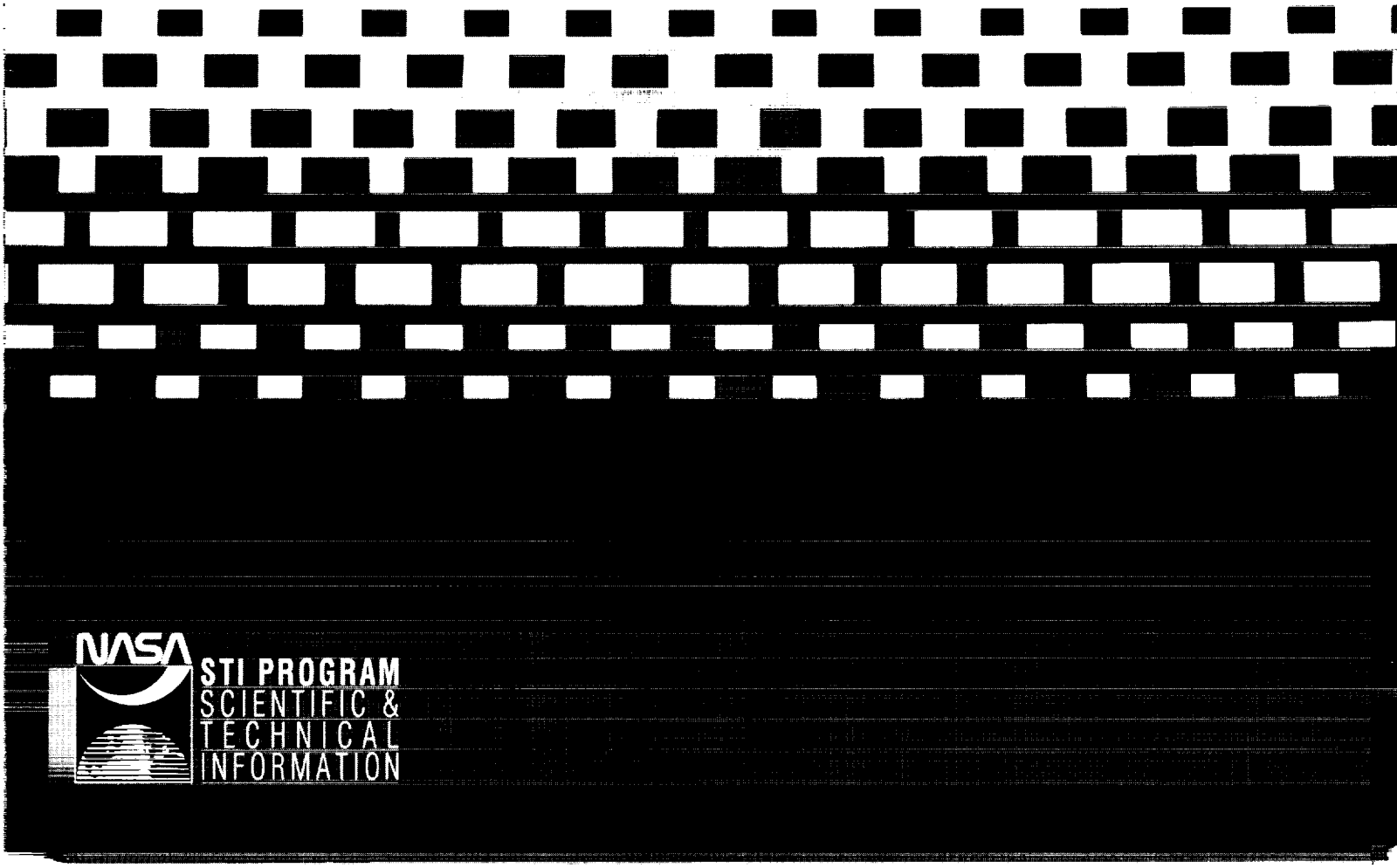
NASA SP-7097
February 1992

CONTINUOUS IMPROVEMENT

A BIBLIOGRAPHY WITH INDEXES 1989-1991



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A BIBLIOGRAPHY WITH INDEXES
1989-1991

National Aeronautics and Space Administration
Scientific and Technical Information Program
Washington, DC
1992

FOREWORD

Today, the Federal Government is confronted by public and congressional demands to provide higher quality products and services as well as to operate more efficiently and effectively within tight budget constraints. Federal managers are being challenged to find new ways to achieve departmental and agency goals within the many constraints associated with public bureaucracies.

In hopes of bringing about these changes in government operations, many Federal agencies, including NASA, have begun to adopt the concepts, tools, and techniques of Continuous Improvement (CI).

This bibliography can help you identify articles and reports that relate to CI. Topics range from the general, including the philosophy and history of CI and basic approaches and strategies for its implementation, through the more particular: lessons learned from the public sector and from the private sector models. Also covered are management and strategic planning, including leadership and support, mission, and vision; specific elements of human resources administration, including training, recognition, empowerment, and teamwork; and customer focus and customer satisfaction. In addition, you will find references to methods and tools for process improvement such as concurrent engineering, computer applications, measurement, quality assurance, quality function deployment, statistical process control, and Taguchi methods.

Entries are drawn from the literature entered into the NASA Scientific and Technical Information Database from 1989 through 1991. It is hoped that Federal employees, managers, and contractors will follow up on the information found here, and will use it well to improve the processes, and thence the products and services, of their organizations.

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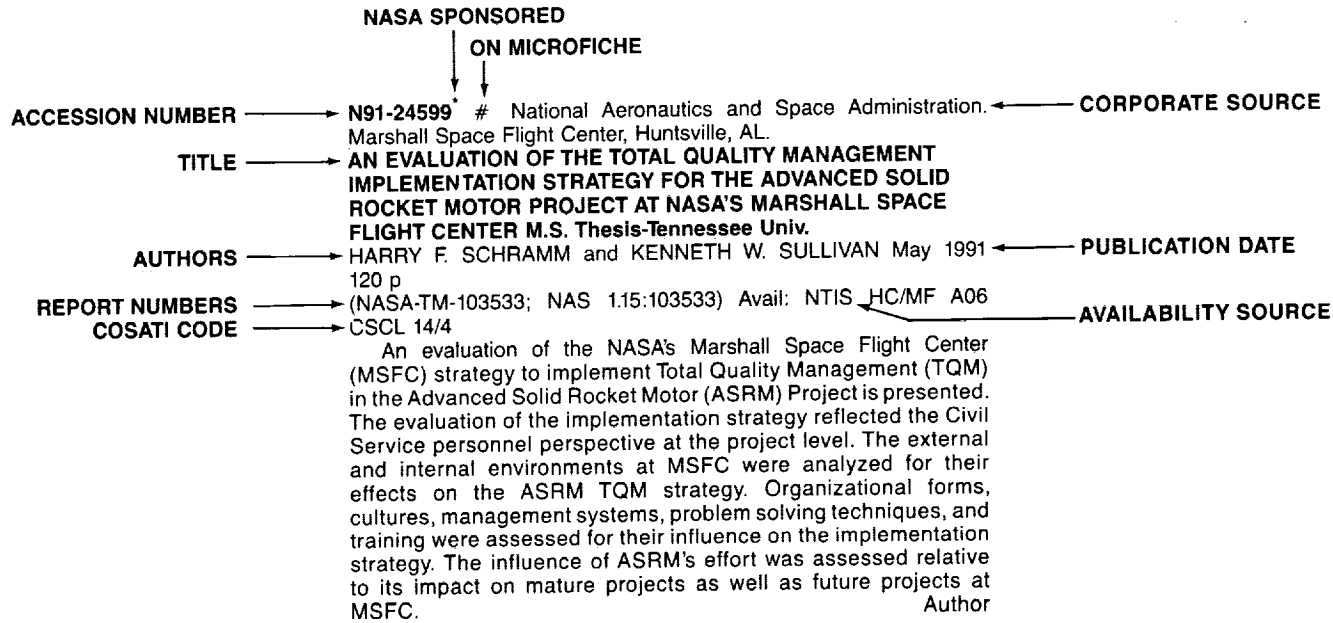
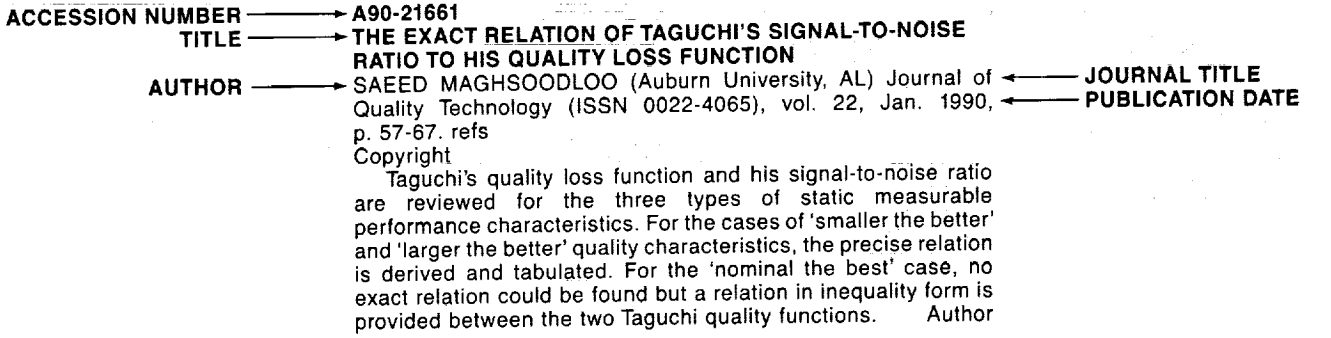
TYPICAL REPORT CITATION AND ABSTRACT



TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT



CONTINUOUS IMPROVEMENT

A Bibliography with Indexes 1989-1991

FEBRUARY 1992

ABSTRACTS

01

GENERAL AWARENESS

Includes philosophy, history, approaches, and strategies.

A90-30771
PROVIDING FOCUS FOR CONTINUOUS IMPROVEMENT ACTIVITY
JEFFREY L. TURNER (Boeing Military Airplanes, Wichita, KS) IN: NAECON 89; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 22-26, 1989. Volume 4. New York, Institute of Electrical and Electronics Engineers, Inc., 1989, p. 1468-1470.
Copyright

The author describes the philosophy and actions necessary for the implementation of a total-quality environment. Total quality is a state of performance of all work processes that collectively provide the product or service. The framework for implementation of total-quality commitment (TQC) is characterized by an integration of problem-solving teams, the management of work processes, and quality-planning activity. Such an implementation design assures participation by all levels of the organization, attention to critical business activity, and measurable, long-term results. The management system changes required to implement TQC are defined. I.E.

A90-31679#
BUILDING IN TOTAL QUALITY MANAGEMENT
G. A. REYNOLDS (Douglas Aircraft Co., Long Beach, CA) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 15-18.
(AIAA PAPER 89-3184) Copyright

Justification for the application of total quality management (TQM) and the application techniques are discussed. Responsibility, authority, and accountability (RAA) is noted as a fundamental tenet of TQM and serves as the 'litmus test' for determining what areas are good candidates for restructuring and if the new structure is appropriate. Previously, improvement efforts were not considered important enough to survive occasional cutbacks or were superseded by other more popular improvement programs. Beneficial change was not sustained, and positive results were marginal or even reversed. It is concluded that organizational structure must embody TQM as the prerequisite for sustaining continuous improvement. R.E.P.

A90-31680#
EXCELLENCE THROUGH CONTINUAL IMPROVEMENT (ETCI)
WILFORD R. POE and JACKSON M. FREEMAN (Honeywell, Inc., Space Systems Group, Clearwater, FL) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 19-27.
(AIAA PAPER 89-3186) Copyright

Total quality management (TQM) is becoming accepted by many U.S. companies as the fundamental business strategy for increasing their competitive position and for improving their financial performance. DOD has embraced it as a means to get higher-quality, more available products and services at prices more consistent with a shrinking defense budget. Application of TQM in an engineering-dominated aerospace business is described. Customer satisfaction is obtained through the quality of its nonhardware items such as data item submittals, design reviews, and engineering analyses. As a result it more closely resembles a service business than a product business. This concept is long-term, realizing that becoming an excellent operation is a managed progression at all levels of the organization. R.E.P.

A90-31688#
TQM - STRATEGY FOR IMPLEMENTATION
RICHARD A. STIMSON (Advanced Technology, Inc., Reston, VA) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 79-82.
(AIAA PAPER 89-3200) Copyright

The paper discusses the implementation of Total Quality Management (TQM). It begins with the foundation of TQM provided in management theory and practice, and explains the new perspective provided by TQM. An implementation strategy consisting of three phases is provided. Author

A90-31706#
THE NEW STANDARDS FOR MATERIAL MANAGEMENT AND ACCOUNTING SYSTEMS ARE A TQM INITIATIVE
ALEXANDER LENGYEL and MICHAEL M. IVERSON (Andersen Consulting, Los Angeles, CA) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 181-184.
(AIAA PAPER 89-3224) Copyright

This paper examines the reasons why material management and accounting systems (MMAS; formerly the 'ten key elements') should be a total quality management initiative. MMAS represents a set of standards that will help position companies for TQM and launch them on the path of continuous improvement. It is concluded that the 'ten key elements' are a TQM initiative because they control and improve the process of doing business in aerospace and defense manufacturing. R.E.P.

A90-31711#
TOTAL QUALITY MANAGEMENT - CULTURES FOR IMPROVED PRODUCTIVITY
DOMINICK R. BARRY (Martin Marietta Corp., Astronautics Group, Denver, CO) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 209-213. refs
(AIAA PAPER 89-3234) Copyright

Environmental issues associated with the total quality management (TQM) concept are considered. TQM emphasizes the need for gradual, continual organizational resistance. The role of management in providing goals and support is examined. The formation of a reward system which supports TQM is discussed. I.F.

A90-31713#
TOTAL QUALITY MANAGEMENT AS APPLIED TO SPACE SYSTEMS NEW BUILD HARDWARE
PHILLIP D. BOWEN and BEN DAVIS (Martin Marietta Corp., Denver, CO) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 217-220.
(AIAA PAPER 89-3238) Copyright

The concept of total quality management (TQM) is applied to the design and development of structural subsystems. The process of designing and developing a system using the total involvement concept of TQM is described. It is noted that the use of product teams, people empowerment, concurrent product development, job ownership, and continuous product improvement provides quality and schedule improvement as well as improving and enhancing the working environment. I.F.

A90-31715#
QUALITY - THE OLD AND THE NEW TESTAMENTS
T. J. CARTIN (Northrop Corp., Electronic Systems Div., Anaheim, CA) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 225-228. refs
(AIAA PAPER 89-3241) Copyright

The approach of Shore (1988) to total quality management (TQM) is described. It involves participation by all organization members in defining structure and methodolgy with the primary emphasis on satisfying the customer. The differences between Feigenbaum's (1983) version of TQM and Shore's are discussed. Consideration is given to the definition of quality, quality planning, acceptable quality level, the manufacturing process, statistical process control, quality costs, corrective action systems, quality training, and supplier quality. I.F.

A90-31719#
THE LANGUAGE OF TQM
STUART I. FICKLER (Systems Research Laboratories, Inc., Dayton, OH) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 246-255. refs
(AIAA PAPER 89-3245) Copyright

The effects of cross-cultural and intracultural issues on neurolinguistic issues as related to total quality management (TQM) are studied. Basic Japanese and American cultural values are described. The successful adaptation of TQM by the Japanese and the transfer of this concept to an American environment are discussed. Particular attention is given to the direct translation of specific Japanese methods to an American environment. TQM in the environment of Japanese management and American labor is examined. The role of corporate managers in TQM is described. Specific communication strategies are presented. I.F.

A90-31721#
TOTAL QUALITY MANAGEMENT WITHIN MULTILEVEL MULTIGOAL HIERARCHICAL SYSTEMS - A CONCEPTUAL INTRODUCTION
FABIO R. GOLDSCHMIED and NICHOLAS V. PETROU IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 266-280. refs
(AIAA PAPER 89-3252) Copyright

A multilevel, multigoal hierarchical system for the structural organization of total quality management is proposed. The hierarchical system consists of three levels: (1) level of description or abstraction (stratum), (2) level of decision complexity (layer), and (3) level of organization structure (echelon). The interaction of these three levels is discussed. The decision-making hierarchy includes a selection layer, a learning or adaptation layer, and a self-organizing layer; the decision units hierarchy is: a single level, single-goal system, a single-level, multigoal system, and a multilevel, multigoal system. It is noted that hierarchical structures provide better resource utilization; adapt faster to environmental changes; and a unit failure does not completely effect the entire system. Four case histories of quality management and diagrams of the proposed system are provided. I.F.

A90-31732#
ASSURING TQM FAILURE
ROBERT C. SCHALLER (Martin Marietta Corp., Astronautics Group, Denver, CO) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 361, 362.
(AIAA PAPER 89-3656) Copyright

Activities that can result in the failure of TQM are examined. Executive management, supervisory, and team member actions that can cause TQM failure are described. An equation for evaluating the probability of failure is provided. I.F.

A90-31734#
TOTAL QUALITY MANAGEMENT (TQM)
VERNON B. SELBY IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 373-378.
(AIAA PAPER 89-3661) Copyright

The concept of TQM is described. The goal of TQM is to satisfy all customers and to identify and implement continuous improvement in processes or products. The ideas and approaches of leading experts in the field of quality management are discussed. Consideration is given to the establishment of high performance work groups and training in order to achieve the objectives of TQM. I.F.

A90-31736#
A PROCESS APPROACH TO TQM IMPLEMENTATION
MICHAEL N. SHAPIRO (Martin Marietta Corp., Astronautics Group, Denver, CO) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 384-387.
(AIAA PAPER 89-3666) Copyright

A four-phased approach to corporate culture change management is proposed. The objectives of the four phases, educate senior management, train change agents, train the trainer, and additional training, are described. The implementation of this approach is discussed. A diagram of job function training requirements is provided. I.F.

A90-31742#
WHY DON'T MORE COMPANIES IMPLEMENT TQM SUCCESSFULLY?
HARRY E. WILKINSON (University Affiliates, Inc., Rockville, MD) and JAMES E. SPATES (Action Counsel, Inc., Bethesda, MD) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 419-424. refs
(AIAA PAPER 89-3700) Copyright

Organizational cultural transformation is necessary for the effective implementation of TQM. Functional teams consisting of research, engineering, production, marketing, and sales, are essential for an effective TQM program. Short, intermediate, and long term goals can be achieved with TQM if a complete organizational cultural transformation occurs. The steps necessary for a successful organizational cultural transformation and the elements that reduce or eliminate resistance to the cultural transformation are described. The roles of employees, management, and facilitator in establishing an effective TQM program are examined. Factors which hinder the cultural transformation and ways to avoid these problems are discussed. I.F.

A90-34955
OUT OF THE CRISIS
W. EDWARDS DEMING Cambridge, MA, MIT, Center for Advanced Engineering Study, 1989, 518 p. refs
Copyright
Current problems in the management of U.S. service and manufacturing industries are addressed, with a focus on failures leading to the erosion of the U.S. competitive position in world markets, and a set of 14 fundamental changes in traditional scientific management techniques is proposed. Chapters are devoted to diseases and obstacles; quality and the consumer; quality and productivity in service organizations; new principles in training and leadership; and operational definitions, conformance, and performance. Also considered are standards and regulations, common and specific causes of improvement, the minimum average total cost of testing incoming materials and final products, organization for improvement of quality and productivity, and management transformation in Japan. T.K.

A90-41768
TOWARD TOTAL QUALITY IN INDUSTRY [VERS LA QUALITE TOTALE DANS L'INDUSTRIE]
PIERRE ANDRE (SNECMA, Paris, France) L'Aeronautique et l'Astronautique (ISSN 0001-9275), no. 139, 1989, p. 52-60. In French.
Copyright
A total quality management methodology is described, and then illustrated by examples from the aircraft industry. In particular, the application of this methodology to SNECMA engines has been shown to be effective. B.J.

A90-42205#
LESSONS LEARNED WHEN IMPLEMENTING TOTAL QUALITY MANAGEMENT
BRIAN J. CHITESTER (United Technologies Corp., Pratt and Whitney Group, West Palm Beach, FL) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference, 26th, Orlando, FL, July 16-18, 1990. 5 p.
(AIAA PAPER 90-2693) Copyright
Despite being called by some the 'alphabet soup program of the year'. TQM is accelerating throughout the aerospace industry. However, organizational inertia can ground even the most soundly designed processes. Critical TQM implementation barriers and lessons learned have been accumulated and expounded on in this paper. Dealing with organizational culture is one of the most difficult issues. In high-technology environments, where people have been task-oriented and product-focused, engineers and scientists often struggle to embrace a process orientation that focuses on participative involvement and prevention. Successful implementation requires a fundamental change in the way companies are structured to do business. Active executive involvement and leadership are paramount to achieving this cultural leap. Without this senior level commitment and accountability TQM will not flourish. Author

A91-29689
AEROSPACE TESTING SEMINAR, 12TH, MANHATTAN BEACH, CA, MAR. 13-15, 1990, PROCEEDINGS
Seminar sponsored by Institute of Environmental Sciences and Aerospace Corp. Mount Prospect, IL, Institute of Environmental Sciences, 1990, 239 p. For individual items see A91-29690 to A91-29721.
Recent developments in the technology and management of testing in the U.S. aerospace industry are discussed in reviews and reports. Sections are devoted to the impact of Total Quality Management on testing, risk and cost management, innovative testing and lessons learned, improved testing for launch systems, Space Station testing, and software issues in testing. Particular attention is given to eliminating waste in the test process, satellite environmental testing cost benefits, motion- and force-controlled vibration testing, Shuttle and Shuttle-C mixed-fleet processing operations, environmental interactions on the Space Station, integrated testing of the Space Station ECLSS at NASA Marshall, a comprehensive software package for thermal vacuum test monitoring, and real-time instrumentation control applications for satellite system tests. Diagrams, drawings, graphs, photographs, and tables of numerical data are provided. T.K.

A91-29694#
TOTAL QUALITY MANAGEMENT - WHAT DOES IT MEAN TO AEROSPACE ENGINEERS?
GEORGE J. THIELEN (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH) IN: Aerospace Testing Seminar, 12th, Manhattan Beach, CA, Mar. 13-15, 1990, Proceedings. Mount Prospect, IL, Institute of Environmental Sciences, 1990, p. 17-20. refs
This paper outlines the origins and basic principles of the Total Quality Management (TQM) concept and its significance to engineers engaged in aerospace design, development and testing. Drawing on results of a recent AIAA survey, current U.S. engineering perceptions of TQM and 'quality of engineering design' are summarized and apparent weaknesses in the process of product development are identified. Changes in customer quality expectations and solicitations are also discussed, together with some recommendations for improving product reliability, producibility, and value through integrated design, development and testing activities. Author

A91-30936
CONTROL DATA CORPORATION'S GOVERNMENT SYSTEMS GROUP STANDARD SOFTWARE QUALITY PROGRAM
GENE REDIG and MIKE SWANSON (Control Data Corp., Bloomington, MN) IN: NAECON 90; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1990. Vol. 2. New York, Institute of Electrical and Electronics Engineers, Inc., 1990, p. 670-674.
Copyright
The authors describe the necessity of developing the Government Systems Group standard Software Quality Program (SQP), the background in developing the SQP, the advantages of the SQP, the components of the SQP, and the highlights of the SQP. The goal of the standard SQP was to develop common and reusable quality processes. The SQP will produce quality products, while the plan offers the advantages of compliancy, reusability, efficiency, effectiveness, consistency, cost savings, and portability. The components of the SQP include the policy, organization, plan, and handbook. The main elements of the SQP, which currently reflects government standards DOD-STD-2167A and DOD-STD-2168 for software development projects, are discussed. This standard SQP was developed using the total quality management process methodologies. The influence that the Software Engineering Institute's Capability Assessment had on developing and implementing this standard SQP is also discussed. I.E.

A91-31021
QUALITY ECONOMICS AND PRODUCTIVITY
YOSEPH BESTER (Elbit Computers, Ltd., Haifa, Israel) IN: NAECON 90; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1990. Vol. 3. New York, Institute of Electrical and Electronics Engineers, Inc., 1990, p. 1294-1298.
Copyright
The quality economics principle establishes the relationship between the value of quality and the cost of quality. The manager of the quality function in an organization is guided by this principle in the task of insuring that the quality value of the outputs of the organization is higher than the investment made (cost of quality) to achieve that quality, and thereby contributes to the maximization of the return on investment and profit in the organization. A review is presented to show that the responsibility of the manager of the quality function in the organization has increased in scope to include productivity, associated with quality-related activities in particular, and production work in general. I.E.

A91-48616
THE TRAINING ENTERPRISE - A VIEW FROM THE TOP
ROBERT F. BACHERT, TENNY A. LINDHOLM, and DONALD D. LYTLE (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH) SAE, Aerospace Technology Conference and Exposition, Long Beach, CA, Oct. 1-4, 1990. 11 p. refs
(SAE PAPER 901943) Copyright

The Air Force is developing metholodogy for the development of 'total' training systems/enterprises. The methodology is based on the concepts of the systems approach and adaptive evolutionary systems. This paper discusses these concepts, the methodology, and their application to the planning, design, and evaluation of training systems. Areas emphasized include the application of the Total Quality Management, needs/requirements analysis, and the Instructional Systems Development (ISD) process. Author

N90-21400# Defense Contract Administration Services Region, Saint Louis, MO.
QUALITY AT A GLANCE
DONALD S. PARSONS, JR., comp. Jan. 1990 33 p
(AD-A217297) Avail: NTIS HC A03/MF A01 CSCL 05/1

This document contains summaries of fifteen of the well known books which underlie the Total Quality Management philosophy. Members of the DCASR St. Louis staff offer comments and opinions on how the authors have presented the quality concept in today's business environment. GRA

N91-25417# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, ID.
IMPROVING ADP QUALITY AND PRODUCTIVITY
1991 42 p Presented at the Association for Energy Systems Operations and Programming (AESOP) Conference on Improving ADP Quality and Productivity, Las Vegas, 16-18 Jan. 1991
(Contract DE-AC07-76ID-01570)
(DE91-010049; CONF-910155-ABSTS) Avail: NTIS HC/MF A03

A brief synopsis of each speakers comments at each session of the conference is included. Subjects covered are specific cases of organizational experiences in computer management. Topics addressed include the following: quality management in a Professional Services Group; computer security incident management; implementation of a quality improvement plan with an examination of metrics; management of maintenance activities; measuring software quality; improving productivity and quality through automated systems and networking; use of personal computers; distributed processing systems; computer graphics for scientific uses; management of information and data base systems; and artificial intelligence in computer programming. DOE

N91-28030# National Inst. of Standards and Technology, Gaithersburg, MD.
NIST RESEARCH REPORTS, OCTOBER 1990
Oct. 1990 37 p
(PB91-112813; NIST/SP-797) Avail: NTIS HC/MF A03; also available SOD HC $1.75 as 003-003-03054-6 CSCL 05/2

The following research reports are presented: (1) Four Companies Win Baldrige Award; (2) NIST, Industry Work Together for Automated Quality; (3) Seven R and D 100 Awards Go to NIST; (4) Teaching Machines their ABCs; (5) Technologies of the Future Identified; (6) To Measure a Molecule; (7) Key Industries Invest to Boost Quality; (8) No Evidence for Fifth Force Found; and (9) Tech Transfer Awards Announced. A research update, conference calendar, and section on new publications are also presented. K.S.

N91-29071# Virginia Polytechnic Inst. and State Univ., Blacksburg.
WHY ENGINEERS MUST KNOW AND MANAGE ORGANIZATIONAL CULTURE
H. A. KURSTEDT, JR., L. A. MALLAK, E. M. HOWARD, and P. S. KURSTEDT 1990 5 p
(Contract DE-FG02-88DP-48058)
(DE91-012425; DOE/DP-48058/T4) Avail: NTIS HC/MF A01

The engineering manager's success is being judged more and more on qualitative measures concerning the human elements of their work. These new measures require engineers to become as skilled and at ease with the tools, methods, and techniques for qualitative issues as they are with more traditional quantitative tools, methods, and techniques. To achieve success toward these qualitative measures demands nothing short of a new way of thinking, indeed a new culture embodying new values and traditions. Engineering managers must use culture change mechanisms along with their other management tools so they can better understand and manage culture. They must view concepts such as just-in-time, total quality management, and continuous performance improvement as integral to culture change efforts; these concepts and corresponding programs require an underlying culture to create an environment for change. Engineers who want to manage and change culture and communicate these changes must become comfortable with hoopla and symbolism to add drama and life to their words and plans. Engineers must understand the elements of culture, become effective communicators, and master the tools, methods, and techniques of culture change. DOE

N91-29843# Army Strategic Defense Command, Huntsville, AL.
MANAGEMENT OF VARIATION AND TQM Final Report
WILLIAM E. HUGHES, JR. Jul. 1991 35 p
(AD-A238399) Avail: NTIS HC/MF A03 CSCL 12/3

Variation has been studied by statisticians and scientists for decades. Although variation is not a new concept, what is new is the awareness that variation affects everyday activities in the workplace. Modern man is plagued with variation problems ranging from raw materials to finished products and services. No matter how precise our methods of producing products and providing services becomes, there will always be some degree of variation. Today's thrust toward the Total Quality Management (TQM) concept will include the understanding of variation. In fact, the concept of variation may be analyzed in each of Deming's 14 points. Future variation issues will include the understanding and management of people. GRA

N91-32385# Thomson-CSF, Sainte Egreve (France).
TOTAL QUALITY MANAGEMENT: WHAT ARE THE FACTS BEHIND THE CONCEPTS?
J. BLANCHART *In* ESA, ESA Electronic Components Conference p 587-588 Mar. 1991
Copyright Avail: NTIS HC/MF A25; EPD, ESTEC, Noordwijk, Netherlands, HC 90 Dutch guilders

The MIL-I-38535 Total Quality Management (TQM) system is discussed. It is concluded to be the most pragmatic TQM system for the manufacturing of military and space Very Large Scale Integration (VLSI). Changes in manufacturers responsibility due to the system are discussed. The effect of the TQM system on quality improvement programs is discussed. A normalized reliability philosophy based on the TQM system is discussed. Shortcomings of the MIL-I-38535 system in certain TQM areas are identified and ways in which manufacturers can get around these shortcomings are described. ESA

02

PUBLIC SECTOR MODELS/LESSONS LEARNED

A90-31687#
TOTAL QUALITY MANAGEMENT AND DEFENSE
GAIL R. DIMITROFF (General Dynamics Corp., Space Systems Div., San Diego, CA) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 73-78. refs
(AIAA PAPER 89-3196) Copyright

This paper presents the current status of the TQM movement within the DOD and the defense industry and demonstrates implementation strategies as well as impediments to those

approaches. The emphasis is on strategies that span government and industry. The core of TQM is viewed as a customer-driven strategy for continual improvement, which can also accommodate and integrate innovation. While problems in the past have been addressed in terms of conflict resolution, the new philosophy requires the creation of an environment consonant with cross-functional/cross-institutional problem solving (a major cultural change). Author

A90-31699#
MANAGING THE TQM CULTURAL CHANGE
JERALD B. GARTMAN and JOHN S. W. FARGHER, JR. (U.S. Navy, Cherry Point, NC) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 142-147.
(AIAA PAPER 89-3212)

The Naval Aviation Depot in North Carolina has been recognized by the federal government as a quality improvement prototype. This quality improvement program has provided: (1) the implementation of the strategic planning process, (2) performance measurement using a 'home grown' manufacturing resource planning system, (3) substantial advances in management accounting and cost control, (4) quality of work and work life, and (5) productivity gain sharing, as well as other productivity enhancement programs. The cornerstone has been the adoption of a philosophy incorporating total quality management and statistical process control. R.E.P.

A90-31726#
TOTAL QUALITY MANAGEMENT (TQM) KEY CONCEPTS AND IMPLEMENTATION METHODOLOGY FOR DEFENSE AND AEROSPACE INDUSTRIES
ROBERT F. MEYLAND (Martin Marietta Electronic Systems, Orlando, FL) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 322-326.
(AIAA PAPER 89-3649) Copyright

The TQM program designed to meet the DOD management initiative of continuously improving performance at every level is examined. The keys to a successful TQM program are: (1) top management support, (2) employee commitment, (3) continued improvement activities, (4) supplier involvement, and (5) customer involvement. The role of management and employees in TQM is discussed. An award program, the TQM cycle, and concurrent engineering are considered. I.F.

A90-31729#
REVISITING THE MEANING OF 'WORK' IN A TQM ENVIRONMENT
JEROME R. PIKULINSKI (General Dynamics Corp., Fort Worth, TX) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 333-338. refs
(AIAA PAPER 89-3653) Copyright

This paper reviews and discusses the applicability of selected personnel management theories to the Department of Defense objective of creating a 'Total Quality Management' environment within the operations of its defense contractors and their suppliers. The materials selected for review show that management has a basic behavioral requirement to create and maintain cooperation. Conversely, workers have a need to achieve motivational states characterized by satisfaction. Motivating workers to higher states of performance may interfere with workers' satisfactions. Various methods may be used to develop cooperation. Demographic factors, technological trends, and increasing desires and needs of workers to control their own work performance are increasing the complexity of managing worker performance. A return to basic management concepts is indicated. Author

A90-31738#
IMPLEMENTING TQM IN THE AIR FORCE'S SPACE BASED INTERCEPTOR PROGRAM OFFICE
RON KURTUS (USAF, Space Systems Div., Los Angeles, CA) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 396-398.
(AIAA PAPER 89-3669) Copyright

The Space Based Interceptor (SBI) program is the pilot program for TQM. The goal of the program is to provide quality, cost effective products to customers. The use of work groups, training sessions, a newsletter, and rain storming sessions to implement TQM is described. The importance of a good relationship between the USAF and the contractors in order to implement TQM is discussed. The SBI program is in the demonstration/validation phase; problems associated with using TQM in this phase are considered. It is noted that the use of TQM in the SBI program has resulted in a potential $10-20 million savings in the SBI Flight Experiment and a reduction of $30 million in SBI software development. I.F.

A90-31741#
TOTAL QUALITY MANAGEMENT IMPROVES COMBAT SUPPORT TRAINING
ARTHUR S. KUBO (BDM International, Inc., McLean, VA) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 414-418.
(AIAA PAPER 89-3699) Copyright

The USAF is using Continuous Process Improvement based on measurable standards to meet an operational requirement within severe time and resource constraints. The methodology is straightforward and is based on identifying the requirements, defining tasks and task standards, establishing what must be trained, measuring the results of training, and making midcourse corrections to improve training performance. This application of the well used Instructional System Development (ISD) methodology is not unique but demonstrates that Total Quality Management-Continuous Process Improvement (TQM-CPI) in combat support can be achieved based on process knowledge, focus on user requirements and performance measurement, and requirements-based training standards. Author

A91-26847
SAYING IS ONE THING, DOING IS ANOTHER
DOUGLAS O. PATTERSON (U.S. Navy, Washington, DC) IES, Journal (ISSN 1052-2883), vol. 34, Jan.-Feb. 1991, p. 17-20.
Copyright

This paper briefly reviews the origins of the DOD templates and their relationship to the industrial processes associated with material acquisition. The principal features of the TQM initiative are then summarized, with emphasis on the DOD and Navy interpretations currently being implemented. Focusing on the Navy material acquisition function, the templates and TQM are shown to represent an integrated approach which offers maximum benefit to both the government and industry. Some 'traps' in the DOD implementation of TQM are identified, along with some thoughts on how to escape. Author

A91-31046#
BARRIERS TO TOTAL QUALITY MANAGEMENT IN THE DEPARTMENT OF DEFENSE
HAL A. RUMSEY and PHILLIP E. MILLER (USAF, Institute of Technology, Wright-Patterson AFB, OH) IN: 1990 Annual Reliability and Maintainability Symposium, Los Angeles, CA, Jan. 23-25, 1990, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1990, p. 95-99.

Reliability and maintainability are discussed as subsets of the assurance sciences. Total Quality Management (TQM) covers all of the assurance sciences, with significant emphasis on the human and organizational systems underlying all production processes. When the Air Force Logistics Command initiated TQM, a number

of challenges had to be overcome to achieve the full potential of the program. These barriers included a lack of worker motivation, opposition of existing management, and lack of effective communication. I.E.

A91-40704*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
MANAGEMENT OF A CFD ORGANIZATION IN SUPPORT OF SPACE HARDWARE DEVELOPMENT
L. A. SCHUTZENHOFER, P. K. MCCONNAUGHEY, H. V. MCCONNAUGHEY, and T. S. WANG (NASA, Marshall Space Flight Center, Huntsville, AL) IN: AIAA Computational Fluid Dynamics Conference, 10th, Honolulu, HI, June 24-27, 1991, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1991, p. 21-31. refs
(AIAA PAPER 91-1529) Copyright

The management strategy of NASA-Marshall's CFD branch in support of space hardware development and code validation implements various elements of total quality management. The strategy encompasses (1) a teaming strategy which focuses on the most pertinent problem, (2) quick-turnaround analysis, (3) the evaluation of retrofittable design options through sensitivity analysis, and (4) coordination between the chief engineer and the hardware contractors. Advanced-technology concepts are being addressed via the definition of technology-development projects whose products are transferable to hardware programs and the integration of research activities with industry, government agencies, and universities, on the basis of the 'consortium' concept. O.C.

N90-18312# Air Force Human Resources Lab., Brooks AFB, TX.
TOTAL QUALITY MANAGEMENT: AN APPLICATION IN A RESEARCH AND DEVELOPMENT LABORATORY Final Technical Paper Dec. 1988 - Sep. 1989
HERBERT J. CLARK Dec. 1989 22 p
(AD-A215808; AFHRL-TP-89-58) Avail: NTIS HC A03/MF A01 CSCL 05/1

In September 1988, the Air Force Human Resources Laboratory (AFHRL) took initial steps to set up a Total Quality Management (TQM) program in the Laboratory. The implementation procedure used was the Method for Generating Efficiency and Effectiveness Measures (MGEEM). This procedure focuses on satisfying customer requirements, identifying Key Result Areas (KRAs) and tracking progress in those KRAs through Mission Effectiveness Indicators. This report outlines how TQM was implemented in AFHRL, and describes the lessons learned in the process. Lessons learned address: TQM versus Total Quality Control (TQC), applying TQM in an R and D organization, sustaining TQM, process action teams, and the acceptance of MGEEM as a method for implementing TQM. The survey feedback intervention technique, the confrontation meeting, and work teams are recommended for establishing TQM in an R and D organization. The procedures allow both managers and workers to develop a sense of ownership in the TQM process. This in turn increases the likelihood of sustaining the program and insuring its long-term effectiveness. GRA

N90-30122# Army War Coll., Carlisle Barracks, PA.
TOTAL QUALITY MANAGEMENT: A RECIPE FOR SUCCESS Study Project
MICHAEL G. PAZAK 2 Apr. 1990 53 p
(AD-A223287) Avail: NTIS HC A04/MF A01 CSCL 05/1

Total Quality Management (TQM) is a high level Department of Defense (DOD) initiative that is being touted as the primary management tool to force the fundamental cultural change in the way the DOD conducts business in the systems age. What is TQM. Where did it come from. What are it's guiding principles. How has it been used. What successes can be attributed to TQM. How can it best be implemented. These questions along with many others are addressed and answered in this work. In addition, an appendix of popular quality improvement models for organizations, their processes, and their individuals is provided. It was concluded that the DOD must embrace the TQM philosophy and proliferate it's principles in order to maximize the return on defense budget dollars. This will require an enormous investment in education, training and time and an equally positive commitment by the DOD leadership to create a DOD wide organizational climate that will stimulate and perpetuate individual productivity enhancing contributions. GRA

N91-17831# Institute for Defense Analyses, Alexandria, VA.
A SURVEY OF TOTAL QUALITY MANAGEMENT (TQM) RESOURCE CENTERS Final Report
JAMES LESTER and SARAH H. NASH Mar. 1990 59 p
(Contract MDA903-89-C-0003)
(AD-A229218; AD-E501310; IDA-D-745) Avail: NTIS HC/MF A04 CSCL 05/1

This document describes a study of various models of Total Quality Management Resource Centers that have been established, and is intended to assist in the development of a design for a Department of Defense (DoD) TQM Resource Center. The Institute for Defense Analyses (IDA) surveyed eight organizations with TQM Resource Centers for their designs and operations. While a precise set of organizations models did not emerge from the data collected, three critical design issues did: the level of activity, the degree of centralization, and the philosophy of operation. Moreover, the data from the study did not argue for or against the establishment of a DoD TQM Resource Center, nor was IDA asked to make this determination. Although the organizations surveyed have successfully used TQM Resource Centers to improve quality, at least two organizations who were winners of the prestigious Baldrige Award for Quality did not invest in TQM Resource Centers. Further study is required by the DoD to determine whether a DoD TQM Resource Center is needed and who its customers would be. GRA

N91-21552# Air War Coll., Maxwell AFB, AL.
TOP QUALITY MANAGEMENT, RELIABILITY, AND MAINTAINABILITY: INSTITUTIONAL GOALS WITH BUILT IN BARRIERS
PHILIP B. AITKEN-CADE 1990 71 p
(AD-A230134) Avail: NTIS HC/MF A04 CSCL 05/1

Total quality management (TQM) has been heralded as the process that will finally cause a cultural change throughout government and industry to usher in a new era of continuously increasing quality. Since the system appears to be slow to react to the change in culture, there may be institutional impediments that are preventing the Air Force from achieving all that it can in reliability and maintainability (R and M) and TQM. However, the study concludes that there are no concrete institutional barriers preventing the Air Force from reaching the goal of TQM. There are only opportunities for senior leaders to demonstrate their commitment to the TQM program. All members of the Air Force and industry must work toward continuous improvement in all facets of the system and the senior leaders must set the pace. Industry has instituted various forms of TQM (after all, TQM is defined in many different ways) and does not need the Government to dictate implementation plans. The success of the Air Force TQM program will depend on the extent to which its senior leaders are prepared to apply the concept of KAIZEN - gradual, unending improvement, doing little things better; setting and achieving ever-higher standards. GRA

N91-24596# Forest Service, Washington, DC.
FROM THE PILOT TEST PHILOSOPHY TO TOTAL QUALITY MANAGEMENT: A LOGICAL PROGRESSION, A MANAGER'S GUIDE Final Report
B. DELANEY May 1990 15 p
(PB91-155168) Avail: NTIS HC/MF A03 CSCL 14/4

A guide written to explore the relationship between the Forest Service's management philosophy of the National Pilot Test Initiative and total quality management is presented. Additionally, the guide presents some ideas and suggestions for building on past Forest Service successes, and on linking the above management approaches together. GRA

N91-24599*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
AN EVALUATION OF THE TOTAL QUALITY MANAGEMENT IMPLEMENTATION STRATEGY FOR THE ADVANCED SOLID ROCKET MOTOR PROJECT AT NASA'S MARSHALL SPACE FLIGHT CENTER M.S. Thesis - Tennessee Univ.
HARRY F. SCHRAMM and KENNETH W. SULLIVAN May 1991 120 p
(NASA-TM-103533; NAS 1.15:103533) Avail: NTIS HC/MF A06 CSCL 14/4

An evaluation of the NASA's Marshall Space Flight Center (MSFC) strategy to implement Total Quality Management (TQM) in the Advanced Solid Rocket Motor (ASRM) Project is presented. The evaluation of the implementation strategy reflected the Civil Service personnel perspective at the project level. The external and internal environments at MSFC were analyzed for their effects on the ASRM TQM strategy. Organizational forms, cultures, management systems, problem solving techniques, and training were assessed for their influence on the implementation strategy. The influence of ASRM's effort was assessed relative to its impact on mature projects as well as future projects at MSFC. Author

N91-30544# Wichita State Univ., KS. National Inst. for Aviation Research.
KQIN: KANSAS QUALITY IMPROVEMENT NETWORK. A REPORT OUTLINING A STATEWIDE QUALITY IMPROVEMENT PLAN
GEORGE HEINRICH and ANNE GALLAGHER Jul. 1991 93 p Sponsored by Kansas Technology Enterprise Corp.
(NIAR-91-20) Avail: NTIS HC/MF A05

A plan is described for the implementation of the Kansas Quality Improvement Network (KQIN). Objectives include providing a support system for business organizations initiating Total Quality Management (TQM) programs, raising the awareness of TQM and working with Kansas educational institutions to both update their curricula in the TQM area and to implement TQM techniques in their operations. The KQIN plan would allow Kansas to become more competitive with other Midwestern states that have already implemented quality improvement networks. Author

03

PRIVATE SECTOR MODELS/LESSONS LEARNED

A89-46727#
THE LEARNING PROCESS OF GETTING TQM INITIATED AT A DIVISION
DAVID GRAVES (Rockwell International Corp., Seal Beach, CA) AIAA, ASME, SAE, and ASEE, Joint Propulsion Conference, 25th, Monterey, CA, July 10-13, 1989. 7 p. refs
(AIAA PAPER 89-2288) Copyright

This paper reviews one company's experience at developing and implementing a total quality management process. It covers the activities, beginning with the work of the planning committee and the development of the training philosophy, and concludes with an objective assessment of the impact of the process. Author

A90-31681#
TOTAL QUALITY MANAGEMENT - THE PROMISE IS REAL
R. G. ROBINSON (Harris Corp., Melbourne, FL) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 28-31.
(AIAA PAPER 89-3187) Copyright

The total quality management program at Harris Corporation as a structured, orderly, and systematic approach to continuous improvement is described. As an integral part of the plan, specific goals for improvement of quality, timeliness, and cost performance get a high level of visibility and attention throughout the organization. Management teams at each level work on problems that only they can solve. Once it is clearly understood where to go through strategic planning, the next step is to define the best way to get there. It is indicated that all of the processes of the business must be well defined and optimized for total organizational effectiveness and efficiency. R.E.P.

A90-31690#
TOTAL QUALITY MANAGEMENT - AN ACTION PROJECT APPROACH
PETER DANNA and MICHAEL HERRINGTON (Olin Corp., Stamford, CT) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 89-97.
(AIAA PAPER 89-3203) Copyright

Achieving total quality management is a mind set that often requires a culture change. When it is achieved, the overwhelming priority of the organization is to always meet the agreed upon expectations of both internal and external customers. By-products of this achievement are elimination of waste, increased productivity, reduced costs, and reduced cycle time. Total quality management and the quality planning process as practiced by Olin Corporation are described, along with two examples of this process at work. R.E.P.

A90-31696#
WHAT CAN WE DO AFTER WE'VE DONE IT ALL?
R. W. NEWHOUSE (General Dynamics Corp., Fort Worth, TX) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 123-125.
(AIAA PAPER 89-3209) Copyright

Total quality management (TQM) at General Dynamics is defined as a leadership philosophy that creates a working environment which promotes teamwork, trust, and the quest for continuous improvement. To demonstrate that management was serious about TQM it was necessary for the total organization to be involved. For total involvement, each level had to realize what it needed to know and do, and the process would only be sustained if a supporting structure was put in place. With that realization, an approach to assuring long-term continual success was initiated. Long-range benefits are anticipated through this approach of establishing strategic and operational goals that include: improved internal and external customer relations, improved processes that can support people, and improved attitude and output of employees at all levels. R.E.P.

A90-31698#
TOTAL QUALITY MANAGEMENT AND THE TRANSITIONING COMPANY - THE PERFECT FIT
MICHAEL J. PISCATELLA (Textron Lycoming, Stratford, CT) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 136-141.
(AIAA PAPER 89-3211) Copyright

The path that Textron Lycoming is taking to achieve a culture of continuous improvement is discussed. A historical perspective illustrates the growing production requirements that resulted in the evolution of the total quality management (TQM) concept. The management team led a strategy to make step-function improvements in process technology and the effectiveness of the workforce in conjunction with assistance provided by the government. This joint effort embodied the basic principles of TQM through the use of quantitative measures and participation of the involved users to continually improve the specific product or service. These changes in technology and human resource skills have allowed significant improvements over the past several years. R.E.P.

A90-31701#
TQM - A SYSTEM SUCCESS STORY
PATRICK H. NORAUSKY (Aerojet Ordnance, Downey, CA) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 152-157.
(AIAA PAPER 89-3217) Copyright

Customer satisfaction and continuous improvement form the basis of the DOD total quality management (TQM) initiative. This initiative recognizes that a thrust is needed to better inculcate the quality process throughout a company. It requires the difficult task of changing not only the culture of a company, but also suppliers used by a company. Aerojet Ordnance's TQM system, involving process of initiation, cultural change within the company and its suppliers, sustaining approach, operational tools, and results, is examined. R.E.P.

A90-31705#
IMPLEMENTING TQM AND JIT IN A MANUFACTURING ENVIRONMENT
DANIEL MCARTHUR (Coopers and Lybrand, Houston, TX) and DAVID CARR (Coopers and Lybrand, Washington, DC) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 175-180.
(AIAA PAPER 89-3221) Copyright

Total Quality Management (TQM) can and should be used in conjunction with other improvement programs. At a large manufacturing facility TQM was used as the quality component of a Just-in-Time (JIT) cycle time management system. TQM was also introduced to nonproduction staff and to vendors, resulting in efficiencies and subsequent reduction in the cost of quality. Use of a single quality method throughout an organization avoids confusion and increases the power of all other productivity and efficiency improvement programs. Author

A90-31720#
IMPLEMENTATION OF A TOTAL QUALITY MANAGEMENT PROGRAM IN PRIVATE INDUSTRY
R. L. FITZGERALD (Techmatics, Inc., Arlington, VA) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 256-265.
(AIAA PAPER 89-3247) Copyright

This paper discusses the implementation of a Total Quality Management (TQM) program in a private industry production facility. Included in the paper are background discussions, environment at the facility prior to TQM, how implementation took place, and results of the program. Also included is a discussion of how this type of TQM program can be applied to Department of Defense activities. Author

A90-31737#
SABIR TQM IMPLEMENTATION PLANS AND PROGRESS
TERRY BEDBURY (Martin Marietta Corp., Bethesda, MD) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 390-395.
(AIAA PAPER 89-3668) Copyright

In March of 1989 the Martin Marietta Space Based Interceptor (SABIR) program began the formal implementation of Total Quality Management (TQM). This paper discusses the process of implementing TQM on a program that is in the Demonstration/Validation phase. An implementation flow is presented and progress and lessons learned during each step accomplished are discussed. Author

A90-31739#
SDIO'S IMPLEMENTATION OF TQM
THOMAS W. LIGHT (SDIO, Washington, DC) and JAMES J. LINDENFELSER (Analytic Sciences Corp., Arlington, VA) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 399-410.
(AIAA PAPER 89-3695) Copyright

The use of TQM in the SDI program is discussed. The SDI Organization (SDIO) approach for implementing TQM involves an internal and an external step. The internal step is concerned with improving the acquisition process, management of the SDS and technology development activities, and internal technical and administrative processes. The external step involves the SDI management network, including executing agents and their contractors. The procedures involved in internal and external implementation of TQM in the SDIO are described. Concurrent engineering, producibility, logistics, acquisition strategies, and cost reduction are examined in terms of TQM. A flow diagram of the overall SDIO TQM implementation approach is presented. I.F.

N91-10298# Rolls-Royce Ltd., Derby (England).
TOTAL QUALITY MANAGEMENT AT ROLLS-ROYCE PLC
R. H. WEDGE 15 Sep. 1990 10 p Submitted for publication (PNR-90759; ETN-90-97961) Copyright Avail: NTIS HC/MF A02

The Rolls-Royce concept concerning quality and quality management is reviewed. The work is focused on the business associated with aircraft gas turbine manufacture. The reasons for the adoption of quality assurance methods and the company's targets are justified. The distribution of responsibilities and tasks in the quality assurance chain is explained. Resulting from the management plans, more effort is accorded to elimination and prevention, so that less time is spent on detection and correction. ESA

04

MANAGEMENT AND STRATEGIC PLANNING

Includes leadership/support, mission, and vision.

A89-48163#
SOFTWARE SUPPORTABILITY - A MANAGER'S PERSPECTIVE
SUE E. HERMANSON (USAF, Washington, DC) AIAA and NASA, Symposium on the Maintainability of Aerospace Systems, Anaheim, CA, July 26, 27, 1989. 6 p.
(AIAA PAPER 89-5052)

Criteria for the management of military software development and 'maintenance' (i.e., postdevelopment support to correct errors and improve performance) are proposed. The first main recommendation is that software development be subjected to the rules of robust design, including well-defined requirements, a systems-design approach, an organized independent architecture, and precise readable language. Robust design aims to minimize the need for modification and yet facilitate modification if it is required. The second recommendation is that adequate software processes be maintained by management, including a well defined methodology and policies, disciplined and repeatable processes, development and support tools, and planning and coordination. Also stressed is the need for continuous improvement of the management process itself, with consistent application of metrics to measure the performance of the software and the software-maintenance system. T.K.

A90-31686#
TEAMWORK FOR EXCELLENCE
SHABBIR SHAD and JANE HAGA (LTV Aircraft Products Group, Dallas, TX) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989,

Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 62-72. refs
(AIAA PAPER 89-3195) Copyright

Implementation of a long-range plan is outlined that includes the assumptions, principles, goals, and strategy to integrate a total quality philosophy into strategic planning for continuous improvement. Focus is then placed on a measurement and reporting system that indicates whether the continuous improvement efforts are successful. Finally, a summary of the lessons learned in introducing total quality management in an aerospace and defense company is given. R.E.P.

A90-31712#
TOTAL QUALITY MANAGEMENT PLANNING
LAWRENCE T. BAUER (Harris Corp., Government Support Systems Div., Syosset, NY) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 214-216.
(AIAA PAPER 89-3235) Copyright

The key ingredient to any successful TQM program is top management commitment and involvement. The early top management involvement reflects itself in a series of goals and visions for the organization. From these broad guidelines, awareness training of personnel can take place, followed by a selected level of skills training associated with the process of improvement and changing the culture of the organization. Management training must also be considered to include continuous improvement as another tool in the manager's kit of approaches to the business environment. To track the success of the program, it is appropriate that a series of measurements be determined reflecting the results of the teams pursuing process improvements. To maintain and coordinate the program, the issue of a responsible person or executive in charge is also appropriate. Following a series of early successes, most programs will tend to level out or even drop in their effectiveness. It is necessary to recognize that TQM requires certain planning for the next level of attainment and the long term infusion of TQM into the culture. Author

A90-31724#
BUYING INTO TOTAL QUALITY MANAGEMENT
GREGORY R. JONES (General Dynamics Corp., Space Systems Div., San Diego, CA) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 310-315. refs
(AIAA PAPER 89-3642) Copyright

The importance of participation in total quality management (TQM) is discussed. Team work and interpersonal skill are essential for the implementation of TQM principles. The role of management in TQM is examined. Particular consideration is given to the need for management to drive out fear and educate and train employees. I.F.

A90-31731#
A TOTAL QUALITY MANAGEMENT (TQM) DIAGNOSTIC GUIDE
JANICE ROUILLER and RICHARD L. SOMERS (General Research Corp., McLean, VA) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 353-360.
(AIAA PAPER 89-3655) Copyright

The Quality Planning and Evaluation Guide is developed. The Guide is designed to assist commercial and government activities in implementing or improving quality management procedures. The structure and content of the work force and staff modules of the Guide are described. The development and evaluation of the guide is discussed and a diagram of the total quality management model is provided. Case studies demonstrating the applicability of the guide are presented. I.F.

A90-31735#
ORGANIZATION STRUCTURES AND MANAGEMENT TECHNIQUES THAT PROMOTE TOTAL QUALITY MANAGEMENT
OWEN SMITH and TIMOTHY PETERS (Martin Marietta Corp., Astronautics Group, Denver, CO) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 379-383. refs
(AIAA PAPER 89-3662) Copyright

Management techniques and organizational structures applicable for implementing total quality management (TQM) are described. These techniques are useful for increasing the productivity and output quality of an organization. Consideration is given to employee responsibility, goal setting, good communications, the training of personnel, and meeting customer's needs. I.F.

A91-30959
PREPARING THE ENTERPRISE FOR TOTAL QUALITY MANAGEMENT - DEFINING, PLANNING, AND EMPOWERING
ROBERT F. BACHERT (USAF, Wright-Patterson AFB, OH) and GLEN R. GALLAWAY (Joshua Group, Inc., Beavercreek, OH) IN: NAECON 90; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1990. Vol. 2. New York, Institute of Electrical and Electronics Engineers, Inc., 1990, p. 812-818. refs
Copyright

The authors discuss the need for an enterprise to begin the development of a TQM (total quality management) process by better understanding its structures, functions, and performance in the context of a total/integrated operation. From this knowledge-base the enterprise can set objectives, define strategies, and plan an effective application of the TQM process and the use of resources that match an enterprise's strengths and weaknesses. The methodology, techniques, and tools for analyzing, planning, and changing management that empower an enterprise to effectively apply TQM are presented and discussed. It is noted that when planning and developing a new enterprise special care should be taken to design-in TQM. I.E.

N90-14127# Defense Logistics Agency, Alexandria, VA.
TOTAL QUALITY MANAGEMENT IMPLEMENTATION STRATEGY: DIRECTORATE OF QUALITY ASSURANCE
May 1989 56 p
(AD-A212863) Avail: NTIS HC A04/MF A01 CSCL 05/1

The Directorate of Quality Assurance strategy for implementing TQM is described. It includes information concerning TQM concepts, methodology for implementation, goals and execution. The primary goal of the DLA-Q implementation strategy is to focus on doing the job right the first time, on time, everytime, and continually improving the way the job is done. GRA

N90-14128# Defense Logistics Agency, Alexandria, VA.
TOTAL QUALITY MANAGEMENT PLAN: TECHNICAL AND LOGISTICS SERVICES
May 1989 29 p
(AD-A212864) Avail: NTIS HC A03/MF A01 CSCL 05/1

The TQM plan for DLA Technical and Logistics Services is described. As a quality provider of technical and logistics services, the Directorate will implement TQM initiatives at Headquarters DLA and at functional counterparts in the Field. The plan requires continuous assessment of customer needs and a systematic evaluation of the processes performed that contribute to customer satisfaction. GRA

N90-14129# Defense Logistics Agency, Alexandria, VA.
TOTAL QUALITY MANAGEMENT IMPLEMENTING PLAN: OFFICE OF SMALL AND DISADVANTAGED BUSINESS UTILIZATION
Jul. 1989 8 p
(AD-A212865) Avail: NTIS HC A02/MF A01 CSCL 05/1

The Office of Small and Disadvantaged Business Utilization

plans for implementing TQM is described. A brief discussion is presented of TQM concepts, methodology for implementation and goals. In addition to focusing on internal improvements, DLA-U will provide TQM information to potential small and disadvantaged businesses as part of their implementation efforts. GRA

N90-14130# Defense Logistics Agency, Alexandria, VA.
TOTAL QUALITY MANAGEMENT PLAN: OFFICE OF CONGRESSIONAL AFFAIRS
Jul. 1989 5 p
(AD-A212866) Avail: NTIS HC A01/MF A01 CSCL 05/1

The DLA Office of Congressional Affairs Total Quality Management implementing plan is described. The plan emphasizes five areas: Customer relations, processes, measurement, awards, and training. The plan also includes specific improvement goals and milestones. GRA

N90-14131# Defense Logistics Agency, Alexandria, VA.
TOTAL QUALITY MANAGEMENT: DIRECTORATE OF CONTRACT MANAGEMENT MASTER PLAN
Jul. 1989 18 p
(AD-A212867) Avail: NTIS HC A03/MF A01 CSCL 05/1

This document describes the Directorate of Contracting Management Total Quality Management implementing plan. It includes a description of the TQM concept, the structure established to complement TQM and goals established by the Directorate of Contract Management to implement TQM. TQM goals within the directorate focus on three primary areas: TQM training, harmonizing contract management policies and procedures with the TQM philosophy, and enhancing communication and feedback. GRA

N90-14132# Defense Logistics Agency, Alexandria, VA.
TOTAL QUALITY MANAGEMENT PLAN: OFFICE OF PUBLIC AFFAIRS
Jul. 1989 15 p
(AD-A212868) Avail: NTIS HC A03/MF A01 CSCL 05/1

The Office of Public Affairs TQM implementing plan is described. A description is provided of three concepts considered vital to TQM as it applies to DLA's Public Affairs program: The customers are the first concern, precise measureable goals and teamwork. Public Affairs TQM goals and a methodology for accomplishment are included. GRA

05

EMPLOYEES/HUMAN RESOURCES

Includes training, recognition, empowerment, and teamwork.

A90-30774#
AFLC TOTAL QUALITY MANAGEMENT CORE EDUCATION AND TRAINING DEVELOPMENT
STEVE D. DOHERTY (USAF, Logistics Command, Wright-Patterson AFB, OH) IN: NAECON 89; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 22-26, 1989. Volume 4. New York, Institute of Electrical and Electronics Engineers, Inc., 1989, p. 1480-1482.

The USAF Logistics Command (AFLC) has been implementing total-quality-management (TQM) philosophy since October 1987. A major concern, however, for every manager and supervisor is whether or not personnel are being adequately trained in TQM principles and disciplines. In looking after this concern, there is a tendency to assume that training is the proper solution for every problem. When not valid, this assumption results in wasted training effort. The tendency is to request more training than needed, thus causing overtraining and a waste of training resources. The author examines how AFLC can design an adequate, yet efficient quality training program and avoid the traps just indicated. He presents the AFLC education and training development model and schedule of the core curriculum development needed to ensure continuation of the AFLC quality revolution. I.E.

A90-31702#
PEACEKEEPER IFSS - A TQM SUCCESS STORY
JOHN PARKER (Martin Marietta Corp., Astronautics Group, Denver, CO) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 158-166.
(AIAA PAPER 89-3218) Copyright

The planning for the Peacekeeper Instrumentation and Flight Safety System (IFSS) shows how teams were formed at each level of the organization as a vehicle for empowerment, and how this increased employee involvement is the foundation for continuously improved performance. As performance improvement initiatives reach fruition in an empowered environment, they provide leverage for greater accomplishments. Quality, cost, and schedule performance were improved through the implementation of a total quality management program. R.E.P.

A90-31708#
TQM SHOULD FOCUS ON THE HUMAN RESOURCE
LINDA RUFF (Martin Marietta Corp., Astronautics Group, Denver, CO) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 192-197.
(AIAA PAPER 89-3229) Copyright

Total quality management (TQM) focused on human resources, the benefits that can be realized if TQM is applied, and some of the current problems facing management without TQM are defined. Some methods that can be used to accomplish better relationships between supervisors/managers and employees with TQM are presented. It is suggested that the future success of an organization is in the success of its people, and that TQM of the human resource can make that success happen. R.E.P.

A90-31728#
USE TRAINING IN A TOTAL QUALITY MANAGEMENT (TQM) ENVIRONMENT TO INCREASE EFFICIENCY
LEROY R. PETERS (Martin Marietta Corp., Astronautics Group, Denver, CO) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 330-332.
(AIAA PAPER 89-3652) Copyright

Methods for improving the training of production worker without affecting production levels are described. Planned and unplanned time need to be used for the education and training of employees. This training time should be utilized to practice setups, and for cross training and additional job skills training. This training will lead to increased productivity and reduced product costs. I.F.

A91-29693#
DEVELOPMENT OPERATIONS - A TQM PROCESS
HAROLD CROY and JOHN O. ECKHOLT (Boeing Aerospace and Electronics, Seattle, WA) IN: Aerospace Testing Seminar, 12th, Manhattan Beach, CA, Mar. 13-15, 1990, Proceedings. Mount Prospect, IL, Institute of Environmental Sciences, 1990, p. 13-15.

The application of Total Quality Management (TQM) methods in an aerospace development program is briefly characterized. The approach involves the formation of 8-12-member Product Development Teams; the members have different areas of expertise but all receive extensive training in such TQM skills as quality awareness and improvement, process management, statistical process control, Taguchi methods, team leadership, and departmental task analysis. The teams are organized before proposals are submitted, when possible, and are responsible for requirements development, design, fabrication, test, delivery and postdelivery support of the specified product. T.K.

A91-41692#
THE PROCESS TEAM CONCEPT
AL HAUSSMANN and BOB DEPHILIPPIS (Aerojet, Propulsion Div., Sacramento, CA) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference, 27th, Sacramento, CA, June 24-26, 1991. 5 p.
(AIAA PAPER 91-2065) Copyright

The organizational responsibilities and operational aspects of the Process Team concept are presented. The overall objective of the Process Team is to reduce the time to complete an operation or to reduce the span time of a product by utilizing cost-effective total quality management principles and practices while meeting customer requirements. Organizations that have properly implemented this process team concept have achieved improved quality, safety, cost, and schedule performance while experiencing improved morale. R.E.P.

A91-54039#
AN EXAMPLE OF INDUSTRIAL INTERACTION WITH AN UNDERGRADUATE AIRCRAFT DESIGN PROGRAM
STEVEN J. D'URSO (McDonnell Aircraft Co., Saint Louis, MO) and KENNETH R. SIVIER (Illinois, University, Champaign) AIAA, AHS, and ASEE, Aircraft Design Systems and Operations Meeting, Baltimore, MD, Sept. 23-25, 1991. 19 p. refs
(AIAA PAPER 91-3116) Copyright

The McDonnell Aircraft Company's interaction with the Aeronautical and Astronautical Engineering program at the University of Illinois is considered. Seven two-hour seminars in aircraft configuration design along with the introduction of a graduate-level aircraft design course are described, and focus is placed on processes, products, and tools as well as design drivers, aerodynamic considerations, and propulsion integration issues. Aircraft structures and systems are outlined, and careers in design are discussed. An experiment is described, in which Taguchi-parameter design techniques are applied to the fusion of several design parameters that make up aircraft specifications. With the goal of generating an aircraft with multimission capabilities, five designs are produced by the class, each with a different mission emphasis. V.T.

A91-54070#
DEVELOPMENT AND IMPLEMENTATION OF A FORMAL TRAINING PROGRAM FOR CONCURRENT ENGINEERING IN AN AEROSPACE ENVIRONMENT
MICHAEL L. WALO, GIL R. MOSARD, and STEVEN E. MOSES (McDonnell Douglas Space Systems Co., Huntington Beach, CA) AIAA, AHS, and ASEE, Aircraft Design Systems and Operations Meeting, Baltimore, MD, Sept. 23-25, 1991. 7 p.
(AIAA PAPER 91-3155) Copyright

In the highly competitive aerospace industry, innovative approaches to quality improvement such as Total Quality Management (TQM) and one of its key elements, concurrent engineering (CE), are critical for survival. An effective training and education program is essential for a smooth transiton to a concurrent engineering environment. The methodology and approach to instructional design used at McDonnell Douglas Space Systems Company (MDSSC) led to a concurrent engineering training program that stimulates interest in using concurrent engineering principles and tools. Other aerospace companies can adapt this training program to fit their specific needs. Author

N91-28024# Institute for Defense Analyses, Alexandria, VA.
CONCURRENT ENGINEERING TEAMS. VOLUME 1: MAIN TEXT
KAREN J. RICHTER and DAVID A. DIEROLF Nov. 1990 56 p
(Contract MDA903-89-C-0003)
(AD-A236093; IDA-P-2516-VOL-1; IDA/HQ-90-36607; AD-E501383) Avail: NTIS HC/MF A04 CSCL 05/1

Specific concurrent engineering practices vary among organizations. There are, however, various management practices that appear to work well for most organizations. This paper presents the reader with specific, useful examples from several defense contractors illustrating how multifunctional concurrent engineering teams are being organized and managed and how concurrent engineering team meetings are conducted and supported. The types of computer support that could be used to enhance the efficiency and effectiveness of concurrent engineering team meetings are identified. The general findings are that there exists a direct relationship between total quality management (TQM) and concurrent engineering, and that many applications of computer-aided group problem solving are possible and practical today for the concurrent engineering team meetings. Areas identified for additional research are the documentation of the decision process and rationale during the product and process definition, the capturing of lessons learned during the implementation of concurrent engineering, and the performance evaluation and training of team members. GRA

N91-29068# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, ID.
THE HUMAN SIDE OF VALUE ENGINEERING
J. WIXSON and H. J. HEYDT 1991 11 p Presented at the SAVE International Conference, Kansas City, May 1991
(Contract DE-AC07-76ID-01570)
(DE91-012817; EGG-M-90540; CONF-9105167-2) Avail: NTIS HC/MF A03

This paper addresses people, pride and performance and their interrelationship with the Value Engineering (VE) technique. It explores the importance of people for the successful application of the technique. It discusses leadership skills, verbal and non-verbal communication, team member recognition and participation, knowledge of right and left brain characteristics and the part each play in the job plan leading to the successful integration of philosophy and techniques to creat change and improve performance. DOE

06

CUSTOMER FOCUS/CUSTOMER SATISFACTION

A90-50196
CONCURRENT ENGINEERING - ENABLING A NEW MATERIAL SUPPLIER/CUSTOMER RELATIONSHIP
JON A. SHUPE, E. DOUGLAS DICKENS, JR., DAVID C. BONNER (B.F. Goodrich Co., Brecksville Research and Development Center, OH), and STEVEN R. LECLAIR (USAF, Materials Laboratory, Wright-Patterson AFB, OH) IN: International SAMPE Symposium and Exhibition, 35th, Anaheim, CA, Apr. 2-5, 1990, Proceedings. Book 2. Covina, CA, Society for the Advancement of Material and Process Engineering, 1990, p. 1852-1860.
Copyright

In the 1990s and beyond, material suppliers will need to extend their 'customer-horizon' in order to market specialty materials in a globally competitive environment. The supplier will need to be capable of timely, demand-driven research and development of specialty materials for an expanding product-base. Further, the material supplier will become a partner in the 'demand-driven' engineering of specialty materials. The supplier will become more involved in addressing the needs of the customer at all levels in the chain. That is, consideration of product requirements, product processing requirements, maintenance and retirement requirements - requirements traversing the complete life-cycle of the product and the material from which it is made. Ultimately, the supplier must have an organization that can interact with the customer(s) at each product level. Author

07

PROCESS IMPROVEMENT METHODS AND TOOLS

Includes concurrent engineering, computer applications, measurement, quality assurance, quality function deployment, statistical process control, and taguchi methods.

A89-14538
THE ROLE OF DATA TRANSFORMATION IN TAGUCHI ANALYSIS
N. LOGOTHETIS (GEC Research, Ltd., Wembley, England) Quality and Reliability Engineering International (ISSN 0748-8017), vol. 4, Jan.-Mar. 1988, p. 49-61. refs
Copyright

This paper reports on the usefulness of data transformation in a proper application of the 'Taguchi method' for off-line quality control. With the joint aim of establishing a meaningful measure of performance variability and reducing the risk of incorrectly assuming no interactions in the performance model, a simple method of choosing appropriate data transformations is presented. This provides the basis for a suggested general procedure for carrying out Taguchi analyses. The technique is assessed by considering how it performs on data taken from previously published applications of the Taguchi method. Author

A89-14539
AN EXPLANATION AND CRITIQUE OF TAGUCHI'S CONTRIBUTIONS TO QUALITY ENGINEERING
GEORGE BOX, SOREN BISGAARD, and CONRAD FUNG (Wisconsin, University, Madison) Quality and Reliability Engineering International (ISSN 0748-8017), vol. 4, Apr.-June 1988, p. 123-131. Research supported by the University of Wisconsin. refs
(Contract NSF DMS-84-20968; DAAL03-87-K-0050)
(AD-A206829) Copyright

In the course of his career, Genichi Taguchi has emphasized the importance of statistically-designed experiments for improving the quality of the engineering design of products and processes. Attention is presently given to Taguchi's choice of statistical methods for solving such design problems; since these methods have frequently been found to be statistically inefficient and cumbersome, simpler and more modern data analysis methods are presently recommended. The rendering of products insensitive to component variation, the minimization of variations about a target value, and the method of accumulation analysis, are addressed. O.C.

A89-14541
BETTER THAN TAGUCHI ORTHOGONAL TABLES
DORIAN SHAININ and PETER SHAININ (Shainin Consultants, Inc., Manchester, CT) Quality and Reliability Engineering International (ISSN 0748-8017), vol. 4, Apr.-June 1988, p. 143-149. refs
Copyright

The advantages and disadvantages of the Taguchi orthogonal tables are evaluated with attention to their involvement of fractional factorials, in order to furnish a framework for the elucidation of an alternative approach whose development by D. Shainin began in the U.S. in 1952. It is noted that only 16 tests in a properly conducted full factorial test plan for two, three, or four variables are necessary for avoidance of spurious conclusion. The alternative variable-search pattern strategy, preceded by such objective clue-generating methods as 'multi-vary charting', can substantially improve the cost-effectiveness of the discovery of root-cause controlling variables through the use of five or more candidate factors; a sequential, rather than random, sequence of interchanging levels is employed. O.C.

A89-14542
CHARACTERIZING AND OPTIMIZING MULTI-RESPONSE PROCESSES BY THE TAGUCHI METHOD
N. LOGOTHETIS (GEC, PLC, Hirst Research Centre, Wembley, England) and A. HAIGH (Ferranti Electronics, Ltd., Microelectronics Centre, Oldham, England) Quality and Reliability Engineering International (ISSN 0748-8017), vol. 4, Apr.-June 1988, p. 159-169. refs
Copyright

The ability of the Taguchi technique to accurately characterize and successfully optimize complicated multiresponse processes with the minimum of experiments is demonstrated, provided that simple statistical techniques which can ensure valid and definitive results, are used. The usefulness of suitable data-transformations is noted, and a systematic procedure for establishing the optimal operating conditions and for carrying out confirmatory experiments is suggested. For the particular case detailed in this paper (which is typical of multiresponse processes) the Taguchi technique achieved an improvement in uniformity of a factor of 2, together with optimized process control. Author

A89-20475
THE USE OF TAGUCHI METHODS TO ESTABLISH A BROAD TECHNOLOGY DATABASE FOR SYSTEM-DESIGN APPLICATIONS IN THE DEFENSE INDUSTRY
JAMES F. KOWALICK and GEORGE HAYEK (Aerojet Ordnance Co., Tustin, CA) Aerojet Technology, vol. 4, no. 1, 1988, p. 40-42.
Copyright

A new application of Taguchi Methods - in the applied research and exploratory development stages of a product - is presented. Such a use implies prior knowledge of performance requirements for future products and of the expected ranges of product parameter levels. The usefulness of the resulting database justifies this application; it is a most efficient means of conducting research and development programs around an entire family of products. Many future system designs can be developed and transferred to production using the database from only one series of Taguchi experiments. With this approach extraordinarily large cost savings are realized over the traditional practice of having to conduct individual research or exploratory development projects for each new product requirement. Applying this approach to pyrotechnic defense products, the authors have found that significant savings in costs, time and personnel can be realized. Author

A89-36169
AN OBSERVATION ON TAGUCHI METHODS
WILLIAM A. GANTER (Production Automation, Inc., Boulder, CO) Quality and Reliability Engineering International (ISSN 0748-8017), vol. 5, Jan.-Mar. 1989, p. 3, 4. refs
Copyright

The statistical content of the Taguchi method has been an area of concern to statisticians. This paper focuses on the controversy surrounding the statistical content in Quinlan's (1985) application of this method. The Quinlan experiment combined both product design variables as materials and process variables to study the extrusion of speedometer cable casing for automobiles. K.K.

A89-46728#
STATISTICAL PROCESS CONTROL - A KEY ELEMENT OF TOTAL QUALITY MANAGEMENT
GAIL R. DIMITROFF (General Dynamics Corp., Space Systems Div., San Diego, CA) AIAA, ASME, SAE, and ASEE, Joint Propulsion Conference, 25th, Monterey, CA, July 10-13, 1989. 7 p.
(AIAA PAPER 89-2289) Copyright

The role of statistical process control in total quality management is discussed, focusing on the impact of statistical process control in shift from inspection to prevention, the control process, the determination of process capability, and continued improvement and innovation. Consideration is given to the implementation of statistical process control before and after design and in the transformation of the total quality management environment. The statistical tools used in process control and the steps for implementing statistical process control as a management tool are outlined. R.B.

A90-13271#
COMMERCIAL TELESCIENCE TESTBED OPERATIONS USING THE OUTPOST PLATFORM IN ORBIT - A CONCURRENT ENGINEERING APPROACH
JAMES R. GRADY, MICHAEL J. WISKERCHEN (Stanford University, CA), THOMAS C. TAYLOR, and WILLIAM A. GOOD (Global Outpost, Inc., Alexandria, VA) IAF, International Astronautical Congress, 40th, Malaga, Spain, Oct. 7-13, 1989. 11 p. refs
(IAF PAPER 89-039) Copyright

The Discovery Space Technology Center and Global Outpost, Inc. are participants in a program to define and develop prototypes of advanced integrated space operations technology applicable to wide variety of space systems. This cooperative research program will incorporate concurrent engineering methodology to develop advanced telescience capabilities with the goal of providing a more effective environment for space systems engineering and operations. Author

A90-13388#
THE ADVANCED LAUNCH SYSTEM - APPLICATION OF TOTAL QUALITY MANAGEMENT PRINCIPLES TO LOW-COST SPACE TRANSPORTATION SYSTEM DEVELOPMENT
M. G. WOLFE (Aerospace Corp., El Segundo, CA), T. G. ROTHWELL (USAF, Space Div., Los Angeles, CA), M. B. OLIVER (General Dynamics Corp., Space Systems Div., San Diego, CA), and D. A. ROSENBERG (ISX Corp., Thousand Oaks, CA) IAF, International Astronautical Congress, 40th, Malaga, Spain, Oct. 7-13, 1989. 12 p. refs
(IAF PAPER 89-229)

The Advanced Launch System (ALS) is a joint NASA/DOD program for the development of a vehicle with expanded payload capabilities and improved economics in the post-year 2000 time-frame. The two most significant initiatives being implemented within the ALS program are those of Total Quality Management (TQM) and the Unified Information System, designated 'Unis'; attention is presently given to the former. TQM encompasses a variety of techniques which minimize variability in the design, manufacturing, production, and operation of a system. TQM is being implemented in the current, system-definition phase of the ALS. O.C.

A90-13684#
APPLICATION OF COMPUTER SIMULATION/LIFE CYCLE COST MANAGEMENT TO MINIMIZE SPACE TRANSPORTATION SYSTEM COST
S. A. GREENBERG (USAF, Space Systems Div., Los Angeles Air Force Station, CA) and R. B. NICOL (Martin Marietta Corp., Denver, CO) IAF, International Astronautical Congress, 40th, Malaga, Spain, Oct. 7-13, 1989. 10 p.
(IAF PAPER 89-698)

An approach currently being undertaken in order to automate the design, test, and operation analysis function of the Space Transportation System (STS) is discussed. This Advanced Launch System Model (ALSYM) provides for an integrated total system simulation of all program phases. Life cycle cost management for STS is addressed by two basic approaches. The first involves changing the philosophy of the STS from a custom, performance-driven carrier to space 'truck'. The implementation of Total Quality Management (TQM) principles, which encompass simultaneous engineering, statistical process control, and variability reduction techniques, is examined as the second important way of attaining life cycle cost management. C.D.

A90-17876
TAGUCHI METHODS: APPLICATIONS IN WORLD INDUSTRY
A. BENDELL, ED., J. DISNEY, ED. (Trent Polytechnic, Nottingham, England), and W. A. PRIDMORE, ED. Berlin and New York, Springer-Verlag, 1989, 409 p. No individual items are abstracted in this volume.
Copyright

The off-line quality-control techniques developed by G. Taguchi and their industrial application are discussed in a collection of previously published papers by leading experts. A general overview of the Taguchi approach to quality engineering and parameter design is given, and individual sections are devoted to applications in electronics, information technology, process industries, the automotive industry, and plastics. Extensive diagrams, drawings, graphs, photographs, and tables of numerical data are included. T.K.

A90-21660
COMBINING TAGUCHI AND RESPONSE SURFACE PHILOSOPHIES - A DUAL RESPONSE APPROACH
G. GEOFFREY VINING (Florida, University, Gainesville) and RAYMOND H. MYERS (Virginia Polytechnic Institute and State University, Blacksburg) Journal of Quality Technology (ISSN 0022-4065), vol. 22, Jan. 1990, p. 38-45. refs
Copyright

It is shown that one can achieve the primary goal of the Taguchi philosophy of obtaining a target condition on the mean, while minimizing the variance, within a response surface methodologies framework. Through a parameter design method and the use of signal-to-noise ratios, Taguchi (1986) has approached the problem of considering both the mean and the variance of the characteristic of interest in the field of industrial statistics. This paper views both the mean and the variance as responses of interest. In this perspective, the dual response approach developed by Myers and Carter (1973) provides a more rigorous statistical methodology for achieving some target for the mean while also achieving some target for the variance. This approach is reviewed and applied to the Taguchi problem. An experiment studying the effect of speed, pressure, and distance upon a printing machine's ability to apply coloring inks on package labels is given as an example and illustrates the reasonability of the dual response approach. S.A.V.

A90-21661
THE EXACT RELATION OF TAGUCHI'S SIGNAL-TO-NOISE RATIO TO HIS QUALITY LOSS FUNCTION
SAEED MAGHSOODLOO (Auburn University, AL) Journal of Quality Technology (ISSN 0022-4065), vol. 22, Jan. 1990, p. 57-67. refs
Copyright

Taguchi's quality loss function and his signal-to-noise ratio are reviewed for the three types of static measurable performance characteristics. For the cases of 'smaller the better' and 'larger the better' quality characteristics, the precise relation is derived and tabulated. For the 'nominal the best' case, no exact relation could be found but a relation in inequality form is provided between the two Taguchi quality functions. Author

A90-25171#
NEW APPROACHES TO LAUNCH VEHICLE SYSTEM DEVELOPMENT
A. D. ABBOTT and J. O. MATZENAUER (Aerospace Corp., Los Angeles, CA) AIAA, Aerospace Engineering Conference and Show, Los Angeles, CA, Feb. 13-15, 1990. 8 p. refs
(AIAA PAPER 90-1811) Copyright

DOD and NASA seek launch capabilities that are more dependable and flexible in operation and which increase vehicle cargo lift capabilities. The Advanced Launch System (ALS) has been developing new approaches to system design and operation which promise increased operational capabilities at reduced costs. The joint ALS program is addressing these goals of reduced launch costs, efficient and flexible launch operations, and enhanced industrial productivity. The new approaches to space launch capability, development, and operation established by the ALS program are summarized. Modular, simplified designs reduce complexity, labor, and costs. Total quality management principles are being applied to build in quality from inception, match system capabilities to user needs, and achieve new economies. R.E.P.

A90-25500#
QUALITY FUNCTION DEPLOYMENT APPLIED TO AN ALS CRYOGENIC TANK

J. M. JUARES (Aerospace Corp., El Segundo, CA), ERIC GUNTHER, and JOHN TOOMEY (USAF, Space Systems Div., El Segundo, CA) AIAA, Aerospace Engineering Conference and Show, Los Angeles, CA, Feb. 13-15, 1990. 9 p. refs
(AIAA PAPER 90-1807)

Quality function deployment (QFD) is used to study the cryogenic tanks of advanced launch systems. QFD, a systems engineering tool used to compile customer needs and wants and translate them into design characteristics, is described. The QFD process for cryogenic tanks is accomplished with a software implementation of a series of tiered matrices and the guidance of a facilitator. It is suggested that the QFD process resulted in improved communications within and between organizations participating in the development of the cryogenic tank design concept. R.B.

A90-27775
DOD MICROCIRCUIT QUALIFICATION INNOVATION-QML

EDWARD B. HAKIM (U.S. Army, Electronics Technology and Devices Laboratory, Fort Monmouth, NJ) Quality and Reliability Engineering International (ISSN 0748-8017), vol. 6, Jan.-Mar. 1990, p. 47-50.
Copyright

The U.S. Department of Defense (DoD) has undertaken the task of modernizing the procedure for qualification of military high-quality/high-reliability microcircuits. This new approach, known as generic qualification, will develop a qualified manufacturers list (QML) which will permit certification of design, fabrication, assembly and packaging using an innovative approach. The objective is to have a single process flow on which both commercial and military product will be indistinguishable and only at qualification testing (which is revolutionary) will the differences be evident. The realization of this change is implementation of statistical process control (SPC) methodologies and total quality management (TQM). Author

A90-28322
CONCURRENT ENGINEERING - AN OVERVIEW FOR AUTOTESTCON

JAMES P. PENNELL, ROBERT I. WINNER, HAROLD E. BERTRAND, and MARKO M. G. SLUSARCZUK (Institute for Defense Analyses, Alexandria, VA) IN: AUTOTESTCON '89 - IEEE International Automatic Testing Conference, Philadelphia, PA, Sept. 25-28, 1989, Conference Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1989, p. 88-99. refs
(Contract MDA903-84-C-0031)
Copyright

A 1988 investigation of concurrent engineering and its role in weapons system acquisition is presented with some attention to testability implications. Included is the definition of concurrent engineering developed during the study. Some benefits reported include 60 percent reduction in product development time, elimination of two thirds of the inspectors in one factory, and several-million-dollars annual savings in chemical and soldering processes. The methods and technologies of concurrent engineering are outlined and the process management ideas, the computer support, and the problem-solving techniques are considered. A conceptual framework is offered to describe the continuing research needed in this area. I.E.

A90-30776
QUALITY FUNCTION DEPLOYMENT - A COMPREHENSIVE TOOL FOR PLANNING AND DEVELOPMENT

MICHAEL A. SCHUBERT (General Motors Corp., Dayton, OH) IN: NAECON 89; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 22-26, 1989. Volume 4. New York, Institute of Electrical and Electronics Engineers, Inc., 1989, p. 1498-1503. refs
Copyright

The central theme of the quality function deployment (QFD) methodology is identification of the 'voice of the customer' and using this voice as a basis for planning and development. This methodology has been applied successfully to products, services, and software. The QFD methodology and how this methodology furnishes a planning framework are examined. A brief history of QFD introduction and growth both in Japan and in the US is included. In addition, how QFD fits with or relates to systems engineering, design reviews, value analysis, and product process planning and analysis is discussed. I.E.

A90-30777#
STATISTICAL PROCESS CONTROL: REQUIREMENTS FOR SUCCESS - M.4 DESIGN QUALITY - PRODUCIBILITY AND PROCESS OPTIMIZATION

THOMAS J. FIESSINGER (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH) IN: NAECON 89; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 22-26, 1989. Volume 4. New York, Institute of Electrical and Electronics Engineers, Inc., 1989, p. 1509-1515.

The author describes the implementation of statistical process control (SPC) from a manager's perspective. He lays the groundwork for SPC both in terms of design and manufacturing, sets the stage for startup, and discusses what critical elements must be present for success. SPC's essential role in design and its relationship with manufacturing are thoroughly detailed. Traditional problem areas of SPC are covered including what process or product parameters need to be controlled, what charting techniques should be used, and how requirements should be levied on suppliers. A few case studies are presented on the successes and failures of several companies' efforts to start an SPC program. Finally, the real and long-term benefits of SPC, including increased communications among all departments, better insights into cost-reduction opportunities, variability-reduction opportunities, continuous quality improvement, and a more effective design-manufacturing interface, are addressed to show why this methodology has great potential for success in today's extremely competitive global environment. I.E.

A90-30778#
SYSTEM DESIGN WITH QUALITY ENGINEERING

ED POHL, DAVE ROBINSON, and JEFF JACOBS (USAF, Institute of Technology, Wright-Patterson AFB, OH) IN: NAECON 89; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 22-26, 1989. Volume 4. New York, Institute of Electrical and Electronics Engineers, Inc., 1989, p. 1524-1528. refs

The authors discuss the use of quality function deployment during the conceptual design of a kinesthetically controlled vehicle. Specifically, the techniques were used to increase the inherent dynamic stability of the vehicle through proper placement of critical components. The resulting design was robust to operator size and skill level as well as on-board weapon system and external-environment-induced oscillations. In the present work, particular emphasis is placed on parameter design, the goal of which is to take an organized approach to design tradeoffs so that the overall system performance is maximized while keeping costs at a minimum. Cost is incurred whenever the desired performance is not achieved. The identification of all applicable parameters that affect the performance of the system is discussed. The parameters fall into two broad classes: design parameters and noise parameters. I.E.

A90-30783
STATISTICAL PROCESS CONTROL IN SOFTWARE QUALITY ASSURANCE

W. STEVEN DEMMY (Wright State University, Dayton, OH) and ARTHUR B. PETRINI (Entek, Inc., Fairborn, OH) IN: NAECON 89; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 22-26, 1989. Volume 4. New York, Institute of Electrical and Electronics Engineers, Inc., 1989, p. 1585-1590.
Copyright

The author shows how SPC (statistical process control) techniques can be used to improve the quality and productivity of large-scale software development. They describe the major elements of a SPC system and consider the use of SPC in

manufacturing. General criteria for selecting SPC candidates are presented. The steps required to apply SPC to software development activities are described, and activities that appear to be particularly good SPC candidates are identified. Major advantages of the SPC approach to software development are summarized. I.E.

A90-30784
COST OF QUALITY AS A BASELINE FOR TOTAL QUALITY MANAGEMENT (TQM) IMPLEMENTATION
WILLIAM J. GRUNENWALD (ADM Consultants, Inc., Fairborn, OH) IN: NAECON 89; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 22-26, 1989. Volume 4. New York, Institute of Electrical and Electronics Engineers, Inc., 1989, p. 1611-1613.
Copyright

The author presents the concept of using cost of quality as an effective tool in implementation of a total-quality-management (TQM) approach. The essence of TQM is defined as the search for opportunities for improvement. TQM implementation and the need for baseline are discussed. The requirements for establishing a baseline are discussed, with the focus on cost of quality. The use of the cost-of-quality baseline is detailed, with emphasis on its continuous value. The establishment of certain Åuniversal truths' which address the use of TQM and cost of quality in a given environment is examined. I.E.

A90-30810
SPC FOR SHORT PRODUCTION RUNS
CHAD C. CULLEN and DAVIS R. BOTHE (International Quality Institute, Inc., Northville, MI) IN: NAECON 89; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 22-26, 1989. Volume 4. New York, Institute of Electrical and Electronics Engineers, Inc., 1989, p. 1960-1963.
Copyright

A control chart designed especially to provide statistical process control (SPC) for short production runs has been developed. This chart allows the operator to plot different part numbers on the same chart, thus considerably reducing the required amount of paperwork and time spent in looking for the right chart. In addition, since all the information concerning the process is now on the same chart, any time-related changes in the process can be more easily detected. With some of the more advanced short-run techniques, even part numbers with different characteristics can be plotted on the same chart. Multiple process streams, subgroups with different sample sizes, and flexible machining centers (with multiple characteristics per part) can all be charted together. I.E.

A90-31676
AIAA/ADPA/NSIA NATIONAL TOTAL QUALITY MANAGEMENT SYMPOSIUM, 1ST, DENVER, CO, NOV. 1-3, 1989, TECHNICAL PAPERS
Washington, DC, American Institute of Aeronautics and Astronautics, 1989, 430 p. For individual items see A90-31677 to A90-31742.
Copyright

Topics presented include reliability and maintainability beyond the year 2000, building in total quality management, variability reduction in rocket engine performance, total quality management and defense, using process improvement to introduce TQM, tinning machine experimental design, design automation for concurrent engineering, managing the TQM cultural change, engineering drawing quality, and total quality management in design. Attention is also given to improving quality and productivity in the workplace, measuring the cost of quality of business processes, total quality management planning, the critical path method and the process of a project, the language of TQM, the space-based interceptor program, and TQM improvement of combat support training. R.E.P.

A90-31677#
R&M 2000 - THE STRATEGIC PROCESS IN THE TQM MOVEMENT
JAMES F. GUZZI (USAF, Systems Command, Andrews AFB, MD) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 1-3. refs
(AIAA PAPER 89-3181)

The 'back to basics' approach supported by total quality management (TQM) in the acquisition process is presented. To demonstrate the conceptual relationships defined by the reliability and maintainability (R&M) 2000 process and TQM, an R&M quality team concept is used to design systems that break less and are easily repaired without a costly and complex support infrastructure. The method has been used successfully in the design of the C-17A airlifter. The requirements include, as a corollary to performance, the aspects of mobility, survivability, manpower, and cost limitations. These added factors demand that the system acquisition process include plans to focus on R&M and identify the necessary TQM initiatives to improve the weapon systems' built-in R&M. R.E.P.

A90-31683#
SHORT-TERM BENEFITS OF CONCURRENT ENGINEERING
PAUL J. BRADLEY (Martin Marietta Corp., Denver, CO) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 41-45. refs
(AIAA PAPER 89-3190) Copyright

The focus of the DOD on total quality management has motivated many companies to evaluate the advantages of incorporating engineering techniques into their design and production organizations. Concurrent engineering has been defined as a systematic approach to the integrated, concurrent design of products and their related processes, including manufacture and support. This approach is intended to cause the developers, from the onset, to consider all elements of the product life cycle from conception through disposal, including quality, cost, schedule, and user requirements. When applying concurrent engineering techniques, it may be necessary to wait a long time. However, while waiting to realize the long-term benefits, the manager can realize many short-term benefits from concurrent engineering. R.E.P.

A90-31684#
CONCURRENT ENGINEERING APPLIED TO AN SDIO TECHNOLOGY PROGRAM
RICHARD H. RAWCLIFFE and RICK L. RANDALL (Aerojet ElectroSystems, Azusa, CA) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 46-53.
(AIAA PAPER 89-3191) Copyright

The paper examines a key concurrent engineering construct involving the use of multifunction teams that employ quality function deployment to enhance the definition of a solid set of product and process requirements based on the wishes of the customer. Aerojet has been tailoring concurrent engineering constructs over the past year and has chosen SPIRIT 111 as a pilot for testing these new constructs because of the potential benefits in reducing cost and improving schedule while providing a state-of-the-art high quality product. The multifunction teams address the issues that exist, including thermal, mechanical, electrical, environmental, performance, modularity, and interchangeability. Lessons learned that may help those considering concurrent engineering and quality function deployment for prototypes or production are summarized. R.E.P.

A90-31689#
USING PROCESS IMPROVEMENT TO INTRODUCE TQM
PETER N. WEBER and ELLEN R. DOMB (Aerojet ElectroSystems, Azusa, CA) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989,

Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 83-88.
(AIAA PAPER 89-3202) Copyright

Product improvement has proven to be an excellent way of introducing total quality management (TQM) because of the commonality of principles, in that both require customer-defined quality, employee involvement, and continuous improvement. The establishment of a TQM organization structure that separates the 'process improvement' from 'process ownership' has insured that a high degree of objectivity is maintained in the process improvement. Involvement by all levels of management in prioritizing process improvement efforts and approving team recommendations has guaranteed the necessary support for process improvement teams (and by extension TQM) to be successful. R.E.P.

A90-31691#
APPLYING TQM TO SOFTWARE DEVELOPMENT - CONTEL'S PROCESS ENHANCEMENT PROGRAM
JUDAH MOGILENSKY (Contel Federal Systems Sector, Chantilly, VA) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 98-104. refs
(AIAA PAPER 89-3204) Copyright

A process enhancement program has been initiated as a vehicle for applying the concepts and principles of total quality management to software development. This process encompasses four task areas: a policies, procedures, and standards area; a tools and environment area; an education and training area; and a measurement and estimation area. Joint integrated progress in all of these areas is seen as the key to success of this program. R.E.P.

A90-31694#
DESIGN AUTOMATION FOR CONCURRENT ENGINEERING
G. A. FRANK, J. B. CLARY, and B. L. DOVE (Research Triangle Institute, Research Triangle Park, NC) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 115-120. refs
(AIAA PAPER 89-3207) Copyright

Concurrent engineering requires rapid and accurate communication between a variety of specialists and encourages the use of quantitative experiments early in the design process. These requirements will lead to increased commitments to developing and maintaining formal models of the system throughout the system life cycle. The corresponding challenge for concurrent engineering tool builders is providing a totally integrated environment. Each specialist can then see a view of the common model of the system and can evaluate the system model in context at any stage of development. Tool developers are responding to this challenge by beginning to integrate the tools needed for concurrent engineering. R.E.P.

A90-31695#
THE CHANGING ROLE OF QUALITY ASSURANCE UNDER TQM
R. E. SANSOM (TRW, Inc., Defense Systems Group, Redondo Beach, CA) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 121, 122.
(AIAA PAPER 89-3208) Copyright

The new model of assuring quality is one that gives added responsibilities to the developers and different ones to the classical quality assurance (QA) organizations. It is one in which 'quality' is not detached from the products and processes by partitioning off inspections and checks as 'quality' activities, but rather becomes an integral part of the product and processes. QA's role is shifted to one of 'process integrity' wherein analysis, advice, and consultation are objectively provided to help improve and strengthen the processes. In addition, QA would play a major role in tailoring the required regulations and standards so that they benefit the product development. R.E.P.

A90-31697#
PROCESS MANAGEMENT - A TQM APPROACH FOR MIDDLE MANAGERS
STEVE HARRINGTON (Control Data Corp., Government Systems Group, Minneapolis, MN) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 126-135.
(AIAA PAPER 89-3210) Copyright

A workable 'middle-out' strategy to install TQM from the middle of an organization is presented and then illustrates the strategy with a case study from Control Data's Government Systems UYH-3 Program. The process management initiatives undertaken by the project manager's team were effective. The team defined improvement policy, deployed the improvements into the program with workable detail, and implemented the improvements using a team approach. This appears to be a powerful management strategy for middle-level managers who coordinate many functional tasks and who have risk support from their own manager. R.E.P.

A90-31700#
MAINTAINABILITY - A CRITICAL LINK IN TQM
SANDRA L. KAMMERT (Martin Marietta Corp., New Orleans, LA) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 148-151. refs
(AIAA PAPER 89-3213) Copyright

Maintainability is the area of lifetime product support having the greatest potential for substantial cost savings in terms of manpower, supply support, and technical documentation. The quality of maintainability must be emphasized as is the quality of the design. Total quality management, as an initiative for performance and product improvement, incorporates the principles and tools of concurrent engineering. Examples where the quality of product maintainability was deficient in the hands of the user, the ultimate judge on how well the job is done, are addressed. R.E.P.

A90-31710#
TOTAL QUALITY MANAGEMENT OVERVIEW (TQMO) WITH MULTIPLE PERSPECTIVE ANALYSIS (MPA)
R. MICHAEL BACKES (Martin Marietta Corp., Astronautics Group, Denver, CO) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 204-208.
(AIAA PAPER 89-3232) Copyright

The total quality management overview (TQMO) analysis tool is described. TQMO is a comprehensive real-time qualitative and quantitative nonconformance analysis yielding basic statistical performance assessments. The task set in defining the TQMO was to put into perspective (by association of like groups and in simplified fashion) the supporting data for the '7 w' elements (who, what, where, when, why, with, and wherefore). In this way, the TQMO architecture evolved into a multiple-perspective analysis. R.E.P.

A90-31716#
TOTAL QUALITY MANAGEMENT APPLIED TO PROJECT PLANNING AND CONTROL
CHERYL L. DIETZ (Martin Marietta Data Systems, Englewood, CO) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 229-233.
(AIAA PAPER 89-3242) Copyright

The project planning and control system study aimed at reducing

project management costs and improving project performance is examined. The total quality management concept is applied to the project management/status reporting framework. A global project management process with an open structure to different levels of requirements and standards is proposed. It includes independent project management techniques and evaluation of planning technologies. Software requirements based on standard project planning and control devices are developed. Schematics of the project management/management reporting process and the developed network configuration are provided. I.F.

A90-31717#
IMPROVEMENT OF RECEIVING OPERATIONS EFFICIENCY THROUGH TOTAL QUALITY MANAGEMENT
JOHN E. DIETZ (Martin Marietta Corp., Astronautics Group, Denver, CO) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 234-241.
(AIAA PAPER 89-3243) Copyright

Total quality management (TQM) is applied to the procurement and receiving system to determine if it is compatible with the planned on-line procurement system. The basic features of the on-line system, SUPPORT (System Utilization for Procurement, Planning, Ordering and Requirements Tracking), are described. Statistical samples of the procurement operation are obtained using fundamental management tools. Analysis of the data reveal that the existing procurement and receiving process is not compatible with the on-line system and will not maximize efficiency. A schematic of the receiving process is presented. I.F.

A90-31722#
MAKING TQM WORK THROUGH THE VARIABILITY REDUCTION PROCESS
BRUCE A. JOHNSON (USAF, Washington, DC) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 303-307. refs
(AIAA PAPER 89-3259)

The Variability Reduction Process (VRP) is a means of improving product performance and reliability while reducing time and cost. The best way to reduce the effects of variation is to eliminate the causes of variation or by developing designs which are insensitive to variation. Employing statistical process control (SPC) and having capable manufacturing process is good but not sufficient. Often, the causes of variability are difficult to remove or control. It is important to develop robust production processes that are insensitive to the manufacturing environment, and robust designs that are insensitive to the operational environment. For the concepts of VRP to succeed, management must create a supportive atmosphere for continuous improvement. Author

A90-31723#
PERSPECTIVE: WORK MEASUREMENT IS WORK MANAGEMENT - A KEY FACTOR IN TQM PHILOSOPHY
WILLIAM L. JOHNSTONE (Martin Marietta Corp., Astronautics Group, Denver, CO) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 308, 309.
(AIAA PAPER 89-3641) Copyright

This paper will communicate that work measurement is a valuable tool to be used by production teams to identify issues impacting production and to facilitate effective corrective action or 'process improvement'. The paper will emphasize that asking the question 'Why didn't we meet standard?' is a positive first step to identifying a problem with the process, thus allowing the team to affect process correction and improvement. The blending of work measurement and TQM is found to be a win, win situation. Author

A90-31725#
STATISTICAL METHODS FOR PRODUCTION IMPROVEMENT
KATHRYN G. LANIER (Martin Marietta Electronic Systems, Orlando, FL) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 316-319.
(AIAA PAPER 89-3645) Copyright

Statistical Methods for Production Improvement (SMPI), the bridge between the Total Quality Management (TQM) philosophy and continuous improvement in production areas, was begun at Martin Marietta Electronic Systems in September 1988. The program's aim was to find new ways to improve yield, reduce rework, and identify areas of potential improvement in a final assembly and test-oriented facility. SMPI provides an approach to evaluating technical and cost alternatives in a preemptive and disciplined manner, using long-standing statistical techniques and Kepner-Tregoe problem-solving guidelines. This approach has proved highly successful at Martin Marietta Electronic Systems and has resulted in increased yield, significant cost savings, and reduction in product build time. This paper discusses the methodology for applying statistical tools in the production environment and focuses on phases of project identification, prioritizing, selection, analysis, and implementation. Author

A90-31727#
TOTAL QUALITY MANAGEMENT AND DATA SECURITY
STEVEN L. MORRIS (Martin Marietta Data Systems, Englewood, CO) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 327-329.
(AIAA PAPER 89-3650) Copyright

The relation between total quality management (TQM) and data security is examined. The objective of TQM and data security is to train and educate employees to their responsibilities toward data security. Data security goals and risks are discussed. I.F.

A90-31733#
UNIVERSAL DATA CLASSIFICATION - THE KEY TO ENHANCED COMMUNICATIONS IN A TQM ENVIRONMENT
RONALD L. SCHULDT (Martin Marietta Corp., Astronautics Group, Denver, CO) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 363-372.
(AIAA PAPER 89-3659) Copyright

The development of a universal standard for product data is examined. A solution concept that is a neutral structure which logically sorts various product data definitions is proposed. In this universal product data classification structure the product data are grouped based on physical, functional, or programmatic uses of the product. The key data types of the structure are described. A diagram of the classfication structure is presented. The benefits of using this structure are discussed. I.F.

A90-31740#
INVENTORY ACCURACY, AN IMPORTANT ELEMENT OF TOTAL QUALITY MANAGEMENT (TQM)
LEROY R. PETERS (Martin Marietta Corp., Astronautics Group, Denver, CO) IN: AIAA/ADPA/NSIA National Total Quality Management Symposium, 1st, Denver, CO, Nov. 1-3, 1989, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1989, p. 411-413.
(AIAA PAPER 89-3696) Copyright

Problems associated with a lack of inventory accuracy in manufacturing are discussed. Three methods for improving inventory accuracy quickly and inexpensively, cycle counting, location audits, and control groups, are described. It is noted that combined utilization of these methods results in inventory accuracies greater than 90 percent within the first 6 months and accuracies of greater than 95 percent after 12 months. I.F.

A90-40576#
APPLICATION OF TAGUCHI METHODS TO COMPOSITE CASE PROBLEMS
J. R. BIAGIONI, JR. (Aerojet, Propulsion Div., Sacramento, CA) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference, 26th, Orlando, FL, July 16-18, 1990. 21 p. refs
(Contract F04704-86-C-0092)
(AIAA PAPER 90-1969) Copyright

This paper describes a failure-modes investigation approach that successfully solved a series of failures that were occurring in rocket motor cases during manufacture. Because of the materials used in fabricating the case, it was assumed that moisture was the principal cause of the observed failure modes; however, a combination of factors was found to be at fault, primarily through the successful incorporation of the experimental design and analysis technique offered by Taguchi methods. This technique uses orthogonal arrays, analysis of variance, and signal-to-noise analysis in a manner that permitted the successful completion of this failure investigation with only 63 designed experiments instead of the more than 13,000 that would have been required using full factorial arrays. The result: no recurrence of the failure modes that were causing a 12-percent loss rate during case manufacture and the avoidance of major capital expenditures considered necessary to solve the problems. Author

A90-40606#
FULL AUTHORITY DIGITAL ELECTRONIC ENGINE CONTROL SYSTEM PROVIDES NEEDED RELIABILITY
DAVID A. FIEBIG (Pratt and Whitney Group, West Palm Beach, FL) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference, 26th, Orlando, FL, July 16-18, 1990. 6 p.
(AIAA PAPER 90-2037) Copyright

Recent advances in digital electronic control systems for military aircraft engines are discussed, with special attention given to the control system of the F100-PW-100 engine servicing the F-15 aircraft. It is shown that the successful implementation of an improved design process, combined environmental reliability testing, accelerated mission engine testing, field service evaluations, manufacturing process reviews, environmental stress screening, and statistical process control resulted in dramatic improvements in engine control system reliability through the 1980s. Further improvements are anticipated from the new-technology dual-channel full-authority electronic controls and successfull implementation of programs such as the propulsion power system integrity program, concurrent engineering, and total quality management. I.S.

A90-42169#
JFS190 TURBINE ENGINE PERFORMANCE OPTIMIZED USING TAGUCHI METHODS
K. WHELESS, M. F. MALAK (Allied-Signal Aerospace Co., Garrett Auxiliary Power Div., Phoenix, AZ), and R. KIKER (USAF, San Antonio Air Logistics Center, Kelly AFB, TX) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference, 26th, Orlando, FL, July 16-18, 1990. 13 p.
(AIAA PAPER 90-2419) Copyright

Solving a performance problem with overhauled jet fuel starters (JFS190s) for the F-15 aircraft by using Taguchi methods is presented. These problems were due to rejections caused by high exhaust gas temperatures and low horsepower. To optimize opposing requirements of minimum exhaust gas temperatures and maximum horsepower, parameter design was used. Four arrays were run during the 24 tests performed. High exhaust gas temperature solutions were identified with the first array while low horsepower necessitated the second, third, and fourth arrays for definite results. Finally, five components are identified as factors with significant effects. R.E.P.

A90-42204#
STATISTICAL EXPERIMENTAL DESIGN AND ITS ROLE IN AEROSPACE VEHICLE DESIGN EFFORTS
J. A. SCHNACKEL and R. H. DOVENMUEHLE (Martin Marietta Corp., Astronautics Group, Denver, CO) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference, 26th, Orlando, FL, July 16-18, 1990. 11 p. refs
(Contract F04701-88-C-0109)
(AIAA PAPER 90-2692) Copyright

The particular application and benefits of statistical experimental techniques to aerospace propulsion analysis are reviewed. Total Quality Management has become the main initiative in commercial, industrial, and government organizations. A method for multivariate analysis in the experimental design process was provided and focussed variables to optimum levels. Statistical experimental design has identified many benefits from the propulsion trade study application. Information was enhanced by the addition of pareto and interaction data. As illustrated, the 27 case application did not provide significant time savings, while the nine-case trade showed a 33 percent reduction in time savings. Both instances show an improved understanding of total system effects. R.E.P.

A90-42817#
ALS - A UNIQUE SYSTEM APPROACH
STEVEN E. SASSO and STEVEN J. ISAKOWITZ (Martin Marietta Astronautics Group, Denver, CO) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference, 26th, Orlando, FL, July 16-18, 1990. 12 p.
(AIAA PAPER 90-2703) Copyright

The principal features of the Advanced Launch System (ALS) that set it apart from past development work are presented, and some of the present achievements are discussed. The ALS is a flexible space launch system that is to provide the timely delivery of a wide range of payloads into orbit at a lowered cost. Design of a modular family of vehicles is based on the usage of advanced technology and concurrent engineering as well as operational efficiency. Analytical tools and principles of Total Quality Management, used in a disciplined systems-engineering process, were employed to develop the design approach. R.E.P.

A90-45306
PRODUCT DESIGN OPTIMIZATION USING TAGUCHI METHODS WITH FINITE ELEMENT ANALYSIS
G. PILON (Canadian Supplier Institute, Inc., Rexdale, Canada) IN: Failure prevention and reliability - 1989; Proceedings of the Eighth Biennial Conference, Montreal, Canada, Sept. 17-21, 1989. New York, American Society of Mechanical Engineers, 1989, p. 145-151. refs
Copyright

Product design is often optimized using finite element analysis with computer aided design. This is usually done by changing factors in an unstructured manner, one-factor-at-a-time. The optimum design obtained in this way is often sensitive to manufacturing variation. This paper demonstrates a methodology for using Taguchi Methods to explore the finite element model space in a structured manner which is efficient and economic. Forthermore, the optimum is desensitized to factors such as manufacturing variation. Author

A90-46927#
THE IMPACT OF TOTAL QUALITY MANAGEMENT (TQM) AND CONCURRENT ENGINEERING ON THE AIRCRAFT DESIGN PROCESS
DANIEL P. SCHRAGE (Georgia Institute of Technology, Atlanta) IN: Vertical Lift Aircraft Design Conference, San Francisco, CA, Jan. 17-19, 1990, Proceedings. Alexandria, VA, American Helicopter Society, 1990, 21 p. refs

In the aerospace industry results from a recent American Institute of Aeronautics and Astronautics (AIAA) quality survey showed a broad-based recognition that quality is a major engineering issue, that basic systems engineering processes as presently practiced need to be improved, that there are significant shortfalls in engineering skills and basic engineering education needed to support quality improvement, and that AIAA as a professional society should get more involved in this issue. This paper will attempt to put in perspective the impact of TQM and concurrent engineering on the aircraft design process and review

some of the essential features for successful incorporation. Author

A90-49109#
TAGUCHI METHODS IN CONCEPTUAL DESIGN FOR LIFE CYCLE COST
S. A. INGALLS, C. L. MARTIN, W. MAYVILLE, J. E. ROGAN, and M. SHUBERT (Georgia Institute of Technology, Atlanta) AIAA, AHS, and ASEE, Aircraft Design, Systems and Operations Conference, Dayton, OH, Sept. 17-19, 1990. 8 p. refs
(AIAA PAPER 90-3222) Copyright

Parametric life cycle cost (LCC) models may be utilized in conceptual design to calculate LCC as a basis for comparison of diverse configuration, production, and support concepts. Cases from conceptual design sizing are employed to explain the basic concepts in Taguchi methodologies. Taguchi methods are used in two conceptual design studies to evaluate the effect of conceptual design choices on the expected value and variability in LCC. It is concluded that the curve-fitting approach to life cycle cost estimation wastes valuable data concerning the relationship between design options and the variability in LCC. Jaynes maximum entropy principle and Bayes theorem are proposed as alternative techniques. While Taguchi's methodologies and philosophy seem to be a useful tool for bringing downstream LCC into early conceptual design, a more sophisticated approach to the utilization of statistical procedures in aircraft design is required to achieve these benefits. R.E.P.

A90-50502
DISTRIBUTED CONCURRENT ENGINEERING COMPUTATION ON A NETWORK OF MICROCOMPUTERS
J. B. MCINNIS and W. H. ELMARAGHY (Western Ontario, University, London, Canada) Engineering with Computers (ISSN 0177-0667), vol. 6, Summer 1990, p. 145-152. Research supported by the Ontario's Premier Council University Research Incentive Fund. refs
Copyright

A programming method that facilitates interworkstation communications on a local area network (LAN) of microcomputers has been developed. Communications are managed using a set of common access status and data files, which are written to and read from the file server hard disk. Use of this programming method permits the work load associated with large computational problems to be distributed to various workstations connected to a LAN for concurrent processing, and has resulted in substantial solution time savings in problems that have been run. The paper describes the basic principles underlying the distributed processing technique that was developed and presents several example problems that were run to test the technique and develop benchmark results for a particular LAN configuration. Author

A90-52851
A SIMPLE METHOD FOR OBTAINING RESOLUTION IV DESIGNS FOR USE WITH TAGUCHI'S ORTHOGONAL ARRAYS
KIMBALL E. BULLINGTON (Micro Motion, Inc., Boulder, CO), JAMES N. HOOL, and SAEED MAGHSOODLOO (Auburn University, AL) Journal of Quality Technology (ISSN 0022-4065), vol. 22, Oct. 1990, p. 260-264. refs
Copyright

A concern expressed in the literature about Taguchi's methods for experimental design is that many such designs are not optimal in the sense that they are not the maximum resolution possible for a given number of main effects and array size. This paper addresses that concern by demonstrating that Taguchi base-two orthogonal arrays consist of fold-over designs and the two-factor products of fold-overs. The result of recognizing this characteristic is a simple method for guaranteeing resolution IV Taguchi designs. This allows the experimenter to retain the ease of design that using Taguchi's orthogonal arrays affords, and at the same time avoid aliasing main effects with two-factor interactions. Author

A91-10139#
RISK MANAGEMENT INTEGRATION WITH SYSTEM ENGINEERING AND PROGRAM MANAGEMENT
GEORGE J. VLAY (Ford Aerospace Corp., Palo Alto, CA) and LAWRENCE T. BREKKA (BDM International, Inc., McLean, VA) AIAA, Space Programs and Technologies Conference, Huntsville, AL, Sept. 25-27, 1990. 12 p. refs
(AIAA PAPER 90-3773) Copyright

The integration of computerized risk management into a system engineering and program management processes is discussed. Program management using Total Quality Management (TQM) is reviewed, and the ways that such management can be improved by computerized risk management are shown using the BDM Risk Analysis and Management System (BRAMS). The application of BRAMS to assess the risk of achieving launch on schedule of a hypothetical satellite system is examined. The role of TQM in system engineering management is discussed. C.D.

A91-10223#
ALS - A UNIQUE DESIGN APPROACH
ROGER A. CHAMBERLAIN (Martin Marietta Astronautics Group, Denver, CO) AIAA, Space Programs and Technologies Conference, Huntsville, AL, Sept. 25-27, 1990. 12 p.
(AIAA PAPER 90-3897)

An advanced launch system (ALS), which is intended to be flexible and to deliver a wide range of payloads at a reduced cost, is discussed. The ALS concept also features total quality management, modular subsystems, standardized interfaces, standardized missions, and off-line payload encapsulation. The technological improvements include manufacturing of dry structures, use of composite materials, adaptive guidance and control systems, and laser-initiated radar systems. The operational improvements range from paperless management, to rocket engine leak detection devices and automated ground operations. B.P.

A91-10908*# NASA Space Station Program Office, Reston, VA.
SPACE STATION FREEDOM - CONFIGURATION MANAGEMENT APPROACH TO SUPPORTING CONCURRENT ENGINEERING AND TOTAL QUALITY MANAGEMENT
RAYMOND B. GAVERT (NASA, Space Station Freedom Program Office, Reston, VA) IN: Space Logistics Symposium, 3rd, Colorado Springs, CO, Apr. 30-May 2, 1990, Proceedings. Huntsville, AL, Society of Logistics Engineers, 1990, 13 p. refs
Copyright

Some experiences of NASA configuration management in providing concurrent engineering support to the Space Station Freedom program for the achievement of life cycle benefits and total quality are discussed. Three change decision experiences involving tracing requirements and automated information systems of the electrical power system are described. The potential benefits of concurrent engineering and total quality management include improved operational effectiveness, reduced logistics and support requirements, prevention of schedule slippages, and life cycle cost savings. It is shown how configuration management can influence the benefits attained through disciplined approaches and innovations that compel consideration of all the technical elements of engineering and quality factors that apply to the program development, transition to operations and in operations. Configuration management experiences involving the Space Station program's tiered management structure, the work package contractors, international partners, and the participating NASA centers are discussed. R.E.P.

A91-10923#
THE POTENTIAL FOR CONCURRENT ENGINEERING IN SPACE SYSTEMS DEVELOPMENT - INDUSTRY PERSPECTIVE
ERICH HAUSNER (TRW Space and Technology Group, Redondo Beach, CA) IN: Space Logistics Symposium, 3rd, Colorado Springs, CO, Apr. 30-May 2, 1990, Proceedings. Huntsville, AL, Society of Logistics Engineers, 1990, 4 p.

It is shown how mutually beneficial linkage may be established through shared requirements development and how concurrent engineering (CE) may be accomplished by a contractor. CE offers

advantages not only to industry as a discipline to enhance system design, but also to government as a discipline to identify concise, clear and meaningful system requirements. If the requirements definition process is sufficiently rigorous and compatible, there should be a smooth transition between government and contractor requirements analyses, generation and implementation. It is concluded that with the current declining defense budgets and rising costs and complexities of weapons systems, CE offers a streamlined process of requirements definition that benefits both industry and government. R.E.P.

A91-10937#
APPLYING QFD TECHNIQUES TO AEROSPACE SUPPORTABILITY
RAMON CHI (Rockwell International Corp., Downey, CA) IN: Space Logistics Symposium, 3rd, Colorado Springs, CO, Apr. 30-May 2, 1990, Proceedings. Huntsville, AL, Society of Logistics Engineers, 1990, 12 p.

Quality function deployment (QFD) is described, and it is shown how beneficial it can be to the logistics and supportability development process. QFD procedures are illustrated using a hypothetical aerospace design. QFD is defined as a technique or discipline that provides a means of translating the user's requirements into the appropriate technical requirements at each stage from research and development through engineering and production, and finally to product deployment and marketing. The goal is to ensure a competitive edge by lowering the cost, improving the quality, and reducing the product's development time. R.E.P.

A91-14478
QUALITY THROUGH DESIGN: EXPERIMENTAL DESIGN, OFF-LINE QUALITY CONTROL AND TAGUCHI'S CONTRIBUTIONS
N. LOGOTHETIS (General Electric Co., PLC, Hirst Research Centre, Wembley, England) and HENRY P. WYNN (City University, London, England) Oxford and New York, Oxford University Press (Oxford Series on Advanced Manufacturing 7), 1989, 474 p. refs
Copyright

A text on experimental design and off-line quality control is presented, emphasizing the contribution to these fields of Taguchi methodologies. The general topics considered include: fundamentals of data analysis, design and analysis techniques for experiments, response surface methods and designs, off-line quality control principles, and simulation and tolerance design. C.D.

A91-14748#
BUILDING QUALITY INTO THE PRODUCT - AN AEROSPACE APPLICATION
BRUNO J. JAMBOR and NANCY W. ABRAMSON (Martin Marietta Astronautics Group, Denver, CO) AIAA, Total Quality Management Symposium, 2nd, Baltimore, MD, Nov. 14-16, 1990. 5 p.
(AIAA PAPER 90-4045) Copyright

A process is presented that integrates quality function development (QFD) and designed experiments into one continuous process of robust design that ensures close mapping of requirements into parametric design. The process emphasizes the necessity to decompose the QFD to the level of critical parts and thereby facilitates the transition to parameter design by choosing control factors from the group of critical parts. In addition, this process necessitates close teamwork between designers and management and a firm commitment to the process, which may require abandonment of established design paradigms. R.E.P.

A91-17236
INTEGRATED DESIGN ENVIRONMENT-AIRCRAFT (IDEA) - AN APPROACH TO CONCURRENT ENGINEERING
STEPHEN A. MEYER (McDonnell Douglas Helicopter Co., Mesa, AZ) IN: AHS, Annual Forum, 46th, Washington, DC, May 21-23, 1990, Proceedings. Volume 1. Alexandria, VA, American Helicopter Society, 1990, p. 509-522. refs
Copyright

The evaluation of the interrelationship between subsystems and design disciplines such as reliability, producibility, maintainability and human factors engineering, and life cycle design criteria during development is an example of the systems approach to design called concurrent engineering. IDEA enables rapid access of disparate design information and establishes a substantiation trail for design decisions, and allows rapid communication of product changes to other members of the development team and provides an efficient, paperless, integrated database for the entire design team to employ during fullscale development. R.E.P.

A91-17303
OPTIMIZING WIRE CRIMPS USING TAGUCHI DESIGNED EXPERIMENTS
TIMOTHY ZERBY, ANASTASIA DRAGUN, and LINDA GRAU (McDonnell Douglas Helicopter Co., Mesa, AZ) IN: AHS, Annual Forum, 46th, Washington, DC, May 21-23, 1990, Proceedings. Volume 2. Alexandria, VA, American Helicopter Society, 1990, p. 1283-1292.
Copyright

In order to reduce the number of electrical connector problems on the Apache helicopter, Taguchi methods are used for identifying the factors that contribute to a good quality connection. Bad wire-to-pin crimps are identified as a major problem, a work group is formed with people from various disciplines that the problem affects, the problem is further defined by the group, and experimental control factors including crimp type and length, strip length, window centering, operators, and wire vendors are identified. Experimental procedures are laid out and conducted, and the experimental data is then analyzed. Crimp depth is identified as the major contributor to the strength of a crimped connection, while it is observed that undercrimping yields the highest pull-strength response and tolerance to different wire brands. V.T.

A91-19399#
IMPROVING FACILITY EFFECTIVENESS TO REDUCE TESTING COST
RAMESH C. GULATI (Sverdrup Technology, Inc.; USAF, Arnold Engineering Development Center, Arnold AFB, TN) AIAA, Aerospace Sciences Meeting, 29th, Reno, NV, Jan. 7-10, 1991. 10 p. refs
(AIAA PAPER 91-0656) Copyright

The operational objectives of an engine test facility, including the improvement of equipment and facility availability, the optimization of tasks and activities, and the reduction of energy costs are identified. Ways of improving the equipment and facility availability through failure prevention and equipment history analysis are discussed, and focus is placed on preventive, predictive, and reliability-centered maintenance. Statistical process control principles applied to maintenance in order to control cost or failures are outlined. Maintenance-optimization models, culture-dependent technique and tools, and works standards including planning and scheduling are considered. A measurement system evaluating the effectiveness of the proposed tools and methods is specified. V.T.

A91-21219* Stanford Univ., CA.
DYNAMIC SYSTEMS-ENGINEERING PROCESS - THE APPLICATION OF CONCURRENT ENGINEERING
MICHAEL J. WISKERCHEN (Stanford University, CA) and R. BRUCE PITTMAN (DYSE Corp., San Jose, CA) Engineering Management Journal (ISSN 1042-9247), vol. 1, June 1989, p. 27-34.
(Contract NCC10-0001)
Copyright

A system engineering methodology is described which enables users, particulary NASA and DOD, to accommodate changing needs; incorporate emerging technologies; identify, quantify, and manage system risks; manage evolving functional requirements; track the changing environment; and reduce system life-cycle costs. The approach is a concurrent, dynamic one which starts by constructing a performance model defining the required system functions and the interrelationships. A detailed probabilistic risk assessment of the system elements and their interrelationships is

performed, and quantitative analysis of the reliability and maintainability of an engineering system allows its different technical and process failure modes to be identified and their probabilities to be computed. Decision makers can choose technical solutions that maximize an objective function and minimize the probability of failure under resource constraints. C.D.

A91-22525
THE TAGUCHI CAPABILITY INDEX
RUSSELL A. BOYLES (Precision Castparts Corp., Portland, OR) Journal of Quality Technology (ISSN 0022-4065), vol. 23, Jan. 1991, p. 17-26. refs
Copyright

The process capability indices C(p) and C(pk) are widely used to provide unitless measures of process potential and performance. These indices do not adequately address the issue of process centering. An alternative definition of C(p) advocated by Taguchi (1985, 1986) addresses this issue directly. Later authors introduced the name C(pm) for the Taguchi index and examined statistical properties of an inefficient estimator under the assumption that the process mean coincides with the target value. The present paper presents statistical procedures based on the original Taguchi estimator which require no assumptions on the process mean. C(pm) and C(pk) are compared and contrasted to dispel the notion that C(pk) measures process centering. Author

A91-29046#
NEW LIFE FOR HEAVY LIFT
RICHARD DEMEIS Aerospace America (ISSN 0740-722X), vol. 29, March 1991, p. 32-35.
Copyright

The advisory committee to NASA on overall approaches for implementing the U.S. space program in the years ahead has concluded that Shuttle missions should only be flown when a human presence is necessary. It was noted that reducing the number of missions would extend the life of the existing fleet and retain the number of orbiters required at the presently planned four and any funding for a fifth orbiter should be utilized instead for the development of a new heavy lift launch vehicle. These recommendations have led to increased design proposals under the Advanced Launch Development (ADLP) Program such as the Shuttle C (cargo), an unmanned version that could orbit 100,00 to 150,000 lb for two- and three-engine versions, respectively, and would make maximum utilization of present Shuttle processing and pad facilities. Other concepts under investigation by ADLP include electromechanical actuators to replace hydraulic systems, advanced modular avionics and common avionics/payload interfaces, and laser-initiated ordnance for component separation and staging. It is noted that the drive to evolve a heavy lift system will fully employ the total quality management approach, with producibility and operability built into the system from the start. R.E.P.

A91-29691#
TOTAL QUALITY EXCELLENCE - THE MULTIDIMENSIONAL APPROACH
ARTHUR W. ACKERMAN, JR. (Loral Space Systems, Palo Alto, CA) IN: Aerospace Testing Seminar, 12th, Manhattan Beach, CA, Mar. 13-15, 1990, Proceedings. Mount Prospect, IL, Institute of Environmental Sciences, 1990, p. 3-10.

The application of Total Quality Management-type strategies requiring 'profound' system knowledge to the design, development, manufacturing, and testing processes for a communication satellite is discussed on the basis of the author's personal experience and illustrated with extensive graphs and diagrams. Consideration is given to the design definition phase, the problem of timely acquisition of high-quality components, computerized techniques for the identification of rework and nonconformance rates in manufacturing and test operations, the need for very rigorous testing of high-power RF and dc components such as TWTAs, and the importance of detailed design reviews in preventing design-related component failures. T.K.

A91-29692#
ELIMINATING WASTE IN THE TEST PROCESSES
SANDRA J. FRAZELLE (Rockwell International Corp., Seal Beach, CA) IN: Aerospace Testing Seminar, 12th, Manhattan Beach, CA, Mar. 13-15, 1990, Proceedings. Mount Prospect, IL, Institute of Environmental Sciences, 1990, p. 11, 12.

The management approaches used in an effort to reduce waste during the testing phase of an aerospace manufacturing program (for the Navstar GPS satellite) are briefly discussed and illustrated with diagrams and flow charts. Particular attention is given to the application of Total Quality Management principles in a process environment, techniques for acquiring accurate process data in a timely fashion, and strategies for overcoming employee resistance. T.K.

A91-29698#
RISK ASSESSMENT AND PROGRAM MANAGEMENT
JEROLD M. HABER IN: Aerospace Testing Seminar, 12th, Manhattan Beach, CA, Mar. 13-15, 1990, Proceedings. Mount Prospect, IL, Institute of Environmental Sciences, 1990, p. 31-38.

The application of risk-assessment (RA) methods to aerospace development programs is described and illustrated with extensive diagrams. The basic RA concepts are defined (hazard, exposure, vulnerability, and risk acceptability criteria); the analysis of a product development program in terms of the general environment and the contractor's work force, assets, and deliverables is explained; the construction of a risk estimation model is outlined; and different RA techniques are compared. A typical RA application involving a government procurement program with an artificially large number of risk sources is discussed in detail, with an emphasis on the value of RA for Total Quality Management. T.K.

A91-30851
NAECON 90; PROCEEDINGS OF THE IEEE NATIONAL AEROSPACE AND ELECTRONICS CONFERENCE, DAYTON, OH, MAY 21-25, 1990. VOLS. 1-3
FRANK L. PALAZZO, ED. (Questech, Inc., Dayton, OH) Conference sponsored by IEEE. New York, Institute of Electrical and Electronics Engineers, Inc., 1990, p. Vol. 1, 466 p.; vol. 2, 456 p.; vol. 3, 424 p. For individual items see A91-30852 to A91-31031.
Copyright

The present conference discusses advancements in VLSI components/packaging, signal processing, airborne computers, data transmission, advanced avionics architectures. optical applications, data control and display, airborne image processing, target acquisition and recognition, airborne radar and fire control, navigation, weapons guidance and interfaces, Kalman filtering, power generation and control, and command control and communications. Also discussed are flight control reconfiguration, multivariable control theory, flight management, Ada language applications, object-oriented Ada simulations, software management and quality assurance, visual system software, voice-interaction applications, human/machine interfaces, pilot acceleration protection, electronic combat analysis, modular avionics, expert systems, machine vision/optical image processing, adaptive networks, logistics readiness, automated testing, and total quality management. O.C.

A91-31019
TOTAL QUALITY IN THE DESIGN PROCESS
RICHARD G. KARM (Texas Instruments, Inc., Dallas) IN: NAECON 90; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1990. Vol. 3. New York, Institute of Electrical and Electronics Engineers, Inc., 1990, p. 1284-1286.
Copyright

The advantages to be gained from the use of technology in the quest for quality improvement are considered. The scope includes not only the traditional manufacturing and automation efforts, but also the large opportunity in the design functions. Considered gains in manufacturing have been achieved through the judicious use of automation, computer-integrated-

manufacturing, and statistical process control. In the quest for continuous quality improvement, the next major step function improvement will come from changes in the design methodology. The ways in which artificial intelligence, design of experiments, and engineering workstations can be used to truly change design methodology, and not just automate the present methods, are studied. I.E.

A91-31023
CONCURRENT ENGINEERING - THE CHALLENGE FOR THE 90S
CAROL A. MARLIN (Unisys Corp., Blue Bell, PA) and KEVIN M. SMITH IN: NAECON 90; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 21-25, 1990. Vol. 3. New York, Institute of Electrical and Electronics Engineers, Inc., 1990, p. 1313-1323. refs
Copyright

A conceptual framework is presented that aids the generation of system requirements sufficient to support the concurrent design activities of avionic engineers, software engineers, knowledge engineers, human factors engineers, and instructional system designers. The recommended design approach for concurrent engineering is given. First, structure the problem comprehensively, independently of technology, and in such a way as to be understandable to the design team members. Second, formulate solution concepts that clearly map to the problem structure. The problems being encountered in avionics design are discussed. It is shown that a multifunctional design team the members of which all work from a common requirements source document could be a major step in implementing an effective solution. I.E.

A91-31047#
R&M 2000 PROCESS - A CORNERSTONE TO THE TOTAL QUALITY MOVEMENT
JAMES F. GUZZI (USAF, Systems Command, Andrews AFB, MD) IN: 1990 Annual Reliability and Maintainability Symposium, Los Angeles, CA, Jan. 23-25, 1990, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1990, p. 106-108. refs

The U.S. DOD Total Quality Management (TQM) campaign to support continuous process improvement is discussed. Reliability, maintainability, and producibility (RM&P) are discussed as key building blocks of TQM and the continuous quality improvement of weapon systems. This relationship supports the strategic importance of R&M 2000 in the TQM movement and clearly supports the R&M 2000 goals. The strategic relationship of the R&M 2000 process is reviewed. To demonstrate the conceptual relationships defined by the R&M 2000 process and TQM, the R&M quality team concept is used. The R&M quality team concept is the first TQM initiative to support the R&M 2000 process. The concept has been successfully used in the design of the C-17A airlifter. I.E.

A91-31375
TAGUCHI'S FIXED-ELEMENT ARRAYS ARE FRACTIONAL FACTORIALS
RAGHU N. KACKER, ERIC S. LAGERGREN, and JAMES J. FILLIBEN (NIST, Gaithersburg, MD) Journal of Quality Technology (ISSN 0022-4065), vol. 23, April 1991, p. 107-116. refs
Copyright

Arguments are presented that demonstrate that Taguchi's (1987) two-, three-, four-, and five-element orthogonal arrays are fractional factorials. It is shown that these arrays can be modified to generate many types of multifactor statistical experiments. It is noted that Taguchi's collection of orthogonal arrays can be expanded to include other arrays, such as those developed by Dey and Ramakrishna (1977). I.S.

A91-31868*# General Dynamics Corp., Fort Worth, TX.
A TAGUCHI STUDY OF THE AEROELASTIC TAILORING DESIGN PROCESS
JONATHAN D. BOHLMANN (General Dynamics Corp., Fort Worth, TX) and ROBERT C. SCOTT (NASA, Langley Research Center, Hampton, VA) IN: AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 32nd, Baltimore, MD, Apr. 8-10, 1991, Technical Papers. Pt. 1. Washington, DC, American Institute of Aeronautics and Astronautics, 1991, p. 364-372. refs
(AIAA PAPER 91-1041) Copyright

A Taguchi study was performed to determine the important players in the aeroelastic tailoring design process and to find the best composition of the optimization's objective function. The Wing Aeroelastic Synthesis Procedure (TSO) was used to ascertain the effects that factors such as composite laminate constraints, roll effectiveness constraints, and built-in wing twist and camber have on the optimum, aeroelastically tailored wing skin design. The results show the Taguchi method to be a viable engineering tool for computational inquiries, and provide some valuable lessons about the practice of aeroelastic tailoring. Author

A91-36939
IMPLEMENTING SPC IN COMPOSITES MANUFACTURING
LEIGH REID (LTV Aircraft Products Group, Dallas, TX) Society of Manufacturing Engineers, Conference on Fabricating Composites '90, Arlington, TX, Oct. 8-11, 1990. 12 p.
(SME PAPER EM90-656) Copyright

Composite materials are extremely sensitive to variability in the manufacturing process. Statistical process control (SPC) methods provide a way to continuously monitor processes and detect excessive or unnatural variability before problems can compromise product quality. LTV Aircraft Products Group (LTVAPG) is implementing SPC and other variability reduction methods in the composites manufacturing areas at its Jefferson Avenue facility in Dallas. As part of group-wide efforts in SPC and continuous process improvement, multi-functional SPC application teams analyze each step in the manufacturing process, install appropriate process monitoring mechanisms, improve the capability of the process, and develop process control plans. Special implementation issues deriving from the nature of composites manufacturing are discussed, and guidelines for implementing SPC in composites manufacturing are provided. Author

A91-40023
MAPPING QUALITY ASSURANCE SYSTEMS - A METHODOLOGY
ROY T. CROSSFIELD (Garrett Automotive, Ltd., Skelmersdale, England) and BARRIE G. DALE (University of Manchester Institute of Science and Technology, England) Quality and Reliability Engineering International (ISSN 0748-8017), vol. 6, June-Aug. 1990, p. 167-178. refs
Copyright

A quality management activity planning (Q-MAP) method is presented for mapping quality assurance procedures, information flows, and responsibilities. Q-MAP is compared with the ICAM definition (IDEF) method as to their suitability for mapping quality assurance systems and fostering the advancement of the quality improvement process. Q-MAP has been applied successfully in modeling all aspects of quality assurance system and procedures, including incoming inspection of goods, gage control/planning, advanced quality planning, new product introduction, implementation of statistical process control, supplier certification, inventory management, final view inspection, purchase of new machines, skip-lot sampling, warranty analysis, and process failure mode and effects analysis. It is concluded that the involvement of employees in the preparation of Q-MAP diagrams has led to improvements in processes and procedures by eliminating differences between actual and documented work practicies. O.G.

A91-40811
THE USE OF TAGUCHI METHODS IN PERFORMANCE DEMONSTRATIONS
G. R. BANDUREK, H. L. HUGHES, and D. CROUCH (Eurotherm, Ltd., Worthing, England) Quality and Reliability Engineering International (ISSN 0748-8017), vol. 6, Apr.-May 1990, p.

121-131. refs
Copyright

The use of Taguchi methods for parameter design and tolerance design is well established. This paper describes a new application to qualification trials or type approval tests. The essential difference from the accepted use is that the purpose is to demonstrate performance when a product is subjected to internal or external noise. With a tolerance trial the aim is to find which sources of noise can be cost-effectively controlled. Two case-study examples are presented which show the value of the technique. The first shows how the measurements are used to provide one of the published performance specifications for a digital electronic product. The second reveals how an interaction between three environmental parameters took an analog electronic product out of specification. There is a discussion on the suitability of the technique for software testing and for reliability demonstrations. This includes comments on which arrays are most appropriate for which situation. Author

A91-40817#
A BETTER METHOD FOR VERIFYING PRODUCTION RELIABILITY
ANTHONY COPPOLA (USAF, Rome Air Development Center, Griffiss AFB, NY) Quality and Reliability Engineering International (ISSN 0748-8017), vol. 6, Sept.-Oct. 1990, p. 295-299. refs

Various schemes have been created for verifying that reliability is not degraded during production. These include the periodic performance of reliability tests during production, three versions of an all-equipment reliability test plan and Bayesian approaches. Each method has its drawbacks. The purpose of all of these is to verify that the production process is continuing to produce products of acceptable reliability, for which the long-existing tools of statistical process control are directly applicable and advantageous. A method of verifying production reliability based on the use of a control chart for failure rate is proposed as a better way than the current standards and alternatives discussed in this paper. Author

A91-41691#
VALUE ANALYSIS APPLICATION AND RESULTS
L. D. REBER (Aerojet, Propulsion Div., Sacramento, CA) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference, 27th, Sacramento, CA, June 24-26, 1991. 6 p.
(AIAA PAPER 91-2063) Copyright

The value analysis methodology developed by L.D. Miles during World War II enhances a product's value, while reducing its production costs, through the study of its intended functions. Attention is presently given to a value-management program case study at a major rocket-propulsion systems manufacturer, which demonstrates the use of a centrally located program office supported by personnel from other departments. The relationship of value analysis to total quality management techniques is explored. O.C.

A91-44071#
A CONCURRENT ENGINEERING APPROACH TO RELIABLE, LOW COST PROPULSION SYSTEM DESIGN
HEIDI J. SANDERS, KATIE T. DOMMER, and DUANE E. WOLTING (Aerojet, Propulsion Div., Sacramento, CA) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference, 27th, Sacramento, CA, June 24-26, 1991.
(AIAA PAPER 91-1940) Copyright

A method for comparing competing rocket engine design concepts based on cost and reliability is presented. The method uses a systematic approach for evaluating and accounting for the factors which contribute to the cost and reliability of specific design alternatives. The method is designed for simplicity and is appropriate for implementation during the conceptual design phase. It uses a scoring approach to quantify relative cost and reliability. Analysis of the results readily provides an understanding of specific features and characteristics which make one concept superior to another. The method ultimately provides the system designer with the data to make informed design decisions. Author

A91-44074#
LOW COST ROCKET MOTOR TECHNOLOGY PROGRAM
P. J. WAGNER and E. B. CLEVELAND (Aerojet, Propulsion Div., Sacramento, CA) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference, 27th, Sacramento, CA, June 24-26, 1991. 8 p.
(AIAA PAPER 91-1959) Copyright

The low-cost rocket motor techology program demonstrated that low-cost booster rocket motors could indeed be produced to meet many requirements for ground-launch unmanned aerial vehicles (UAV) and other similar applications. The approach to this program was to design, develop, fabricate, and test a low-cost motor design using existing technology and component designs which, because of their extensive manufacture and use history, promote high quality and low cost. The program incorporated principles of total quality management, concurrent engineering, and, where applicable, Taguchi parameter optimization to further ruggedize demonstrated materials. The design incorporates low cost off-the-shelf proven materials and a minimum number of components to reduce the number of fabrication and processing operations. The simple grain and insuliner configurations led to a significant reduction in chemical processing and propellant casting steps. Three low-cost motors were fabricated and static fired. They met all predicted performance parameters and demonstrated the low-cost approach to booster rocket motor design. Author

A91-44112#
ASRM NOZZLE DESIGN AND DEVELOPMENT
JOHN W. EDWARDS (Thiokol Corp., Brigham City, UT) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference, 27th, Sacramento, CA, June 24-26, 1991. 6 p.
(AIAA PAPER 91-2070) Copyright

The objectives of the Advanced Solid Rocket Motor (ASRM) Nozzle Program are to improve performance, reliability, and flight safety. A program has been implemented which will achieve the goal through application of the methods of Total Quality Management to develop a simpler, more robust design for the nozzle and its manufacturing processes. Substantial weight reductions have been achieved through the use of low-density carbon-cloth phenolic in the aft exit cone and a lighter weight flex seal. Subscale, prototype, and development and qualification motor tests will be used to develop and validate the materials, processes, and designs. Author

A91-47782
QUALITY ASSURANCE AND SOFTWARE ENGINEERING [ASSURANCE QUALITE ET GENIE LOGICIEL]
FRANCOIS DE NAZELLE (Veridatas, France) IN: The management of large software projects in the space industry; Colloquium, Toulouse, France, Oct. 16-18, 1990, Proceedings. Toulouse, France, Cepadues-Editions, 1991, p. 377-382. In French.
Copyright

Issues associated with quality assurance and software engineering are examined. Particular attention is given to four activitites which serve as the basis of quality control: quality planning, quality engineering, quality evaluation, and quality management. L.M.

A91-47877#
ANATOMY OF A WINNER
RICHARD DEMEIS Aerospace America (ISSN 0740-722X), vol. 29, Aug. 1991, p. 24-27.
Copyright

A number of company design engineering and development innovations in the F-22 Lightning II prototype are described to emphasize the concurrent engineering concept approach that was used. Early in the program it was decided to design the prototype aircraft as close to what would be proposed at engineering/manufacturing development (formerly, full-scale development) as possible. A large jump in developing an integrated avionics system was taken with all sensors and avionics tested in a 757 flying laboratory to complement ground testing. The enineering team relied heavily on its own concurrent engineering

product development teams, individual, multidiscipline groups given the reponsibility for specific parts of the aircraft, and coordinated with all three major manufacturers. R.E.P.

A91-48664
ADVANCED SURFACE PREPARATION
KENNETH ADELSON (General Dynamics Corp., Convair Div., San Diego, CA) Society of Manufacturing Engineers, Conference on Composites in Manufacturing, 10th, Anaheim, CA, Jan. 7-10, 1991. 15 p.
(SME PAPER EM91-100) Copyright

The adhesion strength of surfaces treated by plasma, plasma jet, and corona processes to selected adhered surfaces were characterized using Taguchi methods. The favorable results demonstrate that the three processes studied have significant potential as replacements for current baseline methods. C.D.

A91-51899
FUTURE OF ULTRASONICS
EMMANUEL P. PAPADAKIS (Iowa State University of Science and Technology, Ames) Materials Evaluation (ISSN 0025-5327), vol. 49, Sept. 1991, p. 1180-1182, 1184. refs
(Contract W-7405-ENG-82)
Copyright

The expected future improvements in the field of ultrasonic testing are summarized. In particular, the following areas of improvement are identified: quantitative sizing of flaws, probability of detection, materials properties correlations, signal processing and information theory, radar and sonar technology, and artificial intelligence. Other areas of growth include intelligent processing materials, statistical process control, imaging, CAD-CAM, and simultaneous engineering. V.L.

A91-53044
LESSONS LEARNED DEVELOPING ORGANIC SUPPORT FOR AVIONICS EQUIPMENT
CHARLES GELFOND, RALPH JOHNS, and DAVID PRESTO (ITT Corp., ITT Avionics Div., Nutley, NJ) IN: AUTOTESTCON '90; IEEE Systems Readiness Technology Conference, San Antonio, TX, Sept. 17-20, 1990, Conference Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1990, p. 435-439.
Copyright

The authors summarize some elements of the test program set (TPS) total quality management (TQM) challenge encountered in providing full organic support to the government for an avionics system. The major issues discussed include vertical testability, automatic test equipment (ATE) immaturity, and TPS maturation. The problems encountered, subsequent actions, and lessons learned are addressed. It is concluded that a TQM approach must be employed for the design implementation and development of a successful TPS throughout the life cycle of the TPS. I.E.

A91-53240
AIAA TECHNICAL COMMITTEE ON MULTIDISCIPLINARY DESIGN OPTIMIZATION (MDO) - WHITE PAPER ON CURRENT STATE OF THE ART
Washington, DC, American Institute of Aeronautics and Astronautics, Jan. 15, 1991, 51 p. refs
Copyright

Multidisciplinary design optimization (MDO) is reviewed in terms of the need for technological integration, recent advances in the mathematically based MDO systems and methodologies, and directions for research and development. The use of MDO in the aerospace industry is first considered historically, and the multidisciplinary character of the design process is emphasized. Design considerations related to human interface and computing are set forth to underscore the essential nature of these aspects. In addressing the issues of aerospace design, the MDO approach relies primarily on sensitivity analyses and optimization methods. A list of ten characteristics of the concurrent engineering process is given, and each item is addressed in terms of the corresponding MDO contribution. MDO is essentially an environment in which human, mathematics, and computer factors can be effectively combined to make sound design decisions. C.C.S.

A91-54008#
LIGHT HELICOPTER/COMANCHE PROGRAM UPDATE - THE LHTEC T800 AND BOEING SIKORSKY COMANCHE DESIGN SOLUTIONS
ROBERT HUBBARD (U.S. Army, Washington, DC), JIM MORRIS (Boeing Co., Seattle, WA; Sikorsky Aircraft, Stratford, CT), and RONALD ALTO (Light Helicopter Turbine Engine Co., Saint Louis, MO) AIAA, AHS, and ASEE, Aircraft Design Systems and Operations Meeting, Baltimore, MD, Sept. 23-25, 1991. 12 p.
(AIAA PAPER 91-3074)

Important technologies incorporated into the LHTEC T800 engine and the winning Boeing Sikorsky Comanche weapon system designs are addressed in detail. Both LHTEC and the Boeing Sikorsky team are taking advantage of advanced technologies, in conjunction with MANPRINT, total quality management, and concurrent engineering principles, to significantly improve producibility and supportability. This balanced approach of incorporating advanced technologies is considered to provide a quantum improvement in Comanche war fighting effectiveness, as compared with existing Army helicopter alternatives. O.G.

A91-54064#
EXPERIENCES OF AN INTEGRATED PRODUCT DEVELOPMENT TEAM AT MCAIR
D. G. DUTCHER (McDonnell Douglas Corp., Saint Louis, MO) AIAA, AHS, and ASEE, Aircraft Design Systems and Operations Meeting, Baltimore, MD, Sept. 23-25, 1991. 5 p.
(AIAA PAPER 91-3149) Copyright

Experiences of an Integrated Product Definition Team at McDonnell Aircraft Company are described. How a collocated multidisciplined team focused on a particular product can produce a quality part in less time, eliminating downstream cost due to scrap and rework is shown. Supported by a Total Quality Management environment and given the proper tools, the team was tasked with providing a qualified manufacturer with all the necessary information to make a first time quality product. This information, in the form of a 'Build-To-Package', contained collaborated data from each discipline provided by different computer based tools. Configuration control and release of the data package presented the greatest challenge. A future solution for control and release of heterogeneous data is discussed.
Author

A91-54066#
TRANSITIONING TO A CONCURRENT ENGINEERING ENVIRONMENT
M. S. KNODLE (General Dynamics Corp., Space Systems Div., San Diego, CA) AIAA, AHS, and ASEE, Aircraft Design Systems and Operations Meeting, Baltimore, MD, Sept. 23-25, 1991. 10 p.
(AIAA PAPER 91-3151) Copyright

This paper addresses the specific steps to integrate the product development process and the transition to a concurrent engineering environment at General Dynamics Space Systems Division. A survey of industry and government trends, corporate plans and division goals relating to concurrent engineering was conducted. An integrated product development process was developed and implemented on a pilot project. Performance metrics were taken to evaluate the effectiveness of these new processes. Substantial cost, schedule and quality benefits were achieved. Based on this success, twelve follow-on pathfinder concurrent engineering teams have since been implemented on three separate programs. A concurrent engineering training course has been developed. A management level implementation team has been formed to institutionalize concurrent engineering methods and ease the transition phase to an integrated concurrent engineering environment. Author

A91-54067#
COST-CONSCIOUS CONCURRENT ENGINEERING
PETER T. RICCI and JEFFREY L. HALE (McDonnell Douglas Space

Systems Co., Huntington Beach, CA) AIAA, AHS, and ASEE, Aircraft Design Systems and Operations Meeting, Baltimore, MD, Sept. 23-25, 1991. 10 p. refs
(AIAA PAPER 91-3152) Copyright

Concurrent engineering (CE) is described and examples of its implementation are presented to evaluate practical applications of CE. Management and quality requirements for CE are listed with considerations both internal and external to the engineering enterprise. A CE benchmarking matrix is presented for characteristics such as training, performance measurement, and budgets. The development of strategic and tactical plans is described, and attention is given to the implementation approach and other key issues. Also identified are the most important aspects of the CE process which include management commitment, formal training programs, multidisciplinary teamwork, integrated schedules, and supplier partnerships. CE is considered to be an effective managerial philosophy for improving productivity and quality. C.C.S.

A91-54068#
CONCURRENT ENGINEERING - ELECTRONIC PACKAGING METHODOLOGY YIELDS QUALITY IMPROVEMENTS
A. J. TOMARCHIO (IBM Corp., Federal Sector Div., Manassas, VA) AIAA, AHS, and ASEE, Aircraft Design Systems and Operations Meeting, Baltimore, MD, Sept. 23-25, 1991. 8 p.
(AIAA PAPER 91-3153) Copyright

This paper presents a concurrent engineering methodology described as structured design. The design methodology is characterized by early interaction of all product responsible disciplines, comprehensive definitization of product requirements, in-process design and development validation check points, and a closed-loop quality measurement and corrective action process. The effective interaction of engineering, manufacturing, and other product supporting disciplines has significantly improved the quality of design and has reduced overall product development cycle time. This paper will discuss the application of the methodology for designing electronic structures that yielded an 85-percent reduction of design engineering changes. Author

A91-54069#
MEASURING IMPLEMENTATION PROGRESS IN CONCURRENT ENGINEERING
G. R. MOSARD (McDonnell Douglas Space Systems Co., Huntington Beach, CA) AIAA, AHS, and ASEE, Aircraft Design Systems and Operations Meeting, Baltimore, MD, Sept. 23-25, 1991. 6 p.
(AIAA PAPER 91-3154) Copyright

An aerospace company is implementing concurrent engineering teams on all programs. This paper describes a system and tools to continuously measure implementation progress and the impact of concurrent engineering. Two major measuring approaches were developed: (1) benchmarking matrices used by teams, programs, support divisions, and a concurrent engineering advisory team to measure the transition to a concurrent engineering environment, and (2) an array of effectiveness measures for each team and program in cycle time, quality, productivity, cost, and schedule. Many existing measures must be supplemented or modified in a new concurrent engineering team environment to account for changes such as cycle time increases in early product development phases. Author

A91-54397
SOME EXPERIENCES OF ADVANCED MANUFACTURING CELLS AT BRITISH AEROSPACE WARTON UNIT
J. M. DUXBURY (British Aerospace /Military Aircraft/, Ltd., Preston, England) Institution of Mechanical Engineers, Proceedings, Part G - Journal of Aerospace Engineering (ISSN 0954-4100), vol. 205, no. G1, 1991, p. 59-63.
Copyright

The problem of makespan reduction is examined with reference to the manufacturing experience of British Aerospace Warton Unit. In particular, three production facilities are described which use three different approaches to achieve significant makespan reductions: automation between processes, organizational change, and 'automation of the shell' where conventional techniques are complemented by automated logistics. V.L.

A91-54696
SPC IN LOW-VOLUME MANUFACTURING - A CASE STUDY
GEORGE F. KOONS (Motorola Lighting, Buffalo Grove, IL) and JEFFERY J. LUNER (McDonnell Douglas Corp., Saint Louis, MO) Journal of Quality Technology (ISSN 0022-4065), vol. 23, Oct. 1991, p. 287-295. refs
Copyright

Focusing on the process, not the product, is the key to implementing statistical process control in low-volume manufacturing environments. One approach is to initially assume that all products are being produced by a common process. Data can be used to verify or refute this assumption. If it is refuted, the appropriate subprocesses that must be monitored separately can be identified. A case study of a small batch machining process is used to describe this approach to implementing low-volume SPC. Author

N89-19228# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Systems and Logistics.
R AND M (RELIABILITY AND MAINTAINABILITY) QUALITY TEAM CONCEPT AND C-17 DESIGN AT DOUGLAS AIRCRAFT COMPANY: AN R AND M 2000 INITIATIVE CASE STUDY M.S. Thesis
R. ANTHONY PHILLIPS Sep. 1988 89 p
(AD-A201574; AFIT/GLM/LSM/88S-56) Avail: NTIS HC A05/MF A01 CSCL 05/1

The Aeronautical Systems Divisions's C-17 System Program Office has developed a quality management initiative called the R and M (Reliability and Maintainability) Quality Team Concept. Its purpose is to provide companies with better management of R and M during the full-scale engineering development acquisition phase. Douglas Aircraft Co. (DAC) agreed to implement the R and M Quality Team Concept during design of the C-17. This thesis examined the effect of the R and M Quality Team Concept as instituted by DAC on the quality management of the R and M process during C-17 design. Research assessed the concept's perceived impact on: (1) communication on R and M issues; (2) R and M problem solving; and (3) specific C-17 design changes. A survey was administered to DAC employees and interviews were conducted with management at DAC's Long Beach, CA, facility. Hypothesis testing using z and t-tests assisted in evaluating survey results. Study results revealed overall employee support for the R and M Quality Team Concept. The concept provided a method of R and M management and problem solving not available in a traditional program organization, and a number of C-17 design changes resulted from concept application. GRA

N90-10607# Institute for Defense Analyses, Alexandria, VA.
AEROSPACE SYSTEM UNIFIED LIFE CYCLE ENGINEERING PRODUCIBILITY MEASUREMENT ISSUES Final Report, Jan. 1988 - Sep. 1989
DALE E. CALKINS, RICHARD S. GAEVERT, FREDERICK J. MICHEL, and KAREN J. RICHTER May 1989 177 p
(Contract MDA903-89-C-0003)
(AD-A210937; AD-E501132; IDA-P-2151; IDA/HQ-88-33817)
Avail: NTIS HC A09/MF A01 CSCL 05/1

The goal of the Unified Life Cycle Engineering (ULCE) program is to develop enhanced design environments that will allow supportability and producibility to be considered early in the product design cycle along with the usual factors of cost, performance, and schedule. An investigation into methods for the incorporation of producibility issues in early design is reported. Producibility is a product characteristic inherent in its design denoting ease and economy of manufacture. Many aspects of producibility are judgmental in character. However, to design products that are properly balanced with regard to all of the ULCE design factors, these qualitative aspects of a design must be handled and methods of trading off such factors against quantitative factors such as performance and cost measures must be developed. Methods of

measuring and evaluating factors related to producibility are discussed and a plan is presented for the development of a design environment of an aerospace design synthesis model with a producibility module. Included is a description of relevant design and manufacturing methodologies (e.g., Design for Manufacture and Assembly, Taguchi Methods, Quality Function Deployment, Statistical Process Control) and a discussion of the kinds of tools (hardware, software, and attitude) that can and have been established to ensure strong producibility characteristics in a product. In addition, an extensive bibliography is provided in an appendix. GRA

N90-23634# Sandia National Labs., Albuquerque, NM.
CMOS IC I(SUB DDQ) TESTING FOR THE 1990S
JERRY M. SODEN, CHARLES F. HAWKINS (New Mexico Univ., Albuquerque.), RONALD R. FITZENMEIER, and JOHN R. GUTH 1990 4 p Presented at the VLSI Test Symposium, Atlantic City, NJ, 10-11 Apr. 1990
(Contract DE-AC04-76DP-00789)
(DE90-009508; SAND-90-0613C; CONF-9004174-1) Avail: NTIS HC A01/MF A01

Significant improvements in CMOSIC quality, reliability, and fabrication yield can be readily achieved in the 1990s by appropriate implementation of tests for quiescent power supply current (I(sub DDQ)). As part of an overall quality management program, I(sub DDQ) testing incorporated with design for testability and modified conventional logic response testing enables 100 percent stuck-at fault coverage, quality improvement goals of defective levels less than 100 PPM, and reliability greater than 0.999 for 30 years. DOE

N90-27443# Air Force Systems Command, Norton AFB, CA.
BLOCK 6: THE FUTURE DMSP SPACE SYSTEMS
RAYMOND G. BONESTEELE and RUSTY O. BALDWIN *In* AGARD, Tactical Applications of Space Systems 5 p May 1990 Copyright Avail: NTIS HC A07/MF A01; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The acquisition strategy and anticipated capabilities of the Defense Meteorological Satellite Program (DMSP) Block 6 satellite system are described. It includes brief discussions of previous satellites and the requirements which drove the Block 6 system acquisition. The first three phases of acquisition are discussed: concept study, risk reduction, and full scale development. Strategy and concept of each phase are described in detail. The use of total quality management in each phase is discussed. Author

N90-28857# Allied-Signal Aerospace Co., Kansas City, MO.
QUALITY FUNCTION DEPLOYMENT AS A MECHANISM FOR PROCESS CHARACTERIZATION AND CONTROL Final Report
L. K. GILLESPIE, M. MAURER, L. GILLESPIE, J. SIMS, and D. RAMOS Jul. 1990 86 p
(Contract DE-AC04-76DP-00613)
(DE90-014755; KCP-613-4276) Avail: NTIS HC A05/MF A01

This study was initiated to determine how well quality function deployment (QFD) was suited for process characterization. The process chosen on which to test QFD was the mechanical process of flat lapping (flat sanding) metal parts to a specified flatness or finish. This is the first use of QFD at this facility. It is the first example seen of its use for generic process characterization. It is normally used to define product needs. DOE

N91-12387# Defense Logistics Analysis Office, Alexandria, VA.
TQM TOOLS AND STUFF: THE INDOCTRINATION OF TYRONE NEWBLOOD
Jun. 1990 57 p
(AD-A225208) Avail: NTIS HC/MF A04 CSCL 05/1

This booklet is essentially a reprint of the Rome Air Development Center's Basic Training in TQM (Total Quality Management) Analysis Techniques. Thanks to the kind permission of Mr. Anthony Coppola, the author of the booklet, the DLA TQM office has been able to make very minor changes to his work to put a logistics flavor in this version . GRA

N91-17032*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
SYSTEMS ENGINEERING AND INTEGRATION (SE AND I)
ED CHEVERS and SAM HALEY *In* NASA, Washington, Space Transportation Avionics Technology Symposium. Volume 2: Conference Proceedings p 363-409 Aug. 1990 Prepared in cooperation with NASA, Marshall Space Flight Center, Huntsville, AL
Avail: NTIS HC/MF A99 CSCL 22/2

The issue of technology advancement and future space transportation vehicles is addressed. The challenge is to develop systems which can be evolved and improved in small incremental steps where each increment reduces present cost, improves, reliability, or does neither but sets the stage for a second incremental upgrade that does. Future requirements are interface standards for commercial off the shelf products to aid in the development of integrated facilities; enhanced automated code generation system slightly coupled to specification and design documentation; modeling tools that support data flow analysis; and shared project data bases consisting of technical characteristics cast information, measurement parameters, and reusable software programs. Topics addressed include: advanced avionics development strategy; risk analysis and management; tool quality management; low cost avionics; cost estimation and benefits; computer aided software engineering; computer systems and software safety; system testability; and advanced avionics laboratories - and rapid prototyping. This presentation is represented by viewgraphs only. B.G.

N91-17033*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
OPERATIONAL EFFICIENCY: AUTOMATIC ASCENT FLIGHT DESIGN
In NASA, Washington, Space Transportation Avionics Technology Symposium. Volume 2: Conference Proceedings p 415-422 Aug. 1990
Avail: NTIS HC/MF A99 CSCL 22/2

The expected increase in launch vehicle operations to support Space Station Freedom and a Lunar/Mars exploration initiative will require a more efficient approach to ascent flight design and operations. A concept is presented of continuous improvement in ascent flight design through an evolutionary process beginning with today's vehicles and continuing into the next century with the Advanced Launch System (ALS) and Advanced Manned Launch System (AMLS). A pictorial view is given of the improvement path described. The detailed objectives necessary to obtain efficiency improvements are described. The technology milestones along this evolutionary path are outlined and the accomplishments to date are summarized. The technology issues are discussed which must be addressed. Author

N91-17406# Pacific Northwest Lab., Richland, WA.
A CANDIDATE CONFIGURATION FOR AUTOMATED PROCESS MONITORING
ROGER HOLLENBAUGH (Army Depot System Command, Chambersburg, PA.) and A. LYNN FRANKLIN Mar. 1990 3 p Presented at the Artificial Intelligence Applications for Military Logistics, Williamsburg, VA, 27-30 Mar. 1990
(Contract DE-AC06-76RL-01830)
(DE90-010991; PNL-SA-18028; CONF-9003157-1) Avail: NTIS HC/MF A01

The concept of total quality management (TQM) embodies a number of significant notions. Among these is the notion of statistical process control (SPC). The U.S. Army Depot System Command (DESCOM) has endorsed the concept of TQM and is actively pursuing the implementation of SPC throughout its organization. One of the difficulties inherent in the applications of SPC to the wide variety of DESCOM processes is the extensive amount of training required to collect process, and interpret the requisite statistical information. To reduce this training demand and to simplify the application of SPC over a broad range of processes, DESCOM is developing a generic automated SPC collection and interpretation system. This system interfaces with

individual stages from a large variety of industrial processes to provide automated data storage, presentation, and interpretation. The system is composed of the following six separate modules: process interface module; data storage and presentation module; pattern recognition module; pattern interpretation module; incremental learning module; and user interface module. DOE

N91-21178# Aerospace Corp., El Segundo, CA.
QUALITY FUNCTION DEPLOYMENT IN LAUNCH OPERATIONS
P. L. PORTANOVA and E. J. TOMEI, JR. 23 Nov. 1990 84 p (Contract F04701-88-C-0089)
(AD-A230983; TOR-0091(6561-04)-1) Avail: NTIS HC/MF A05 CSCL 05/1

The goal of the Advanced Launch System (ALS) is a more efficient launch capability that provides a highly reliable and operable system at substantially lower cost than current launch systems. Total Quality Management (TQM) principles are being emphasized throughout the ALS program. A continuous improvement philosophy is directed toward satisfying users' and customer's requirements in terms of quality, performance, schedule, and cost. Quality Function Deployment (QFD) is interpreted as the voice of the customer (or user), and it is an important planning tool in translating these requirements throughout the whole process of design, development, manufacture, and operations. This report explores the application of QFD methodology to launch operations, including the modification and addition of events (operations planning) in the engineering development cycle, and presents an informal status of study results to date. QFD is a technique for systematically analyzing the customer's (Space Command) perceptions of what constitutes a highly reliable and operable system and functionally breaking down those attributes to identify the critical characteristics that determine an efficient launch system capability. In applying the principle of QFD, a series of matrices or charts are developed with emphasis on the one commonly known as the House of Quality (because of its roof-like format), which identifies and translates the most critical information. GRA

N91-21555# Air Force Human Resources Lab., Wright-Patterson AFB, OH.
DECISION SUPPORT ENVIRONMENT FOR CONCURRENT ENGINEERING REQUIREMENTS Final Technical Paper
RAYMOND R. HILL, JR. Jan. 1991 61 p
(AD-A230899; AFHRL-TP-90-89) Avail: NTIS HC/MF A04 CSCL 05/1

The results are presented of internal Air Force Human Resources Laboratory (AFHRL) research investigating the potential applications of Quality Function Deployment (QFD) to Concurrent Engineering (CE). Influences from the Total Quality Management (TQM) initiative, as well as CE, have increased acquisition emphasis on customer satisfaction and proper definition of the Voice of the Customer. In weapon system acquisition the combat command's requirements are the voice of the customer and it is their needs and requirements that must be captured, defined, and satisfied. To help achieve this goal, as well as TQM and CE goals of improved acquisition efficiency and effectiveness, this research investigated the weapon system requirements process. A decision support environment accommodating the requirements process and incorporating the methods and tools will enhance CE through the earliest parts of design, the definition of the weapon system requirements, and the needs upon which those requirements are based. A finding of the research was QFD could be used as a paradigm for a Decision Support System (DSS) environment to incorporate the investigated methods, and thereby enhance the requirements definition, analysis, and management aspects of weapon system acquisition. GRA

N91-22208# Compagnia Italiana Servizi Tecnici, Rome. Space Div.
FUTURE MISSION CONTROL CENTER: AN OPERATIVE SCENARIO
FEDERICO CAVALIERE and SILVANO MANGANELLI *In* ESA, Ground Data Systems for Spacecraft Control p 115-120 Oct. 1990
Copyright Avail: NTIS HC/MF A99

Continuous improvement in subsystem design and implementation of new technologies is paving the way to a new generation of unmanned spacecrafts, which will evolve more and more into autonomous systems. Autonomy characteristics cannot cope with the current philosophy of Mission Control Center (MCC) operations, which is based on a more or less unique definition of a 'nominal status', any deviation from which has to be evaluated and managed by the human expert. The current concept of the characteristics of a future generation of spacecraft defining functional characteristics of a mission control center for future unmanned space missions is discussed. ESA

N91-24639# Rolls-Royce Ltd., Derby (England).
A ROLE MODEL FOR QUALITY MANAGEMENT IN FINITE ELEMENT ANALYSIS
JOHN BARLOW *In* AGARD, Analytical Qualification of Aircraft Structures 12 p Apr. 1991
Copyright Avail: NTIS HC/MF A08; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Many engineering companies use a quality management system to ISO 9001 as a means of controlling quality and standards in their products and operations. The National Agency for Finite Element Methods and Standards has recently issued a quality systems supplement on the application of ISO 9001 to the use of finite element analysis in the design and validation of engineering products. A role model is presented for a quality system designed to fulfill the requirements of that document. Quality aspects of the following topics are covered: management of the analysis operation; acquisition; development and verification of software; qualification and documentation of analysis methods; project analysis; and education and training of personnel. Comments are included, based on experience of implementing finite element quality procedures. Author

N91-24955# Pacific Northwest Lab., Richland, WA.
TECHNOLOGY TRANSFER QUALITY ASSURANCE
F. C. HOOD Mar. 1991 7 p Presented at the 2nd International Waste Management Conference, Las Vegas, 17-20 Mar. 1991
(Contract DE-AC06-76RL-01830)
(DE91-010009; PNL-SA-19240; CONF-910384-1) Avail: NTIS HC/MF A02

The results of research conducted at Pacific Northwest Laboratory (PNL) for the DOE are regularly transferred from the laboratory to the private sector. The principal focus of PNL is on environmental research and waste management technology; other programs of emphasis include molecular science research. The technology transfer process is predicated on Quality to achieve its objectives effectively. Total quality management (TQM) concepts and principles readily apply to the development and translation of new scientific concepts into commercial products. The concept of technology transfer epitomizes the TQM tenet of continuous improvement: always striving for a better way to do things and always satisfying the customer. A successful technology transfer process adds value to society by providing new or enhanced processes, products, and services to government and commercial customers, with a guarantee of product pedigree and process validity. DOE

N91-26993# Air Force Systems Command, Griffiss AFB, NY.
A ROME LABORATORY GUIDE TO BASIC TRAINING IN TQM ANALYSIS TECHNIQUES
ANTHONY COPPOLA Mar. 1991 57 p
(Contract AF PROJ. 9993)
(AD-A233855; RL-TR-91-29) Avail: NTIS HC/MF A04 CSCL 05/1

Total Quality Management (TQM) is a DoD initiative for continuously improving performance at every level, in every area of DoD responsibility. Implementing this philosophy will require a cultured change in the defense community. It will also require the intelligent use of appropriate analysis techniques. This report

describes the basic analytical tools used in TQM: Process flow charts, Ishikawa charts, Statistical process control, Histograms, Pareto diagrams, Scattergrams and the Shewhart cycle. For easier comprehension, a mythical scenario is used in which the tools are introduced to a willing, but untrained, manager (and to the reader) by a TQM specialist. GRA

N91-27383# Institute for Defense Analyses, Alexandria, VA.
CONCURRENT ENGINEERING TEAMS. VOLUME 2: ANNOTATED BIBLIOGRAPHY
KAREN J. RICHTER and DAVID A. DIEROLF Nov. 1990 116 p
(Contract MDA903-89-C-0003)
(AD-A236094; IDA-P-2516-VOL-2; IDA/HQ-90-36608; AD-E501382) Avail: NTIS HC/MF A06 CSCL 05/1

Specific concurrent engineering practices vary among organizations. There are, however, various management practices that appear to work well for most organizations. This paper presents the reader with specific, useful examples from several defense contractors illustrating how multifunctional concurrent engineering teams are being organized and managed and how concurrent engineering team meetings are conducted and supported. The types of computer support that could be used to enhance the efficiency and effectiveness of concurrent engineering team meetings are identified. The general findings are that there exists a direct relationship between total quality management (TQM) and concurrent engineering, and that many applications of computer-aided group problem solving are possible and practical today for the concurrent engineering team meetings. Areas identified for additional research are the documentation of the decision process and rationale during the product and process definition, the capturing of lessons learned during the implementation of concurrent engineering, and the performance evaluation and training of team members. GRA

N91-28247*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
CONCURRENT ENGINEERING
C. C. CHAMIS, L. LEGER, D. HUNTER, C. JONES, R. SPRAGUE, L. BERKE, J. NEWELL, and S. SINGHAL (Sverdrup Technology, Inc., Brook Park, OH.) *In* NASA, Washington, Space Transportation Propulsion Technology Symposium. Volume 3: Panel Session Summaries and Presentations p 973-988 May 1991
Avail: NTIS HC/MF A99 CSCL 21/8

The following subject areas are covered: issues (liquid rocket propulsion - current development approach, current certification process, and costs of engineering changes); state of the art (DICE information management system, key government participants, project development strategy, quality management, and numerical propulsion system simulation); needs identified; and proposed program. Author

N91-28271*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
SPACE TRANSPORTATION MAIN ENGINE RELIABILITY AND SAFETY
JAN C. MONK *In* NASA, Washington, Space Transportation Propulsion Technology Symposium. Volume 3: Panel Session Summaries and Presentations p 1347-1357 May 1991
Avail: NTIS HC/MF A99 CSCL 21/8

Viewgraphs are used to illustrate the reliability engineering and aerospace safety of the Space Transportation Main Engine (STME). A technology developed is called Total Quality Management (TQM). The goal is to develop a robust design. Reducing process variability produces a product with improved reliability and safety. Some engine system design characteristics are identified which improves reliability. E.R.

N91-32382# Aerospatiale, Cannes (France).
PREPARING ELECTRONICS QUALITY FOR THE NEXT CENTURY
JEAN-CHRISTOPHE FACHON *In* ESA, ESA Electronic Components Conference p 571-573 Mar. 1991
Copyright Avail: NTIS HC/MF A25; EPD, ESTEC, Noordwijk, Netherlands, HC 90 Dutch guilders

Total Quality Management (TQM) concepts adapted to the development of quality electronic components are discussed. TQM as applied in the U.S. is contrasted with possible TQM approaches in Europe. The need for the U.S. and Europe to rise to the challenge of Japan's lead in electronic component manufacturing is stressed. Ways in which TQM policies will affect cooperation between the U.S. and Europe are discussed. A TQM approach is predicted to be widespread in Europe four years after it is established in the U.S. ESA

N91-32383# Thomson-CSF, Orsay (France).
EQML: A CHANCE FOR EUROPE
P. CUNY and M. BARRE (MATRA Espace, Paris-Velizy, France) *In* ESA, ESA Electronic Components Conference p 575-577 Mar. 1991
Copyright Avail: NTIS HC/MF A25; EPD, ESTEC, Noordwijk, Netherlands, HC 90 Dutch guilders

The European qualification, approval or capability approval system is found to be poorly adapted to Very Large Scale Integration (VLSI) and Application Specific Integrated Circuits (ASICs). EQML, a European qualification system based on the QML system developed by the U.S. Department of Defense, is described. EQML content in terms of qualification and task definition in integrated circuit manufacturing is discussed. The procedure allows qualifications to be carried out by tradeoffs provided that the interfaces are controlled. ESA

N91-32384# Texas Instruments France, Villeneuve-Loubet. Quality Dept.
SPACE MANUFACTURING QUALITY THROUGH STATISTICAL PROCESS CONTROL: AN APPLICATION AT TEXAS INSTRUMENTS FRANCE, A SPACE SEMICONDUCTORS PRODUCTION LINE
JEAN-PAUL ANDRISI and FREDERIC ARTUPHEL *In* ESA, ESA Electronic Components Conference p 579-585 Mar. 1991
Copyright Avail: NTIS HC/MF A25; EPD, ESTEC, Noordwijk, Netherlands, HC 90 Dutch guilders

Ways in which Statistical Process Control (SPC) can ensure continuous quality improvements, minimize the cost of ownership and generate a total quality environment for all manufacturing and quality control employees are outlined. Cpk and ppm defect rate dependency are discussed. A review of specific examples of SPC technique implementation in space semiconductors production shows how continuous quality improvements support specific space market needs. Two major applications are analyzed: (1) the enhancement of internal wire bonding process quality via SPC driven process improvement, and (2) how wafer manufacturing internal process control data can be used as a substitute for MIL STD 883 method 2010 internal visual inspections procedures. ESA

N91-32386# Thomson-CSF, Orsay (France).
WHICH POSITION FOR MIL-SPACE INDUSTRY FACING QML CONCEPT
P. CUNY and M. BARRE (MATRA Espace, Paris-Velizy, France) *In* ESA, ESA Electronic Components Conference p 589-594 Mar. 1991
Copyright Avail: NTIS HC/MF A25; EPD, ESTEC, Noordwijk, Netherlands, HC 90 Dutch guilders

Use of the European Quality Management system EQML by part manufacturers, equipment manufacturers and system users is discussed. Evolution of normalized qualification standards enabling better confidence and cost efficiency in new product generation is discussed. Ways of improving development cycles, yields and product performances using the EQML system are outlined. The main phases involved in the qualification concept are identified. ESA

N91-32389# GEC-Plessey Semiconductors, Lincoln (England).
TECHNOLOGY APPROVAL USING CAPABILITY INDICES

W. J. ANDERSON *In* ESA, ESA Electronic Components Conference p 607-610 Mar. 1991
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Technology approval is offered as an alternative to conventional component approval procedures. Statistical Process Control (SPC) and capability indices are used to demonstrate manufacturing capability. Applied to mandated systematic performance improvement, the procedure is intended to meet and exceed the requirements of current systems. Successful implementation of this standard should result in the products of a demonstrably higher quality and reduced cost in comparison to existing approval systems. Technology approval may be granted only to a manufacturer who has been granted manufacturers approval in accordance with the requirements of a recognized national system. ESA

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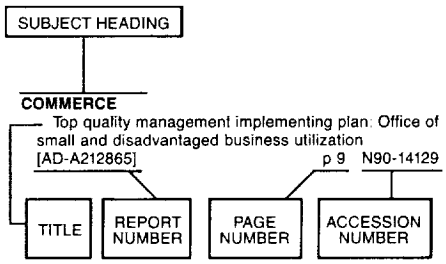

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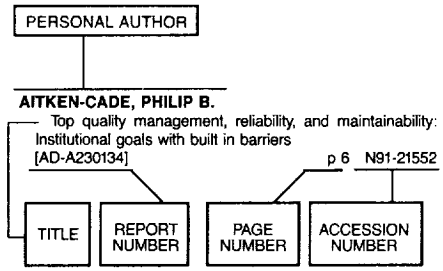

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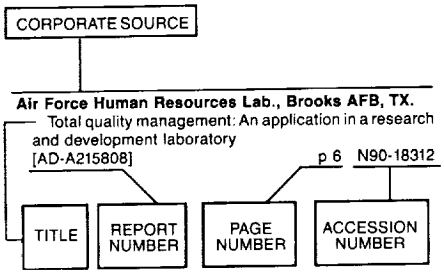

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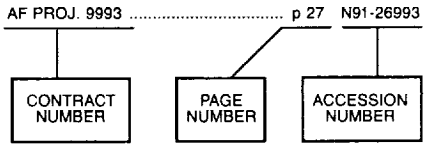

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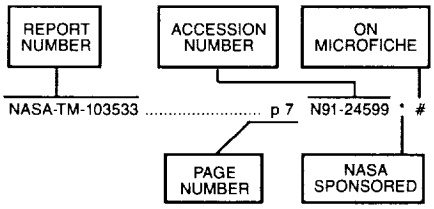

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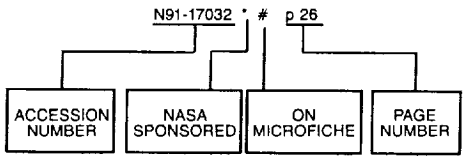

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