan ahead and take advantage of a greater range of solutions can result in a more cost-effective resolution. Figure 4 shows average costs for various nonrecurring engineering-resolution cost factors.[2]

In addition, if parts require qualification or testing, additional costs increase those illustrated above.

- Radiation hardening testing (Added costs range from $5,000 for dose-rate testing only to $52,000 for dose-rate, total-dose, and single-event-upset testing. Costs may reach $82,000 for microprocessors.)
- Plastic-encapsulated microcircuit testing (Increased costs range from $600 for acoustic microscopy only to $47,340 for full qualification of a 100-piece lot.)

Intangible Items

Other factors that may add costs include

- lifetime buys,
- bridge buys,
- requalification,
- reverse engineering, and
- expediting fees.

Program Savings—Formulas and Examples

Use the following formula to estimate cost avoidance savings from using parts management practices:

Total Estimated Savings = PPPg × NSP (25%) × SP (10%) × QFS,

where:

PPPg = estimated number of parts per program (system, end item, etc.)

NSP = number of potential standard parts = 25%

SP = standard parts used due to parts management (new parts avoided) = 10%

QFS = quantified factor for savings = $20,000.[3]

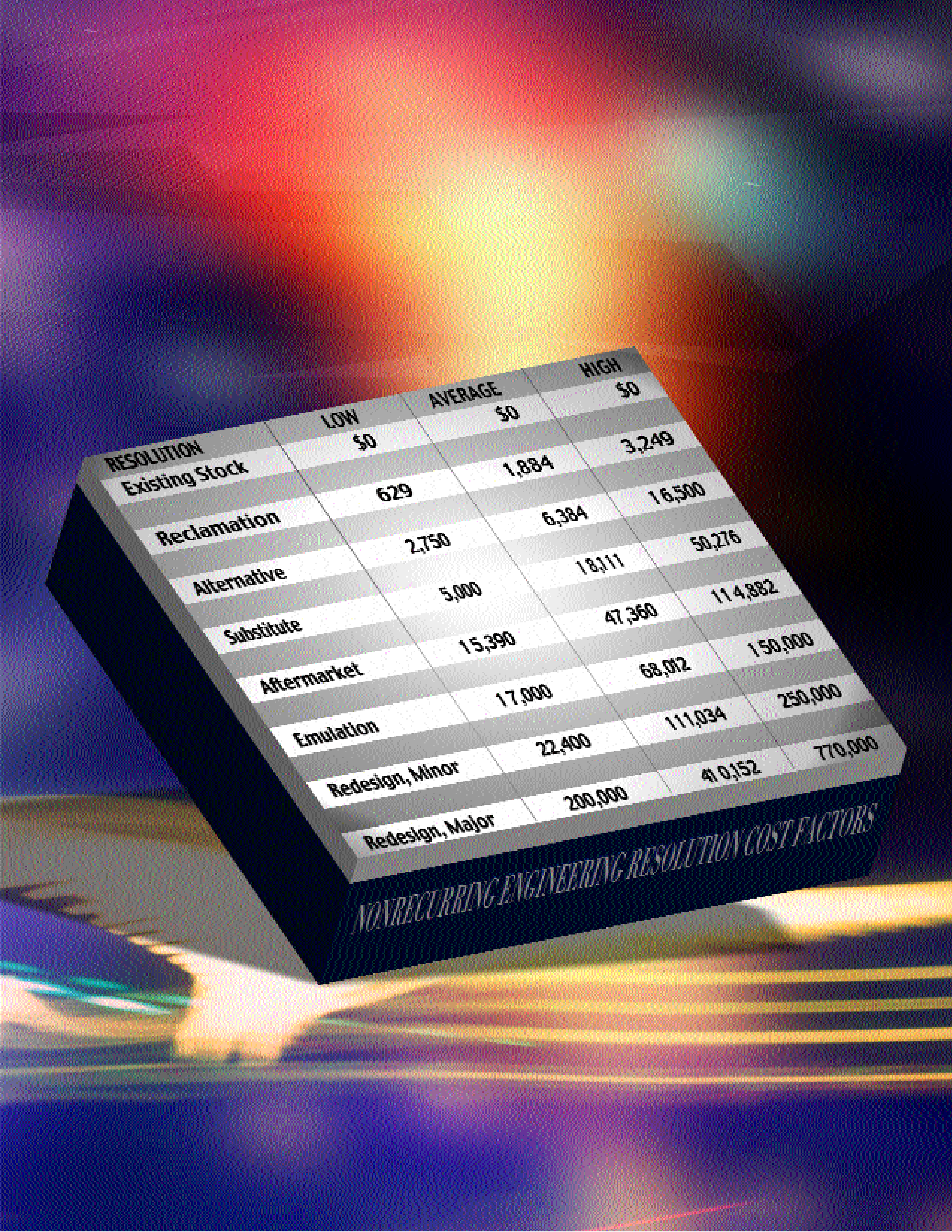
Experience shows that programs without parts management discipline introduce 2.5 percent more new nonstandard parts into the logistics system than do programs with parts management discipline.

[2]From Defense MicroElectronics Activity, *Resolution Cost Factors for Diminishing Manufacturing Sources and Material Shortages*, Final Report, February 1999.

[3]Based on the computations illustrated in Figure 1.

Opposite Page: Figure 4

Nonrecurring Engineering Resolution Cost Factors



RESOLUTION	LOW	AVERAGE	HIGH
Existing Stock	$0	$0	$0
Reclamation	629	1,884	3,249
Alternative	2,750	6,384	16,500
Substitute	5,000	18,111	50,276
Aftermarket	15,390	47,360	114,882
Emulation	17,000	68,012	150,000
Redesign, Minor	22,400	111,034	250,000
Redesign, Major	200,000	410,152	770,000

NONRECURRING ENGINEERING RESOLUTION COST FACTORS

Example

For a program (end item) with 10,000 separate part numbers, about 2,500 parts (25 percent) will be candidates for using standard or common parts, such as microcircuits, resistors, nuts, or bolts, already in the logistics system. Of these 2,500 potential standard parts, an additional 250 (10 percent) will end up using common or standard parts rather than new parts by applying parts management discipline. Parts management will help the program avoid adding 250 new part numbers to the system, saving about \$5 million (250 × \$20,000) across the program life cycle.

Bill of Material Savings

A different approach for calculating partial program savings uses only the actual cost differences. This method does not consider factors such as those in Figure 1. However, this method is useful for programs that already have a complete bill of material (BOM) before introducing parts management discipline. The approach identifies tangible cost savings by determining the exact cost for a BOM after applying standardization decisions as compared to the cost before standardization. The cost difference reflects cost changes resulting from substituting parts, replacing parts with preferred standard parts, or other parts management.

Total Actual Parts Cost Savings = BOM (before standardization)
– BOM (after standardization)

Related Websites

Defense MicroElectronics Activity:

http://www.dmea.osd.mil/index.html

Government-Industry Data Exchange Program:

http://www.gidep.org

Parts Standardization and Management Committee:

http://www.dscc.dla.mil/programs/psmc/

Defense Standardization Program:

http://www.dsp.dla.mil

Navy Lakehurst Systems Standardization and Parts Management:

http://www.lakehurst.navy.mil/ssd/toc.htm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