NASA SP-7097 (02)
September 1994

CONTINUAL IMPROVEMENT

A BIBLIOGRAPHY WITH INDEXES 1992-1993

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1992-1993

National Aeronautics and Space Administration
Scientific and Technical Information Program
Washington, DC 1994

This publication was prepared by the NASA Center for AeroSpace Information,
800 Elkridge Landing Road, Linthicum Heights, MD 21090-2934, (301) 621-0390.

FOREWORD

This bibliography is a follow-on to NASA SP-7097, *Continuous Improvement: A Bibliography with Indexes 1989-1991*. Entries are drawn from literature entered into the NASA Scientific and Technical Information Database during 1992 and 1993.

Topics cover the philosophy and history of Continual Improvement (CI), basic techniques for process improvement strategies for organizational transformation, and lessons learned from public and private sector models. NASA has aligned its CI efforts with the criteria from the Malcolm Baldridge National Quality Award and the Presidential Award for Quality to focus attention on the following areas:

- leadership for quality
- information and analysis
- strategic planning
- customer focus
- human resource utilization
- management of process quality
- supplier quality, and
- assessing results.

CI activity is well underway at NASA with the completion and ongoing deployment of the NASA CI Plan, the establishment and operation of a Quality Steering Team (NASA's overarching quality body), the involvement of quality councils at the NASA installation level, and the implementation of the recommendations outlined in Vice President Gore's National Performance Review initiative.

The material referenced in this bibliography can help support the activities mentioned above. Scope notes for the categories in the Table of Contents and the Indexes provide guidance for the user.

TABLE OF CONTENTS

TYPICAL REPORT CITATION AND ABSTRACT

NASA SPONSORED
ON MICROFICHE

ACCESSION NUMBER → **N92-19246*#** Mei Associates, Inc., Lexington, MA. ← CORPORATE SOURCE

TITLE → **DESIGNING AN ADVANCED INSTRUCTIONAL DESIGN ADVISOR: CONCEPTUAL FRAMEWORKS, VOLUME 5 Interim Report, Aug. 1989 - Feb. 1991**

AUTHORS → ROBERT M. GAGNE, ROBERT D. TENNYSON, and DENNIS J. GETTMAN Dec. 1991 63 p ← PUBLICATION DATE

CONTRACT NUMBER → (Contract F33615-88-C-0003)

REPORT NUMBERS → (AD-A244061; AL-TP-1991-0017-VOL-5) Avail: CASI HC A04/MF A01 ← AVAILABILITY AND PRICE CODE

The Advanced Instructional Design Advisor is an R and D project being conducted by the Armstrong Laboratory Human Resources Directorate and is aimed at producing automated instructional design guidance for developers of computer-based instructional materials. The process of producing effective computer-based instructional materials is complex and time-consuming. Few experts exist to insure the effectiveness of the process. As a consequence, the Air Force is committed to providing its courseware developers with up-to-date guidance appropriate for the creation of computer-based instruction. The assistance should be provided in an integrated automated setting. This paper addresses design specifications for an instructional design advisor. Instructional System Development (ISD), artificial intelligence, and expert systems are discussed. DTIC

TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT

ACCESSION NUMBER→ **A93-44565** National Aeronautics and Space Administration. ← CORPORATE SOURCE
Langley Research Center, Hampton, VA.

TITLE→ **EFFECTS OF PROCESS VARIABLES ON THE PROPERTIES OF YBA2CU30(7-X) CERAMICS FORMED BY INVESTMENT CASTING**

AUTHORS→ M. W. HOOKER, T. D. TAYLOR, H. D. LEIGH (Clemson Univ., SC), S. A. WISE, J. D. BUCKLEY, P. VASQUEZ, G. M. BUCK, and L. P. HICKS (NASA, Langley Research Center, Hampton, VA) ← AUTHOR'S AFFILIATION

IEEE Transactions on Applied Superconductivity (ISSN 1051-8223) ← JOURNAL TITLE

PUBLICATION DATE→ vol. 3, no. 1, pt. 3 March 1993 p. 1154-1156. 1992 Applied Superconductivity Conference, Chicago, IL, Aug. 23-28, 1992, Proceedings, Pt. 2 A93-44558 18-33 refs

CONTRACT NUMBER→ (Contract NGT-50548)

An investment casting process has been developed to produce netshape, superconducting ceramics. In this work, a factorial experiment was performed to determine the critical process parameters for producing cast YBa2Cu3O7 ceramics with optimum properties. An analysis of variance procedure indicated that the key variables in casting superconductive ceramics are the particle size distribution and sintering temperature. Additionally, the interactions between the sintering temperature and the other process parameters (e.g., particle size distribution and the use of silver dopants) were also found to influence the density, porosity, and critical current density of the fired ceramics. Author

CONTINUAL IMPROVEMENT

A Bibliography with Indexes 1992 - 1993

SEPTEMBER 1994

01
LEADERSHIP FOR QUALITY

A92-16338
SUCCESSFUL SYSTEM DEVELOPMENT - THE EFFECT OF SITUATIONAL FACTORS ON ALTERNATE USER ROLES
STEPHEN R. HAWK (Illinois Institute of Technology, Chicago) and BRIAN L. DOS SANTOS (Purdue University, West Lafayette, IN) *IEEE Transactions on Engineering Management* (ISSN 0018-9391), vol. 38, Nov. 1991, p. 316-327. refs
Copyright

The authors report on the results of a field study that sought to determine the impact of two forms of user involvement, namely, user participation and user leadership, during systems development. This study sought to determine the impact of two situational factors on the effects of user participation and user leadership. Neither user participation nor user leadership was found to be related to user information satisfaction (UIS). Both forms of user involvement, however, were found to have a more positive relationship with UIS under certain circumstances. User participation was more positively related to UIS when use of the system was for decision support and when users were at higher levels in the organization. User leadership was more positively related to UIS when users were at higher levels in the organization. I.E.

A92-38630*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
TEAM DYNAMICS IN ISOLATED, CONFINED ENVIRONMENTS - SATURATION DIVERS AND HIGH ALTITUDE CLIMBERS
BARBARA G. KANKI (NASA, Ames Research Center, Moffett Field, CA) and STEVEN E. GREGORICH (San Jose State University Foundation, Moffett Field, CA) AIAA, Space Programs and Technologies Conference, Huntsville, AL, Mar. 24-27, 1992. 11 p. refs
(AIAA PAPER 92-1531) Copyright

The effects of leadership dynamics and social organization factors on team performance under conditions of high altitude climbing and deep sea diving are studied. Teams of two to four members that know each other well and have a relaxed informal team structure with much sharing of responsibilities are found to do better than military teams with more than four members who do not know each other well and have a formal team structure with highly specialized rules. Professionally guided teams with more than four members, a formally defined team structure, and clearly designated role assignments did better than 'club' teams of more than four members with a fairly informal team structure and little role specialization. C.D.

A92-44943
THE ASSESSMENT OF COORDINATION DEMAND FOR HELICOPTER FLIGHT REQUIREMENTS
CLINT A. BOWERS, BEN B. MORGAN, JR. (Central Florida, University, Orlando, FL), and EDUARDO SALAS (U.S. Navy, Naval Training Systems Center, Orlando, FL) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1 1991 6 p refs

An overview is presented of a military aircrew coordination training program that focuses on the training of the specific skills and behaviors that comprise aircrew coordination. For this program, a questionnaire was prepared to measure pilot's perceptions of the coordination demand imposed by a sample of CH-46 flight tasks. In addition to rating the coordination demand associated with each coordination skill dimension, pilots were requested to provide their perceptions of the amount of overall workload and total coordination demand imposed by each task. R.E.P.

A92-55671
TECHNOLOGY ASSESSMENT OF HUMAN SPACEFLIGHT - *COMBINING PHILOSOPHICAL AND TECHNICAL ISSUES*
J. FROMM (DLR, Cologne, Germany) and G. H. HOEVELMANN (Marburg, Universitaet, Germany) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. Aug. 1992 9 p refs
(IAF PAPER 92-0224) Copyright

A transutilitarian rationale is proposed for assessing human spaceflight that is based on objectives for these endeavors and ethical norms of conduct. Specific attention is given to: presupposed/tacit reasons for including man in spaceflight and the restricted notion of rational/justifiable activity. It is shown that economic rationale is insufficient and unsuitable as a means for assessing manned spaceflight, and transutilitarian objectives are compiled that contribute to the motivation for manned flight. The transutilitarian motivations include: pioneering uncharted territory, enhancing national prestige, establishing space-related autonomy, promoting international cooperation, and enhancing science and the quality of human life. C.C.S.

A92-55683
INTERPERSONAL ISSUES AFFECTING INTERNATIONAL CREWS ON LONG DURATION SPACE MISSIONS
NICK KANAS (California, University, San Francisco) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 7 p. refs
(IAF PAPER 92-0243)

It is noted that, in future long-duration space missions involving international crews, a number of interpersonal issues can be isolated that will affect crew member interactions and performance. These issues include decreased cohesiveness over time, interpersonal tension, reactions to different leadership roles, cultural disparities, and commonality of language and dialect. It is suggested that, to deal with these issues, crews should be selected for mature social skills, interpersonal compatibility, and facility in a common language. L.M.

A92-55812
THE INFLUENCE OF MOTIVATION AT 'HANDS ON' PROGRAMS
HANS H. VON MULDAU (Privates Forschungsinstitut fuer Androidentechnik, Rossdorf, Germany) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 10 p.
(IAF PAPER 92-0477) Copyright

The motivational aspects of education and academic work are examined, and 'hands-on' education is argued to be an effective

motivational tool for pedagogical applications. Methods of learning are reviewed with attention given to standards of values in distinct cultural systems, and educational techniques are examined with respect to the use of motivational factors. It is shown that fault tolerance is important in teaching, and specific interactional techniques are given for dealing with faults in learning. The importance of learning aids is established, and the concept of hands-on programs is argued to be useful. Hands-on education is defined as incorporating active participation in projects/techniques into traditional academic treatments of theoretical concepts. Hands-on education is theorized to be efficacious and generally underutilized. C.C.S.

A93-11995
ECONOMIC ISSUES FACING THE UNITED STATES IN INTERNATIONAL SPACE ACTIVITIES
HENRY R. HERTZFELD (HRH Associates, Bethesda, MD) *In* Space economics Washington American Institute of Aeronautics and Astronautics 1992 p. 417-435. refs
Copyright

Historical and current trends in the global aerospace industry are examined to identify critical economic and political issues that affect U.S. civilian space activities. Key issues encompass: domestic industrial policy, foreign technological dominance, emerging commercial terrestrial operations, and the fiscal consequences of big-ticket R&D programs. Other historical considerations are U.S. leadership in space sciences, national security, international space projects, and the need for coordinated government actions. Projections of U.S. space activities in the next decade point toward smaller R&D expenditures and less incentives for risky large-scale space projects. International interindustry and interdisciplinary space projects are expected for the next decade due to escalating costs, shifting political climates, and the entrance of private companies and smaller nations into the aerospace industry. C.C.S.

A93-12061* National Aeronautics and Space Administration, Washington, DC.
RATIONALE AND CONSTITUENCIES FOR THE SPACE EXPLORATION INITIATIVE
KRISTINE A. JOHNSON (NASA, Space Exploration Directorate, Washington) *In* Mars: Past, present, and future; Proceedings of the Conference, Williamsburg, VA, July 16-19, 1991 Washington American Institute of Aeronautics and Astronautics 1992 p. 91-96.
Copyright

In order to maximize the benefits from prospective space-exploration endeavors, and to enlist the support of as many constituencies as possible, NASA is either conducting or developing programs which emphasize different aspects of the Space Exploration Initiative. Attention is presently given to the cases of education using space exploration themes as teaching tools and technology transfer from government to private industry. Only on the basis of the establishment of such constituencies, will it be possible to sustain funding over the three decades foreseen as required for a Mars exploration effort. O.C.

A93-43535
FLAT ORGANIZATIONS FOR EARTH SCIENCE
JESSE H. AUSUBEL (Rockefeller Univ.; Carnegie Commission on Science, Technology, and Government, New York) and JOHN H. STEELE (Woods Hole Oceanographic Institution, MA) *American Meteorological Society, Bulletin* (ISSN 0003-0007) vol. 74, no. 5 May 1993 p. 809-814. refs
Copyright

The institutions that made American science famous figure less and less in the leadership and management of American science. Causes for this decline, especially evident in ocean and atmospheric sciences, include large programs that cut across institutions, the volume of federal funds, the scale of scientific instruments and facilities, easier travel and telecommunications, and time horizons of entrepreneurial science. The pattern emerging results not from a deliberate policy of bypassing major institutions and their management, but from radical changes in the structure of scientific activity. Science is matching industry in a trend toward flatter management and functional, rather than geographic, organization. Some risks and needs arise with the new balance - or imbalance - of power. Author

N92-18298*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.
TOTAL QUALITY LEADERSHIP
Summary Report Apr. 1991 182 p Presented at the 7th Annual NASA/Contractors Conference on Quality and Productivity p 24-25 Oct. 1990 (ISSN 1049-667X)
(NASA-TM-105466; NAS 1.15:105466) Avail: CASI HC A09/MF A02

More than 750 NASA, government, contractor, and academic representatives attended the Seventh Annual NASA/Contractors Conference on Quality and Productivity. The panel presentations and Keynote speeches revolving around the theme of total quality leadership provided a solid base of understanding of the importance, benefits, and principles of total quality management (TQM). The presentations from the conference are summarized. Author

N92-18767# Office of Science and Technology, Washington, DC.
GRAND CHALLENGES: HIGH PERFORMANCE COMPUTING AND COMMUNICATIONS. A REPORT BY THE COMMITTEE ON PHYSICAL, MATHEMATICAL, AND ENGINEERING SCIENCES TO SUPPLEMENT THE PRESIDENT'S FISCAL YEAR 1992 BUDGET
Executive Summary Jan. 1991 65 p
(PB92-102409) Avail: CASI HC A04/MF A01

This Congressional Report presents an ambitious and well-coordinated research and development program designed to sustain and extend U.S. leadership in all advanced areas of computing and networking. The program not only provides a far-sighted vision for the underlying technologies but also gives recognition to the importance of both human resources and those applications that serve major national needs. It provides for the use of improved computational and communications technologies to contribute to more effective solutions of grand challenge problems. The goal of the Federal High Performance Computing and Communications (HPPCC) Program is to accelerate significantly the commercial availability and utilization of the next generation of high performance computers and networks. NTIS

N92-20541# National Academy of Sciences - National Research Council, Washington, DC. Committee on Science, Engineering, and Public Policy.
SCIENCE AND TECHNOLOGY LEADERSHIP IN AMERICAN GOVERNMENT: ENSURING THE BEST PRESIDENTIAL APPOINTMENTS
1992 96 p Sponsored in part by Carnegie Commission on Science, Technology, and Government Prepared in cooperation with National Academy of Engineering, Washinton, DC
(LC-92-60301; (ISBN-0-309-04727-7) Avail: CASI HC A05/MF A01

The federal government's capability to attract highly qualified individuals to serve in the top-level executive positions involved in science and technology (S&T) decision making and program management is examined. The problems encountered in recruiting and keeping talented experts, especially scientists and engineers, as presidential appointees are addressed, and recommendations for improving the situation are presented. Author

N92-28149# Office of Management and Budget, Washington, DC.
IMPROVING THE IMPACT OF FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION: A CALL FOR ACTION
DAVID GOLD 15 May 1992 32 p
Avail: CASI HC A03/MF A01

Through its billions of dollars in expenditures on research and development (R&D), the US Federal Government generates more scien-

tific and technical information (STI) than any other single source in the world. Federal STI represents a product and direct benefit of the over $70 billion in annual Federal R&D expenditures. How the Federal Government goes about making this information available for use has a direct and very significant impact on the ability of the billions of dollars in R&D expenditures to promote US competitiveness, enhance science and math education, and advance the US science base. An effort to build a strong case in support of the position that the issues confronting the Federal STI system are critically important to the US and that administration leadership in coordinating STI is needed is presented. Author

N93-18383# National Science Foundation, Washington, DC. Directorate for Education and Human Resources.
DECADE OF ACHIEVEMENT: EDUCATIONAL LEADERSHIP IN MATHEMATICS, SCIENCE AND ENGINEERING
Activities Report, 1981-1991
1991 35 p Original contains color illustrations
(NSF-92-94) Avail: CASI HC A03/MF A01

The effort to make the United States number one in math and science achievement must reflect the diversity of our country and our democratic approach to education. Everyone, not just a select few, must reap the benefits of our efforts to provide a world-class education to our students. There are many reasons for seeking to provide a world-class education. One reason is that education is important for its own sake. But education for its own sake is not as compelling an argument for government support as is the fact that a world-class education system is essential if we are to improve our standard of living and the quality of life on our planet. Described are the diverse and vigorous education and human resource programs the Foundation has developed and supported over the last ten years - activities that reach out to all, recognizing the needs of a changing U.S. population and a changing workplace. I.I.C.

N93-25232# President's Council of Advisors on Science and Technology, Washington, DC.
SCIENCE, TECHNOLOGY, AND NATIONAL SECURITY
Dec. 1992 24 p
Avail: CASI HC A03/MF A01

During nearly half a century of cold war, America used technological superiority to offset the numerical advantage of Soviet military power. More recently, the spectacular performance of U.S. defense and intelligence technology in Operation Desert Storm graphically demonstrated to the world an American technological prowess that is matched by no other nation. Leadership in science and technology helped make American leadership in world affairs effective. Yet science and technology are forever moving forward: today's cutting edge can easily become tomorrow's trailing edge. Thus, continuation of America's advantage cannot be taken for granted, but must be constantly renewed through vigorous and far-sighted policies and programs. The panel has been given the task of proposing policies that will provide to future Presidents as wide a lead in national security technology as America enjoys today. In its deliberations, the panel has identified six critical objectives for presidential attention: (1) preserving and extending our capability to gather and interpret essential intelligence by exploiting advanced science and technology for intelligence; (2) staving off proliferation of weapons of mass destruction and advanced conventional weapons, which opponents will try to use to undercut our unmatched capability for intense, precision, conventional warfare; (3) restructuring government's approach to applying technology and acquiring new high-tech defense and intelligence systems, so we can continue to have modern forces despite budget cutbacks; (4) attracting and retaining technically qualified people to serve in key national security posts; (5) giving a new emphasis to exploring defensive technology, so that have options to defend our nation, our allies, and our forces in proliferation does occur; and (6) enunciating a presidential strategy for continued superiority in science and technology, so that government and industry leaders clearly recognize that the advantage we displayed in Desert Storm must be preserved in the future. Author

N93-26131# President's Council of Advisors on Science and Technology, Washington, DC.
HIGH PERFORMANCE COMPUTING AND COMMUNICATIONS PANEL REPORT
Dec. 1992 12 p
Avail: CASI HC A03/MF A01

In FY-92, a presidential initiative was launched, aimed at securing U.S. preeminence in high performance computing and related communication technologies. The initiative, entitled High Performance Computing and Communications (HPCC), is one of five initiatives coordinated by the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET) process. Nine federal agencies are currently involved, with the Defense Advanced Research Project Agency, the Department of Energy, the National Aeronautics and Space Administration, and the National Science Foundation providing the principal program funding and direction. Lesser but important roles are being played by the National Oceanic and Atmospheric Administration, the National Institute of Standards and Technology, the Environmental Protection Agency, the Department of Education, and the National Institutes of Health. The stated goal of the initiative is threefold: extend U.S. technological leadership in high performance computing and computer communications; provide wide dissemination and application of the technologies; and spur gains in U.S. productivity and industrial competitiveness, all within the context of the mission needs of federal agencies. The strategy for accomplishing the goals and the program components are highlighted in the report 'Grand Challenges: High Performance Computing and Communications,' published as a supplement to the fiscal year 1992 and 1993 budgets. Author (revised)

02
INFORMATION AND ANALYSIS

A92-17593#
A METHOD FOR TAILORING THE INFORMATION CONTENT OF A SOFTWARE PROCESS MODEL - VERSION 2
MARK AREND (McDonnell Douglas Space Systems Co., Houston, TX) IN: AIAA Computing in Aerospace Conference, 8th, Baltimore, MD, Oct. 21-24, 1991, Technical Papers. Vol. 1 1991 14 p refs
(AIAA PAPER 91-3725) Copyright

The paper defines the framework of a general method for selecting a necessary and sufficient subset of a general software life-cycle's information products, to support new software development projects. User-interview guidelines can be used to capture specific requirements for software quality very early in the development life cycle. Software quality requirements can be used to highlight appropriate information products whose content and generation support the eventual existence of specific quality items in the software product. Author

A92-19144
ANALYSIS OF A SIMPLIFIED HOPPING ROBOT
DANIEL E. KODITSCHEK and MARTIN BUEHLER (Yale University, New Haven, CT) *International Journal of Robotics Research* (ISSN 0278-3649), vol. 10, Dec. 1991, p. 587-605. Research supported by GMF Robotics Corp. refs
(Contract NSF DMC-85-52851)
Copyright

Some analytical results concerning simplified models of Raibert's hoppers are presented. The task of achieving a recurring hopping height for an actuated 'ball' robot is represented as a stability problem in a nonlinear discrete dynamical control system. The paper models the properties of Raibert's control scheme in a simplified fashion and argues that his strategy leads to closed-loop dynamics governed by a well-known class of functions, the unimodal maps. The motivation for this work is the hope that it will facilitate the development of general design principles for 'dynamically dexterous' robots. Author

A92-19392* California Univ., Irvine, CA.
SAFETY
NANCY G. LEVESON (California, University, Irvine) IN: Aerospace software engineering - A collection of concepts 1991 19 p refs
(Contract NSF CCR-87-18001; NSF RII-88-00505; NSF DCR-85-21398; NAG1-668)
Copyright

Software requirements, design, implementation, verification and validation, and especially management are affected by the need to produce safe software. This paper discusses the changes in the software life cycle that are necessary to ensure that software will execute without resulting in unacceptable risk. Software is being used increasingly to monitor and control safety-critical processes in which a run-time failure or error could result in unacceptable losses such as death, injury, loss of property, or environmental harm. Examples of such processes maybe found in transportation, energy, aerospace, basic industry, medicine, and defense systems. Author

A92-20000#
TECHNOLOGY IN THE LIVES OF AN AIRCRAFT DESIGNER (1991 WRIGHT BROTHERS LECTURE)
I. T. WAALAND (Northrop Advanced Technology and Design Center, Pico Rivera, CA) AIAA, Aircraft Design and Operations Meeting, Baltimore, MD, Sept. 23, 1991. 17 p
(AIAA PAPER 91-3069) Copyright

An autobiographical account is given of the configurational design development history of U.S. tactical and strategic aircraft from the mid-1950s to the present. The configurational aerodynamics efforts detailed encompass the E-2 AEW carrier-based aircraft, the F-111B, the F-14A, the Space Shuttle, the F/A-18, and the B-2 stealth bomber. The increasing complexity of both aircraft and the design process is held to have significantly increased the isolation of engineering disciplines, precluding the most natural pathways to 'concurrent engineering'. O.C.

A92-20106* Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA.
PROCESS ASSESSMENTS IN NASA
MARILYN W. BUSH (JPL, Pasadena, CA) IN: International Conference on Software Engineering, 13th, Austin, TX, May 13-16, 1991, Proceedings. Los Alamitos, CA, IEEE Computer Society, 1991, 6 p refs
Copyright

A software process assessment procedure, refined by the Software Engineering Institute (SEI), has been introduced into NASA. The techniques were extended to cover contract management and especially software quality assurance organizations. A preliminary assessment questionnaire consisting of 98 items was introduced and found to be a useful tool at a series of on-site surveys. O.G.

A92-27750
TECHNOLOGICAL COMPETITION AND INTERDEPENDENCE - THE SEARCH FOR POLICY IN THE UNITED STATES, WEST GERMANY, AND JAPAN
GUENTER HEIDUK, ED. (Universitaet Duisburg Gesamthochschule, Federal Republic of Germany) and KOZO YAMAMURA, ED. (Washington, University, Seattle) Seattle, WA and London/Tokyo, University of Washington Press/University of Tokyo Press, No individual items are abstracted in this volume. 1990 277 p
(ISBN 0-295-96931-8) Copyright

The present work discusses the current status of the U.S.'s postwar technological leadership, the current and prospective status of Japanese technological capabilities, perceptions as to Germany's technological capabilities in the 1980s, the effects of industrial structure on industrial policy, and a theory of international economic regimes. Also discussed are the relative effectiveness of conglomerates and keiretsu in fostering technological innovation, the German competitive position in the trade of technology-intensive products, prospects for U.S. leadership in high-tech industries, the changing character of competitive advantage in automo-biles, and the benefits and burdens of technological leaders. O.C.

A92-43583
AN APPROACH TO TREND ANALYSIS IN DATA WITH SPECIAL REFERENCE TO COMETARY MAGNITUDES
J. R. DONNISON and H. W. PEERS (Goldsmiths' College, London, England) *Royal Astronomical Society, Monthly Notices* (ISSN 0035-8711), vol. 256, no. 4, June 15, 1992, 8 p refs
Copyright

A novel trend-analysis method is presently developed in association with a Pareto power-law model used by Donnison (1986, 1987, 1990) to model the brightness magnitude distribution of long and short-period comets. Compelling evidence is found for an increase in the brightness indices with the discovery rate of the long-period comets. No trend is discernible as a function of perihelion distance; neither are trends apparent in the brightness distribution of the short-period comets with increased orbital period. O.C.

A92-46015
TECHNOLOGICAL INNOVATION DIFFUSION - THE PROLIFERATION OF SUBSTITUTION MODELS AND EASING THE USER'S DILEMMA
UMA KUMAR and VINOD KUMAR (Carleton University, Ottawa, Canada) *IEEE Transactions on Engineering Management* (ISSN 0018-9391), vol. 39, no. 2, May 1992. Research supported by NSERC. 11 p refs
Copyright

In this paper, the proliferation, assumptions, motivation, and behavior of various substitution models of the technological diffusion process are explored. The underlying notion is that such an understanding helps the model user to choose the most appropriate model for the situation. This paper discusses the development, motivation, and assumptions of various deterministic and binary substitution models and compares them on the basis of their three mathematical characteristics. Further, it is shown that the study of the interrelationships between the models is useful in narrowing the choice. The behavior of the models is studied through an illustration of diffusion of innovative oxygen-steel technology in Spain and in Japan. Author

A92-47284
GENETIC SEARCH STRATEGIES IN MULTICRITERION OPTIMAL DESIGN
P. HAJELA (Rensselaer Polytechnic Institute, Troy, NY) and C.-Y. LIN (Florida, University, Gainesville) *Structural Optimization* (ISSN 0934-4373), vol. 4, no. 2, June 1992. 9 p refs
(Contract DAAL03-88-K-0013)
Copyright

The present paper describes an implementation of genetic search methods in multicriterion optimal designs of structural systems with a mix of continuous, integer and discrete design variables. Two distinct strategies to simultaneously generate a family of Pareto optimal designs are presented in the paper. These strategies stem from a consideration of the natural analogue, wherein distinct species of life forms share the available resources of an environment for sustenance. The efficacy of these solution strategies are examined in the context of representative structural optimization problems with multiple objective criteria and with varying dimensionality as determined by the number of design variables and constraints. Author

A92-48516
THE CARE AND FEEDING COSTS OF A MATURING SOFTWARE PROCESS
GREGORY J. SCOTT (Lockheed Missiles and Space Co., Inc., Sunnyvale, CA) and ANN L. HUGHES (Loral Corp., New York) IN: NAECON 91; Proceedings of the IEEE National Aerospace and Electronics

Conference, Dayton, OH, May 20-24, 1991. Vol. 2 6 p refs
Copyright

Three major components of the software process have been defined: human relations or people, such as skills acquisition, compensation, incentives and rewards; technology, including CASE (computer-aided software engineering); and management, policies, procedures, standards and practices. The authors explore the overt and hidden costs of these components in three phases: the initial nonrecurring costs to acquire and install these capabilities as the organization grows from an initial level of process maturity; the recurring costs associated with maintenance of the installed systems used in a well-defined software process organization; and the continuing costs associated with technology tracking and insertion to maintain a state-of-the-practice that is consistent within an organization using a managed or optimizing software development process. I.E.

A92-48525
INTERFACING TEAMWORK TO A 'T' FOR AUTOMATED TEST CASE GENERATION FROM DATA FLOW DIAGRAMS - A CASE STUDY

DAVID E. COLLIER (U.S. Navy, Naval Avionics Center, Indianapolis, IN) IN: NAECON 91; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1991. Vol. 2 6 p

The author describes the effort required to interface two case tools, Teamwork for software analysis and design, and 'T' for software testing. He documents and shares experiences about interconnecting these CASE (computer-aided software engineering) tools. The interconnection was constructed to transfer information from Teamwork to 'T' automatically, thus reducing the amount of labor required to translate from one tool to the other. I.E.

A92-48533
EARLY MPTS ANALYSIS - METHODS IN THIS 'MADNESS'

FRANK C. GENTNER and EDWARD BOYLE (USAF, Armstrong Laboratory, Wright-Patterson AFB, OH) IN: NAECON 91; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1991. Vol. 2 10 p refs
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The approved DoD Instruction (DoDI) 5000.2, Defense Acquisition Management Policy and Procedures, and draft AFR 57-1, Operational Needs, Requirements, and Concepts, require Manpower, Personnel, Training, and Safety (MPTS) or Human Systems Integration (HSI) analysis early in the acquisition process. These new requirements push MPTS analysis earlier than ever before into the pre-concept and concept phases. Air Force (AF) and DoD acquisition leaders have been stressing the importance of higher quality system requirements identification and refinement prior to entering the demonstration/validation phase, since it is less expensive to make conceptual changes than engineering changes during the later acquisition phases. The authors examine one method by which AF personnel and contractors can conduct early MPTS/HSI analysis with today's available MPTS tools and databases. I.E.

A92-48568
UNDERSTANDING THE SELECTION OF STATISTICAL TESTS

CLINTON L. CAMPBELL (USAF, Institute of Technology, Wright-Patterson AFB, OH) IN: NAECON 91; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1991. Vol. 3 6 p

The author uses operating characteristic curves to examine the statistical risks associated with various test plans. Using binomial distribution examples, he shows how the supplier's and procurer's statistical risks can be understood prior to starting a test, thereby avoiding the selection of a test that accidentally loads the dice against the supplier. In addition, the formulae used to calculate operating characteristic curves using electronic spreadsheets are identified. I.E.

A93-18984
A GENERAL ENGINEERING SCENARIO FOR CONCURRENT ENGINEERING ENVIRONMENTS

V. H. MUCINO (West Virginia Univ., Morgantown) and V. PAVELIC (Wisconsin Univ., Milwaukee) *In* Struceng & Femcad - Structural engineering and optimization Gournay-sur-Marne, France Institute for Industrial Technology Transfer-International 1991 p. 137-145. refs

The paper describes an engineering method scenario which categorizes the various activities and tasks into blocks seen as subjects which consume and produce data and information. These methods, tools, and associated utilities interact with other engineering tools by exchanging information in such a way that a relationship between customers and suppliers of engineering data is established clearly, while data exchange consistency is maintained throughout the design process. The events and data transactions are presented in the form of flowcharts in which data transactions represent the connection between the various bricks, which in turn represent the engineering activities developed for the particular task required in the concurrent engineering environment. I.S.

A93-20365#
EFFICIENT MULTIOBJECTIVE OPTIMIZATION SCHEME FOR LARGE SCALE STRUCTURES

RAMANA V. GRANDHI, GEETHA BHARATRAM (Wright State Univ., Dayton, OH), and V. B. VENKAYYA (USAF, Flight Dynamics Directorate, Wright-Patterson AFB, OH) *In* AIAA/USAF/NASA/OAI Symposium on Multidisciplinary Analysis and Optimization, 4th, Cleveland, OH, Sept. 21-23, 1992, Technical Papers. Pt. 2 Washington American Institute of Aeronautics and Astronautics 1992 p. 679-685. refs
(Contract F33615-88-C-3204)
(AIAA PAPER 92-4772)

This paper presents a multiobjective optimization algorithm for an efficient design of large scale structures. The algorithm is based on generalized compound scaling techniques to reach the intersection of multiple functions. Multiple objective functions are treated similar to behavior constraints. Thus, any number of objectives can be handled in the formulation. Pseudo targets on objectives are generated at each iteration in computing the scale factors. The algorithm develops a partial Pareto set. This method is computationally efficient due to the fact that it does not solve many single objective optimization problems in reaching the Pareto set. The computational efficiency is compared with other multiobjective optimization methods, such as the weighting method and the global criterion method. Trusses, plate, and wing structure design cases with stress and frequency considerations are presented to demonstrate the effectiveness of the method. Author

A93-34470
AN EVOLUTIONARY APPROACH

THOMAS J. HEALY (Rockwell International Corp., Space Systems Div., Downey, CA) *Aerospace America* (ISSN 0740-722X) vol. 31, no. 4 April 1993 p. 25-27.
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The paper describes an evolutionary approach to the development of aerospace systems, represented by the introduction of integrated product teams (IPTs), which are now used at Rockwell's Space Systems Division on all new programs and are introduced into existing projects after demonstrations of increases in quality and reductions in cost and schedule due to IPTs. Each IPT is unique and reflects its own program and lasts for the life of the program. An IPT includes customers, suppliers, subcontractors, and associate contractors, and have a charter, mission, scope

of authority, budget, and schedule. Functional management is responsible for the staffing, training, method development, and generic technology development. AIAA

A93-36007
VALISYS - A NEW QUALITY ASSURANCE TOOL
JOHN J. MAZUR, JR. (Boeing Defense & Space Group, Helicopters Div., Philadelphia, PA) *In* AHS, Annual Forum, 48th, Washington, June 3-5, 1992, Proceedings. Vol. 2 Alexandria, VA American Helicopter Society 1992 p. 1481-1493.
Copyright

This paper details the use of Valisys software for inspection of parts at Boeing Helicopters. Valisys, developed by the Valisys Corporation and marketed by IBM, runs on the CATIA (Computer-Aided Three-Dimensional Interactive Application) CADCAM System. Valisys is presently used at Boeing Helicopters to program coordinate measuring machines (CMMs) for inspection of aircraft parts and analysis of CMM data. Valisys works interactively with CATIA to assure that engineering designs conform to the ANSI Y14.5 Standard and produces CMM programs directly from the CATIA designs. One of the keys to Valisys is a revolutionary tool called a Softgauge (Registered Trademark of Valisys Corporation). It is a precise three-dimensional CAD model of a part's tolerance zone and its associated datums. Design Engineers can use Softgauges to graphically visualize a part's worstcase condition and Quality Engineers use them as inspection criteria for CMM inspection. Valisys produces CMM programs directly from the Softgauges, creates an electronic CAD model of the as-built part and then compares it to the Softgauge definition. This paper examines the Valisys inspection process at Boeing Helicopters with specific applications and examples of the benefits that are currently being realized. Also discussed are plans to implement Valisys in a Flexible Machining Cell for in-process inspection on milling machines. Author

A93-42826
A COMPREHENSIVE PLANNING AND CONTROL TOOL FOR LARGE SOFTWARE PROJECTS
R. A. DOERING (Delco Electronics Corp., Goleta, CA) *In* NAECON 92; Proceedings of the IEEE 1992 National Aerospace and Electronics Conference, Dayton, OH, May 18-22, 1992. Vol. 2 New York Institute of Electrical and Electronics Engineers, Inc. 1992 p. 587-591.
Copyright

Delco Systems Operations and Douglas Aircraft Company have been developing the over 300,000 lines of Jovial software for Delco's Mission Computer to be installed on the C-17 Aircraft. A comprehensive system has been developed to plan, control, and report on the software development for this large effort. A flexible relational database manager is being used to track scheduled and actually accomplished software design, code, and data statements distributed over up to three simultaneous release versions are monitored. Various reports, metrics, and indicators are described. Emphasis is placed on the teamwork and cultural changes that are essential to the successful implementation of the method. Author

A93-50100#
AIDE II INTEGRATED DESIGN EVALUATION PROGRAM
RICHARD V. ALEXANDER (Aerojet, Propulsion Div., Sacramento, CA) Jun. 1993 6 p. AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 29th, Monterey, CA, June 28-30, 1993 (AIAA PAPER 93-2319) Copyright

The AIDE computer program (Aerojet's Integrated Design Evaluation) derives from the industry's earliest design optimization program for establishing propulsion requirements for Polaris. It is used to establish design requirements, solid rocket motor operating conditions, design details, and evaluate design alternatives for propulsion systems optimized to meet a wide range of systems requirements. AIDE uses detailed component design subroutines (when possible) to make preliminary designs. The program does in minutes what a large number of designers would take weeks to do. AIDE (or previous versions) have been used on every major solid rocket study/hardware program at Aerojet for the past 35 years. The versatility of AIDE was demonstrated in our SICBM work. Our first SICBM contract with AFRPL was to perform design optimization studies and evaluate alternative concepts in systems definition. It was then used to select optimum operating conditions for each of the three stages for which Aerojet submitted proposals. After winning a development contract, it was used during the next two years for sensitivity and trade studies refining our second stage SICBM design. Author (revised)

A93-50586
SIMPLIFIED CONTROL AND DISPLAY CONCEPTS FOR SPACE VEHICLE CONTROL, APPLIED TO SPACE STATION, SPACE SHUTTLE AND UNMANNED SATELLITES
JOHN M. BARRY (Rockwell International Corp., Space Systems Div., Downey, CA) *In* Guidance and control 1992; Proceedings of the 15th Annual AAS Rocky Mountain Conference, Keystone, CO, Feb. 8-12, 1992 San Diego, CA Univelt, Inc. 1992 p. 189-195. refs (AAS PAPER 92-027) Copyright

NASA and the Air Force are constantly exploring ways to reduce launch vehicle, satellite, and planetary mission life cycle costs. A significant amount of these costs has been devoted to the control of these missions. This control is labor-intensive and requires a diversity of equipment and control devices. The diagnostic procedures involved in this control are duplicated in the development, testing, and operation of the space assets. This control philosophy tends to inhibit technological growth. Such growth is necessary in space systems which are being designed and modified over decades. This paper advocates and demonstrates an innovative approach to simplify the control and display concepts and improve the development and operational process for space assets. It visualizes traditional system engineering techniques in a concurrent engineering environment. This approach captures the knowledge of functional decomposition, failure modes and effects analysis and configuration management in a dynamic prototyping process. It can use existing testing and checkout information to control and operate the space asset during assembly, test, and operation. The implementation of this technique will reduce space development and operations costs, cycle time, and allow for technological growth. Author (revised)

A93-53770
NETWORKS EXTEND SIMULATION'S REACH
BRIAN F. GOLDIEZ (Central Florida Univ., Orlando, FL) *Aerospace America* (ISSN 0740-722X) vol. 31, no. 8 Aug. 1993 p. 22-25.
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Simulator networking called distributed interactive simulation (DIS) is discussed. DIS standards are capable of supporting concurrent engineering by providing a convenient way to create a rapid prototyping environment. DIS makes it possible to combine diverse simulation models to produce an integrated concurrent engineering environment. AIAA

N92-12502*# Collaborative Technology Corp., Austin, TX.
GROUP DECISION SUPPORT SYSTEMS
DON PETERSEN *In* Research Inst. for Advanced Computer Science, Networking as a Strategic Tool, 1991 12 p
Avail: CASI HC A03/MF A02

Computers are used to support collaboration among members of a business team. The specific application is the augmentation of meetings. The motivation, approach, and empirical results are presented. Author

N92-12991# General Accounting Office, Washington, DC. National Security and International Affairs Div.
AEROSPACE PLANE TECHNOLOGY: RESEARCH AND DEVELOPMENT EFFORTS IN JAPAN AND AUSTRALIA
Oct. 1991 153 p 6
(AD-A241641; GAO/NSIAD-92-5) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

U.S. leadership and preeminence in the research and development of aerospace plane technologies are being challenged by Japan and other countries. U.S. leadership and preeminence are based on the National Aero-Space Plane Program. As discussed in our prior reporton European aerospace plane technology, congressional supporters of the program are concerned about foreign competition and

its impact on U.S. technological leadership. The former Chairman of the House Committee on Science, Space, and Technology asked GAO to identify indicators to measure foreign countries' current state of aerospace plane technological development and progress. The indicators were selected based on the interests of Committee representatives and on discussions with experts. These indicators are (1) space policies and aerospace goals and objectives; (2) aerospace plane program objectives, design goals, schedules, and costs; (3) the current status and rate of progress in the development of critical technologies; (4) the funding for and the number and type of people involved with the programs; (5) test facilities and their capabilities; and (6) the existence of and interest in international cooperation. The former Chairman also asked GAO to collect data nd information on the indicators. DTIC

N92-13311*# Analytical Services and Materials, Inc., Hampton, VA.
THE APPLICATION OF STATISTICALLY DESIGNED EXPERIMENTS TO RESISTANCE SPOT WELDING Final Report
ROBERT A. HAFLEY and STEPHEN J. HALES Washington NASA Dec. 1991 53 p
(Contract NAS1-18599; RTOP 946-01-00-77)
(NASA-CR-4412; NAS 1.26:4412) Avail: CASI HC A04/MF A01

State-of-the-art Resistance Spot Welding (RSW) equipment has the potential to permit realtime monitoring of operations through advances in computerized process control. In order to realize adaptive feedback capabilities, it is necessary to establish correlations among process variables, welder outputs, and weldment properties. The initial step toward achieving this goal must involve assessment of the effect of specific process inputs and the interactions among these variables on spot weld characteristics. This investigation evaluated these effects through the application of a statistically designed experiment to the RSW process. A half-factorial, Taguchi L sub 16 design was used to understand and refine a RSW schedule developed for welding dissimilar aluminum-lithium alloys of different thickness. The baseline schedule had been established previously by traditional trial and error methods based on engineering judgment and one-factor-at-a-time studies. A hierarchy of inputs with respect to each other was established, and the significance of these inputs with respect to experimental noise was determined. Useful insight was gained into the effect of interactions among process variables, particularly with respect to weldment defects. The effects of equipment related changes associated with disassembly and recalibration were also identified. In spite of an apparent decrease in equipment performance, a significant improvement in the maximum strength for defect-free welds compared to the baseline schedule was achieved. Author

N92-14134*# Alabama Univ., Huntsville, AL. Lab. for Inline Process Analyses.
SPECTROSCOPY AND MULTIVARIATE ANALYSES APPLICATIONS RELATED TO SOLID ROCKET NOZZLE BONDLINE Final Report
W. F. ARENDALE, RICHARD HATCHER, BRIAN BENSON, and GARY L. WORKMAN 26 Nov. 1991 159 p
(Contract NAS8-36955)
(NASA-CR-184281; NAS 1.26:184281) Avail: CASI HC A08/MF A02

Chemical composition and molecular orientation define the properties of materials. Information related to chemical composition and molecular configuration is obtained by various forms of spectroscopy. Software algorithms developed for multivariate analyses, expert systems, and Artificial Intelligence (AI) are used to conduct repetitive operations. The techniques are believed to be of particular significance toward achieving TQM objectives. The objective was to obtain information related to the quality of the bondline in the solid rocket motor, SRM, nozzle. Hysol 934 NA, a room temperature curing epoxide resin, is used as the bonding agent. A good bond requires that the adhesive be placed on a properly prepared metal surface, the adhesives Part A and B be mixed in appropriate ratio from material within shelf life specifications. Spectroscopic data was obtained for surfaces prepared according to specifications, contaminated metal surfaces, samples of the epoxide adhesive at times that represent shelf aging from 3 months to 2 years, several mix ratio of A to B, and curing material. Temperature was found to be a significant factor. The study concentrated on pot life and mix ratio. Author

N92-15584# Pacific Northwest Lab., Richland, WA.
R/D SOFTWARE QUALITY ASSURANCE
F. C. HOOD Oct. 1991 8 p Presented at the 18th Annual American Society of Quality Control (ASQC) National Energy Division Conference, Danvers, MA, 6-9 Oct. 1991
(Contract DE-AC06-76RL-01830)
(DE92-002137; PNL-SA-19670; CONF-9110102-5) Avail: CASI HC A02/MF A01

Research software quality assurance (QA) requirements must be adequate to strengthen development or modification objectives, but flexible enough not to restrict creativity. Application guidelines are needed for the different kinds of research and development (R&D) software activities to assure project objectives are achieved. DOE

N92-17064# TRW Space and Defense Sector, Redondo Beach, CA.
PRAGMATIC QUALITY METRICS FOR EVOLUTIONARY SOFTWARE DEVELOPMENT MODELS
WALKER ROYCE Jan. 1991 16 p
(AD-A243022; TRW-TS-91-01) Avail: CASI HC A03/MF A01

Due to the large number of product, project and people parameters which impact large custom software development efforts, measurement of software product quality is a complex undertaking. Furthermore, the absolute perspective from which quality is measured (customer satisfaction) is intangible. While we probably can't say what the absolute quality of a software product is, we can determine the relative quality, the adequacy of this quality with respect to pragmatic considerations, and identify good and bad trends during development. While no two software engineers will ever agree on an optimum definition of software quality, they will agree that the most important perspective of software quality is its ease of change. We can call this flexibility, adaptability or some other vague term, but the critical characteristic of software is that it is soft. The easier the product is to modify, the easier it is to achieve any other software quality perspective. This paper presents objective quality metrics derived from consistent lifecycle perspectives of rework which, when used in concert with an evolutionary development approach, can provide useful insight to produce better quality per unit cost/schedule or to achieve adequate quality more efficiently. DTIC

N92-19425*# Houston Univ., Clear Lake, TX.
A METHOD FOR TAILORING THE INFORMATION CONTENT OF A SOFTWARE PROCESS MODEL
SHARON PERKINS (Houston Univ., Clear Lake, TX.) and MARK B. AREND (McDonnell-Douglas Space Systems Co., Houston, TX.) *In* NASA. Goddard Space Flight Center, Proceedings of the 15th Annual Software Engineering Workshop 32 p Nov. 1990 Previously announced as N91-13097
(Contract NCC9-16)
Avail: CASI HC A03/MF A06

The framework is defined for a general method for selecting a necessary and sufficient subset of a general software life cycle's information products, to support new software development process. Procedures for characterizing problem domains in general and mapping to a tailored set of life cycle 7 processes and products is presented. An overview of the method is shown using the following steps: (1) During the problem concept definition phase, perform standardized interviews and dialogs between developer and user, and between user and customer; (2) Generate a quality needs profile of the software to be developed, based on information gathered in step 1; (3) Translate the quality needs profile into a profile of quality criteria that must be met by the software to satisfy the quality needs; (4) Map the quality criteria to a set of accepted

processes and products for achieving each criterion; (5) select the information products which match or support the accepted processes and product of step 4; and (6) Select the design methodology which produces the information products selected in step 5. Author

N92-19427*# TRW Defense and Space Systems Group, Redondo Beach, CA.
PRAGMATIC QUALITY METRICS FOR EVOLUTIONARY SOFTWARE DEVELOPMENT MODELS
WALKER ROYCE *In* NASA. Goddard Space Flight Center, Proceedings of the 15th Annual Software Engineering Workshop 31 p Nov. 1990
Avail: CASI HC A03/MF A06

Due to the large number of product, project, and people parameters which impact large custom software development efforts, measurement of software product quality is a complex undertaking. Furthermore, the absolute perspective from which quality is measured (customer satisfaction) is intangible. While we probably can't say what the absolute quality of a software product is, we can determine the relative quality, the adequacy of this quality with respect to pragmatic considerations, and identify good and bad trends during development. While no two software engineers will ever agree on an optimum definition of software quality, they will agree that the most important perspective of software quality is its ease of change. We can call this flexibility, adaptability, or some other vague term, but the critical characteristic of software is that it is soft. The easier the product is to modify, the easier it is to achieve any other software quality perspective. This paper presents objective quality metrics derived from consistent lifecycle perspectives of rework which, when used in concert with an evolutionary development approach, can provide useful insight to produce better quality per unit cost/schedule or to achieve adequate quality more efficiently. The usefulness of these metrics is evaluated by applying them to a large, real world, Ada project. Author

N92-19432*# Reifer Consultants, Inc., Torrance, CA.
REUSE METRICS AND MEASUREMENT: A FRAMEWORK
DONALD J. REIFER *In* NASA. Goddard Space Flight Center, Proceedings of the 15th Annual Software Engineering Workshop 20 p Nov. 1990
Avail: CASI HC A03/MF A06

The lessons learned and experience gleaned are described by those who have started to implement the reuse metrics and measurement framework used in controlling the development of common avionics and software for its affiliated aircraft programs. The framework was developed to permit the measurement of the long term cost/benefits resulting from the creation and use of Reusable Software Objects (RSOs). The framework also monitors the efficiency and effectiveness of the Software Reuse Library (SRL). The metrics and measurement framework is defined which was established to allow some determinations and findings to be made relative to software reuse. Seven criteria are discussed which were used to guide the establishment of the proposed reuse framework. Object recapture and creation metrics are explained along with their normalized use in effort, productivity, and quality determination. A single and multiple reuse instance version of a popular cost model is presented which uses these metrics and the measurement scheme proposed to predict the software effort and duration under various reuse assumptions. Studies in using this model to predict actuals taken from the RCI data base of over 1000 completed projects is discussed. Author

N92-19676# Environmental Protection Agency, Research Triangle Park, NC. Quality Assurance Management Staff.
HARMONIZATION OF QA PROCEDURES FOR ENVIRONMENTAL DATA OPERATIONS: DEVELOPMENT OF A NATIONAL CONSENSUS STANDARD FOR QUALITY ASSURANCE FOR ENVIRONMENTAL PROGRAMS
G. L. JOHNSON, D. W. WOLFE, and S. M. BLACKER Oct. 1991 21 p Presented at the Proceedings of the 19th Annual Energy Division Conference of the American Society for Quality Control, Oct. 1991 Prepared in cooperation with Bechtel Corp., San Francisco, CA; and MAC Technical Services, Germantown, MD
(PB91-240523; EPA/600/D-91/221) Avail: CASI HC A03/MF A01

Decisions on where and how to clean up Federally-owned facilities contaminated by mixtures of hazardous chemical and radioactive wastes requires that quality environmental data be obtained. The Federal Government is currently using several different standards or sets of requirements for establishing the quality assurance and quality control (QA/QC) procedures associated with environmental data operations for these sites. These standards defined the criteria for the QA activities and documentation required, the content and format of the documentation, and who was responsible for implementation. Shortcomings in these standards of requirements led in 1989 to efforts by several public and private sector groups to 'harmonize' the multiple sets of standards and requirements into a single set. These efforts are being conducted under the auspices of the American Society for Quality Control (ASQC) and involve participation by the Environmental Protection Agency (EPA), Department of Energy (DOE), Department of Defense (DOD), Nuclear Regulatory Commission (NRC), and others in the contractor and regulated communities. The progress toward establishing a national consensus standard for QA for environmental programs through the ASQC standard-setting process is described. Author

N92-20994# Naval Postgraduate School, Monterey, CA.
DECISION MAKING FOR SOFTWARE PROJECT MANAGEMENT IN A MULTI-PROJECT ENVIRONMENT: AN EXPERIMENTAL INVESTIGATION M.S. Thesis
MICHAEL J. HARDEBECK Sep. 1991 119 p
(AD-A245063) Avail: CASI HC A06/MF A02

Software project development can be characterized as failing to meet the user's needs within budget and schedule limitations. The number of software development failures far exceeds the number delivered as specified throughout industry and specifically in the Department of Defense. The System Dynamics Model of Software Project Management is a sustained and generally accepted quantitative model for simulating the software development lifecycle. Dynamic management issues can now be evaluated in an experimental setting which eliminates the financial risks. The objective is to use the System Dynamics Model's gaming interface to investigate the effects of managerial motivation on software project managers in a multiproject environment. Specifically, this experiment was conducted to determine the effect of individual or team motivation on subsystem managers of a larger project. The effect of the two motivation methods is measured in terms of staffing level decisions, final cost, and final duration. DTIC

N92-21277*# Houston Univ., TX. Dept. of Computer Science.
TRAINING, QUALITY ASSURANCE FACTORS, AND TOOLS INVESTIGATION: A WORK REPORT AND SUGGESTIONS ON SOFTWARE QUALITY ASSURANCE Final Report
PEN-NAN LEE *In* Texas A and M Univ., NASA/ASEE Summer Faculty Fellowship Program, 1991, Volume 1 10 p Dec. 1991
Avail: CASI HC A02/MF A03

Previously, several research tasks have been conducted, some observations were obtained, and several possible suggestions have been contemplated involving software quality assurance engineering at NASA Johnson. These research tasks are briefly described. Also, a brief discussion is given on the role of software quality assurance in software engineering along with some observations and suggestions. A brief discussion on a training program for software quality assurance engineers is provided. A list of assurance factors as well as quality factors are also included. Finally, a process model which can be used for searching and collecting software quality assurance tools is presented. Author

N92-21505# Wichita State Univ., KS. National Inst. for Aviation Research.
COOPERATIVE RESEARCH: ONE ANSWER TO MAINTAINING THE COMPETITIVE EDGE Abstract Only
BILL WENTZ *In its* Techfest 18 Proceedings 1 p Jan. 1992
Avail: CASI HC A01/MF A01

As the U.S. aviation industry faces increasing competition from Europe and Asia, it is increasingly important that Kansas aviation firms remain competitive. Clearly, we need to develop better products, special skills, and productivity and quality standards which more than compensate for our higher wages and salaries. One of the ways to remain competitive is through continuous product and process improvement. This means giving more consideration to retraining and upgrading a stable work force. It also means making sustained investment in research and development to achieve continuous improvement. Further, we must work to reduce the time lag between discovery and product. This time lag can most effectively be reduced by cooperative research involving strong interaction by designers from industry with university and federal laboratory researchers, and with representatives from regulatory agencies. If we are successful in achieving effective teamwork to quickly bring research concepts from the laboratory into the production shop, we will maintain the leadership role in aviation which this nation has traditionally held. One of the characteristics of Japanese and European firms is their willingness to participate in joint research, with shared funding and partnerships which assure that all participants share equitably in the results. The National Institute for Aviation Research is seeking to form consortia relationships among the firms with common research needs. The paper will describe several case histories of joint government-industry-university research and development in aviation, and suggest opportunities for future cooperation. Author

N92-25984*# Research Inst. for Computing and Information Systems, Houston, TX.
IDEF5 ONTOLOGY DESCRIPTION CAPTURE METHOD: CONCEPT PAPER
CHRISTOPHER P. MENZEL and RICHARD J. MAYER (Texas A&M Univ., College Station.) 1990 34 p
(Contract NCC9-16; RICIS PROJ. IM-06)
(NASA-CR-190285; NAS 1.26:190285) Copyright Avail: CASI HC A03/MF A01

The results of research towards an ontology capture method referred to as IDEF5 are presented. Viewed simply as the study of what exists in a domain, ontology is an activity that can be understood to be at work across the full range of human inquiry prompted by the persistent effort to understand the world in which it has found itself - and which it has helped to shape. In the contest of information management, ontology is the task of extracting the structure of a given engineering, manufacturing, business, or logistical domain and storing it in an usable representational medium. A key to effective integration is a system ontology that can be accessed and modified across domains and which captures common features of the overall system relevant to the goals of the disparate domains. If the focus is on information integration, then the strongest motivation for ontology comes from the need to support data sharing and function interoperability. In the correct architecture, an enterprise ontology base would allow th e construction of an integrated environment in which legacy systems appear to be open architecture integrated resources. If the focus is on system/software development, then support for the rapid acquisition of reliable systems is perhaps the strongest motivation for ontology. Finally, ontological analysis was demonstrated to be an effective first step in the construction of robust knowledge based systems. Author

N92-26481 Golden Gate Coll., San Francisco, CA.
INFORMATION LIABILITY: NEW INTERPRETATIONS FOR THE ELECTRONIC AGE Ph.D. Thesis
BLODWEN TARTER 1991 163 p
Avail: Univ. Microfilms Order No. DA9208142

Information liability hinges on two questions: who is responsible for creating and providing accurate information for third-party consumption; and, to what extent is the creator and/or provider actually liable for the quality of that information? This dissertation examines these questions as they relate to electronic databases. The broad electronic distribution of data appears to have created a demand for a higher standard of quality than is expected of traditional printed materials. This demand for better quality, coupled with the complexity of the electronic information publishing process and the economic value of decisions made based upon online information, has significantly elevated concerns about information liability. The review of the literature falls into four categories: (1) librarian/information specialist malpractice, (2) case law on database producers' and database distributors' liability for accuracy of information, (3) database quality as a conceptual issue, and (4) database quality as a practical issue. Exploratory interviews with selected database producers, distributors, search intermediaries, telecommunications network providers, and end users identified common information liability concerns and possible ways to alleviate those concerns. The dissertation details and categorizes the results of those interviews. The study suggests that the electronic information industry has many ways of limiting its information liability. The judicious use of contracts and disclaimers, careful planning and implementation of quality control and assurance processes and procedures, thorough education of end users, and innovative use of changing technology are logical means to lessen the likelihood of litigation. Each of these tools should be used to the greatest extent possible. The risk/benefit trade off for each organization will determine to what extent these safeguards are implemented. Litigation and damage claims cannot be prevented, but the likelihood of their occurrence can be reduced by careful preventive practices. Emphasis will continue to be upon continual improvement of electronic information delivery as a way to avoid court mandated solutions. However, the drive for profitability, rather than any fear of litigation, is the most compelling reason for maintaining and improving the quality of electronic information. Dissert. Abstr.

N92-26534# Fermi National Accelerator Lab., Batavia, IL.
ARCHITECTURE FLOW DIAGRAMS UNDER TEAMWORK
T. NICINSKI Feb. 1992 10 p Presented at the Symposium on Assessments of Quality Software Development Tools, New Orleans, LA, 27-29 May 1992
(Contract DE-AC02-76CH-03000)
(DE92-010482; FNAL/C-92/58; CONF-9205128-1) Avail: CASI HC A02/MF A01

The Teamwork CASE tool allows Data Flow Diagrams (DFDs) to be maintained for structured analysis. Fermilab has extended teamwork under UNIX (trademark) to permit Hatley and Pirbhai Architecture Flow Diagrams (AFDs) to be associated with DFDs and subsequently maintained. This extension, called TWKAFD, allows a user to open an AFD, graphically edit it, and replace it into a TWKAFD maintained library. Other aspects of Hatley and Pirbhai's methodology are supported. This paper presents a quick tutorial on Architecture Diagrams. It then describes the user's view of TWKAFD, the experience incorporating it into teamwork, and the successes with using the Architecture Diagram methodology along with the shortcomings of using the teamwork/TWKAFD tool. DOE

N92-26630*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
COMPUTER MODELING OF HUMAN DECISION MAKING
WILLIAM B. GEVARTER Dec. 1991 45 p
(NASA-TM-107868; FIA-91-32; NAS 1.15:107868) Avail: CASI HC A03/MF A01

Models of human decision making are reviewed. Models which treat just the cognitive aspects of human behavior are included as well as models which include motivation. Both models which have associated computer programs, and those that do not, are considered. Since flow diagrams, that assist in constructing computer simulation of such models, were not generally available, such diagrams were constructed and are presented. The result provides a rich source of information, which

can aid in construction of more realistic future simulations of human decisionmaking. Author

N92-31563# Woods Hole Oceanographic Inst., MA.
A DATA PROCESSING MODULE FOR ACOUSTIC DOPPLER CURRENT METERS
ALBERT J. PLUEDDEMANN, ANDREA L. OLEN, ROBIN C. SINGER, and STEPHEN P. SMITH Jan. 1992 72 p
(Contract N00014-89-J-1288)
(AD-A250901; WHOI-92-05) Avail: CASI HC A04/MF A01

This report describes the development of a Data Processing Module (DPM) designed for use with an RD Instruments Acoustic Doppler Current Meter (ADCM). The DPM is a self-powered unit in its own pressure case and its use requires no modification to the current meter. The motivation for this work was the desire for real-time monitoring and data transmission from an ADCM deployed at a remote site. The DPM serves as an interface between the ADCM and a satellite telemetry package consisting of a controller, an Argos Platform Transmit Terminal, and an antenna. The DPM accepts the data stream from the ADCM, processes the data, and sends out the processed data upon request from the telemetry controller. The output of the ADCM is processed by eliminating unnecessary data, combining quality control information into a small number of summary parameters, and averaging the remaining data in depth and time. For the implementation described here, eight data records of 719 bytes each (output from the ADCM at 15 minute intervals) were processed and averaged over 2 hr intervals to produce a 34 byte output array. DTIC

N92-32627# Knowledge Based Systems, Inc. College Station, TX.
INFORMATION INTEGRATION FOR CONCURRENT ENGINEERING (IICE) IDEF3 PROCESS DESCRIPTION CAPTURE METHOD REPORT Interim Report, Feb. 1991 - Apr. 1992
RICHARD J. MAYER, THOMAS P. CULLINANE, PAULA S. DEWETTE, WILLIAM B. KNAPPENBERGER, and BENJAMIN PERAKATH May 1992 155 p
(Contract F33615-90-C-0012)
(AD-A252633; KBSI-IICE-90-STR-01-0592-02; AL-TR-1992-0057) Avail: CASI HC A08/MF A01

This document provides a method overview, practice and use description, and language reference for the IDEF3 Process Description Capture Method. The name IDEF originates from the Air Force program for Integrated Computer-Aided Manufacturing (ICAM) from which the first ICAM Definition, or IDEF, methods emerged. It was in recognition of this foundational work, and in support of an overall strategy to provide a family of mutually-supportive methods for enterprise integration, that continued development of IDEF technology was undertaken. More recently, with their expanded focus and widespread use as part of Concurrent Engineering, Total Quality Management (TQM), and business re-engineering initiatives, the IDEF acronym has been re-cast as the name referring to an integrated family of integration definition methods. IDEF3 was designed as a complementary addition to the IDEF family of methods serving the role of a knowledge acquisition and requirements definition tool that structures the user's understanding of how a given process, event, or system works around process flow and object state transition descriptions. A special-purpose graphical language accompanying the IDEF3 method serves to highlight temporal precedence and causality relationships relative to the process or event being described. DTIC

N92-32658# Knowledge Based Systems, Inc. College Station, TX.
IDEF4 OBJECT-ORIENTED DESIGN METHOD MANUAL Interim Report, Feb. 1991 - Apr. 1992
RICHARD J. MAYER, ARTHUR A. KEEN, and M. S. WELLS May 1992 131 p
(Contract F33615-90-C-0012)
(AD-A252634; KBSI-IICE-90-STR-01-0592-01; AL-TR-1992-0056) Avail: CASI HC A07/MF A01

This document provides a method overview, practice and use description, and language reference for the IDEF4 Object-Oriented Design Method. The name IDEF originates from the Air Force program for Integrated Computer-Aided Manufacturing (ICAM) from which the first ICAM Definition, or IDEF, methods emerged. It was in recognition of this foundational work, and in support of an overall strategy to provide a family of mutually-supportive methods for enterprise integration, that continued development of IDEF technology was undertaken. More recently, with their expanded focus and widespread use as part of Concurrent Engineering, Total Quality Management (TQM), and business re-engineering initiatives, the IDEF acronym has been re-cast as the name referring to an integrated family of Integration Definition methods. IDEF4 was developed as a design method to assist in the production of quality designs for object oriented implementations. This document is targeted at both object-oriented programmers looking for a design method and programmers learning an object-oriented programming language who want to know how to design good object-oriented programs. DTIC

N92-33737*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
SEAWIFS CALIBRATION AND VALIDATION PLAN, VOLUME 3
STANFORD B. HOOKER, ed., ELAINE R. FIRESTONE, ed. (General Sciences Corp., Laurel, MD.), CHARLES R. MCCLAIN, WAYNE E. ESAIAS, WILLIAM BARNES, BRUCE GUENTHER, DANIEL ENDRES, B. GREG MITCHELL (National Aeronautics and Space Administration, Washington, DC.), and ROBERT BARNES (Chemal, Inc., Wallops Island, VA.) Sep. 1992 45 p
(NASA-TM-104566-VOL-3; NAS 1.15:104566-VOL-3; REPT-92B00117)
Avail: CASI HC A03/MF A01

The Sea-viewing Wide Field-of-view Sensor (SeaWiFS) will be the first ocean-color satellite since the Nimbus-7 Coastal Zone Color Scanner (CZCS), which ceased operation in 1986. Unlike the CZCS, which was designed as a proof-of-concept experiment, SeaWiFS will provide routine global coverage every 2 days and is designed to provide estimates of photosynthetic concentrations of sufficient accuracy for use in quantitative studies of the ocean's primary productivity and biogeochemistry. A review of the CZCS mission is included that describes that data set's limitations and provides justification for a comprehensive SeaWiFS calibration and validation program. To accomplish the SeaWiFS scientific objectives, the sensor's calibration must be constantly monitored, and robust atmospheric corrections and bio-optical algorithms must be developed. The plan incorporates a multi-faceted approach to sensor calibration using a combination of vicarious (based on in situ observations) and onboard calibration techniques. Because of budget constraints and the limited availability of ship resources, the development of the operational algorithms (atmospheric and bio-optical) will rely heavily on collaborations with the Earth Observing System (EOS), the Moderate Resolution Imaging Spectrometer (MODIS) oceans team, and projects sponsored by other agencies, e.g., the U.S. Navy and the National Science Foundation (NSF). Other elements of the plan include the routine quality control of input ancillary data (e.g., surface wind, surface pressure, ozone concentration, etc.) used in the processing and verification of the level-0 (raw) data to level-1 (calibrated radiances), level-2 (derived products), and level-3 (gridded and averaged derived data) products. Author

N92-34140*# Research Inst. for Computing and Information Systems, Houston, TX.
EXPLORATORY STUDY ON PERFORMANCE MEASURES AS INDICATORS OF IS EFFECTIVENESS Interim Report
PETER C. BISHOP (Houston Univ., Clear Lake, TX.) and CISSY YOES (Houston Univ., Clear Lake, TX.) Apr. 1992 37 p
(Contract NCC9-16; RICIS PROJ. IR-01A)
(NASA-CR-190642; NAS 1.26:190642) Avail: CASI HC A03/MF A01

The Information Systems Directorate at JSC/NASA has undertaken the reevaluation of its performance measures process and measures. Under the direction of a quality approach it is essential to identify an external perspective of how well an organization is performing. This study was conducted with two major objectives: (1) survey and summarize the academic literature on performance measures as indicators of information systems (IS) effectiveness; and (2) survey organizations

for their experience in measuring for IS effectiveness. Four approaches to measuring the effectiveness of IS performance were identified: (1) listen to the customer for the things they need; (2) align with corporate goals; (3) benchmark against well-respected organizations; and (4) ask yourself what critical factors lead to success. The list of known methods for soliciting customer feedback are as follows: (1) executive visit; (2) survey, interview, and focus group; (3) complaints and compliments; and (4) service level agreements. A common set of characteristics that satisfy customers was identified from the literature. The list includes elements such as the following: accuracy, timeliness, relevance, understandability, reliability, and completeness. Future research in this topic area should prove beneficial to determine the metrics for external validity. Author

N93-10237# Microelectronics and Computer Technology Corp., Austin, TX.

AN MCM/CHIP CONCURRENT ENGINEERING VALIDATION Quarterly Technical Report No. 2, Apr. - Jun. 1992

HECTOR MORENO 30 Jun. 1992 58 p

(Contract MDA972-92-C-0022; ARPA ORDER 8363)

(AD-A253783; HVE-171-92) Avail: CASI HC A04/MF A01

A schema to model the information required to do physical design of Multi-Chip Modules was written in the EXPRESS language and mapped into ROSE C++ classes. Software was written in the SKILL language (from Cadence Design Systems) to read and write from/to the Cadence EDGE layout system. C++ code was written to interface the EDGE system to the ROSE C++ classes referred to above. As a result, there now exists a full path in and out of the EDGE system and the information stored by ROSE. DTIC

N93-10396# Westinghouse Environmental Management Co. of Ohio, Cincinnati.

QUALITY ASSURANCE PRACTICES FOR DATA ENTRY AND ELECTRONIC DATA TRANSFER

L. M. TOMCZAK, J. C. GORE, J. W. NEXON, H. B. SPITZ (Cincinnati Univ., OH.), J. J. CARDARELLI (Cincinnati Univ., OH.), LIA DAI (Cincinnati Univ., OH.), NING LIU (Cincinnati Univ., OH.), and SUE MCGIMPSEY (Cincinnati Univ., OH.) Jun. 1992 16 p Presented at the 8th Annual Waste Testing and Quality Assurance Symposium, Arlington, VA, 13-17 Jul. 1992

(Contract DE-AC05-86OR-21600)

(DE92-014804; FEMP-2265; CONF-9207100-1) Avail: CASI HC A03/MF A01

The Radiological Environmental Monitoring (REM) group at the Fernald Environmental Management Project is involved in two practices that will result in the improved quality assurance of collected data: the quality assurance program for manually entered data, and electronic data transfer. The first practice focuses on adopting strict quality assurance guidelines for manual database entry. The second practice focuses on electronic data transfer from the recording instrument in order to reduce the manpower normally required for manual data entry. The applications of these two practices can enhance any data collection program where instruments with electronic memories and a signal output are utilized. Organizations employing either or both of these practices, as applicable, can strengthen the quality and efficiency of their data collection program. The use of these practices can assist in complying with quality assurance requirements under ASME NQA-1, RCRA, CERCLA, and DOE Order activities. DOE

N93-11371# Rochester Inst. of Tech., NY.

SOFTWARE QUALITY METHODOLOGY INTEGRATION STUDY RESULTS Final Report, Sep. 1987 - Jul. 1990

JEFFREY A. LASKY and MICHAEL J. LUTZ May 1992 112 p

(Contract F30602-88-D-0026)

(AD-A253891; RL-TR-92-79) Avail: CASI HC A06/MF A02

The thrust of this effort was to examine the software quality methodology and determine what improvements were necessary to improve utility of this technology. Rome Laboratory has been working in the area of software quality since the earlier 70's. The goal of the framework was to provide program managers a quantitative method for gaining insight into the quality of their software products (i.e., software requirements specification, preliminary design, detailed design, coding). This effort identified short falls in the methodology due to technology advances and the need to make enhancements. Safety is one area the software quality framework does not support or address. This effort identified new quality factors that would be needed to address safety and software quality issues. Factors, criteria definitions, and metric element questions from the software quality model were reviewed within the context of defining safety. Object oriented technology (OOT) was also examined to determine what should be added to the framework. New software developments are using object oriented design and to take advantage of this technology the framework needs to be updated. Seven software quality factors and ten software criteria were identified as being impacted by the use of object oriented technology. DTIC

N93-11508# Honeywell, Inc., Minneapolis, MN. Systems and Research Center.

ENGINEERING INFORMATION SYSTEM (EIS) Final Report, Sep. 1987 - Jul. 1991

RAJ KANT and JON KRUEGER 31 Jan. 1992 79 p

(Contract F33615-87-C-1401)

(AD-A254013; C920049; WL-TR-91-8048) Avail: CASI HC A05/MF A01

The Engineering Information System (EIS) was created in response to increasing concerns about the exchange of engineering information between contractors and the government, contractors on a single team, and contractors on different teams who share technical data and diverse tools. The EIS specifications provide a means for managing heterogeneity among hardware and software platforms, data formats, tools, site-specific policies and methodologies, and interfaces to create multiple-domain, multiple-life-cycle environments. An Engineering Information Model (EIM) and the EIS framework comprise the EIS. The EIM is a semantic model of information found in an EIS. An EIM realization, called the reference schema, is a set of object types that form a specific logical organization of data and operations. The EIS framework contains automated services embodied in software to support the use of the EIM to manage and control the data and activities of the engineering process. Current computer networking gateways require significant enhancement to meet the needs of cost-effective and concurrent engineering information access. The use of integration information gateways is the key to achieving the levels of technical interchange needed between organizations and various engineering environments. The EIS technologies can provide the Integration necessary to allow transparent information access across the information exchange networks. DTIC

N93-12670*# National Aeronautics and Space Administration, Washington, DC.

COORDINATING COUNCIL. THIRD MEETING: STI STRATEGIC PLANS 1990

43 p Meeting held 29 Nov. 1990

(NASA-TM-108016; NAS 1.15:108016) Avail: CASI HC A03/MF A01

The NASA Scientific and Technical Information Program Coordinating Council conducts meetings after which both modified transcripts of presentations and interactive discussions are published. The theme for the November 1990 meeting was 'STI Strategic Plans'. This theme was the focus of recorded discussions by members of the council. The last section of the report presents visuals on strategic goals for the STI Information Division. NASA's vision is to be at the forefront of advancements in aeronautics, space science, and exploration. More specific NASA goals are listed followed by the STI Division mission statement. The Strategic Goals for the STI Division are outlined as follows: Implement effective management strategies, Accomplish rapid deployment of the NASA STI Network, Seek out and develop cooperative partnerships, Establish the STI Program as an integral part of the NASA R&D effort, Enhance the quality of our products and services through a focus on the customer, Build an attitude of quality throughout the enterprise, Expand

the existing participant community, Assert a NASA leadership role for STI policy, and Develop a program for information science R&D. The STI division mission statement appears on the document cover as follows 'The mission of the NASA STI Program is to advance aerospace knowledge, contribute to U.S. competitiveness, and become an integral partner in NASA R&D programs to support NASA goals. R.L.B.

N93-13616# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, ID.
VERIFICATION AND VALIDATION OF TMAP4
G. R. LONGHURST, S. L. HARMS, E. S. MARWIL, and B. G. MILLER Jul. 1992 94 p
(Contract DE-AC07-76ID-01570)
(DE92-019684; EGG-FSP-10347) Avail: CASI HC A05/MF A01

The Tritium Migration Analysis Program MODI/CY04 (TMAP4) was written to be used in analyzing experiments and for safety calculations that involve the injection, solution, diffusion, trapping, release, and other related processes experienced by hydrogen isotopes in materials. Because of the desire to make it suitable for analyzing safety issues, it is important that TMAP4 be certified (verified and validated) at Quality Assurance Level A. This report documents the work done to achieve that certification. The process includes assuring that the developed code meets the software requirements specified in the Software Quality Assurance Plan, verifying that the code functions in accordance with the written description and that it is self-consistent and internally correct, and validating that its computed results are in agreement with experimental data and/or known analytical solutions. Quality Level A certification for TMAP4 is specifically for implementation on an IBM PS/2 Model 70 operating under DOS 5.0. Certification for any other environment will require demonstration that all of the verification and validation tests documented here give the same results in the new environment. DOE

N93-13737*# Research Inst. for Computing and Information Systems, Houston, TX.
PERFORMANCE MEASUREMENT FOR INFORMATION SYSTEMS: INDUSTRY PERSPECTIVES Final Report
PETER C. BISHOP (Houston Univ., Clear Lake, TX.), CISSY YOES (Houston Univ., Clear Lake, TX.), and KAY HAMILTON (Houston Univ., Clear Lake, TX.) 30 Oct. 1992 41 p
(Contract NCC9-16; RICIS PROJ. IR-01A)
(NASA-CR-191369; NAS 1.26:191369) Avail: CASI HC A03/MF A01

Performance measurement has become a focal topic for information systems (IS) organizations. Historically, IS performance measures have dealt with the efficiency of the data processing function. Today, the function of most IS organizations goes beyond simple data processing. To understand how IS organizations have developed meaningful performance measures that reflect their objectives and activities, industry perspectives on IS performance measurement was studied. The objectives of the study were to understand the state of the practice in IS performance techniques for IS performance measurement; to gather approaches and measures of actual performance measures used in industry; and to report patterns, trends, and lessons learned about performance measurement to NASA/JSC. Examples of how some of the most forward looking companies are shaping their IS processes through measurement is provided. Thoughts on the presence of a life-cycle to performance measures development and a suggested taxonomy for performance measurements are included in the appendices. L.R.R.

N93-14525# Army Command and General Staff Coll., Fort Leavenworth, KS.
THE EVOLUTION OF ARTIFICIAL INTELLIGENCE AND EXPERT COMPUTER SYSTEMS IN THE ARMY M.S. Thesis
RICKEY L. HANSON 5 Jun. 1992 143 p
(AD-A255221) Avail: CASI HC A07/MF A02

This study is an analysis of the evolution of artificial intelligence and expert computer systems in the U.S. Army and the role the Army should play in the future evolution of these technologies. This study investigates the Army's approach to the development and use of these computer systems. It will assess whether the Army should play a leadership or a follower role in the development of these systems. The Army's decision to either lead or follow in these technologies will have significant effects on the limited resources of tomorrows smaller and less resourced force. This study will examine these issues given the trend in reduced fiscal resources and personnel. The civilian sector's development and use of these systems are evaluated to determine benefits to the Army through the use of these systems. The adaptability of these systems to various Army requirements are evaluated as are the near and far term costs of these systems. This study concludes that the U.S. Army should play a follower role in the future evolution of both expert computer systems and artificial intelligence. The Army should exploit current technologies and help guide the civilian community in the research and development of military applications. DTIC

N93-15962# Carnegie-Mellon Univ., Pittsburgh, PA. Software Egineering Inst.
SOFTWARE MEASURES AND THE CAPABILITY MATURITY MODEL Final Report
JOHN H. BAUMERT and MARK S. MCWHINNEY Sep. 1992 297 p
(Contract F19628-90-C-0003)
(AD-A257238; CMU/SEI-92-TR-25; ESC-TR-92-025) Avail: CASI HC A13/MF A03

This document describes a set of software measures that are compatible with the measurement practices described in the Capability Maturity Model for Software. These measures, in the form of software indicators, cover thirteen different categories that include progress, effort, cost, and quality. Each indicator category contains example figures which illustrate behavior that may occur on a project. The text provides users with tips on how to use these figures or similar ones on their projects. Project software managers and software engineering process groups can use these indicators during the software development life cycle to gain insight into the software development process and software process improvement activities. The indicators chosen have been successfully used on projects in the software industry. DTIC

N93-17823# Carnegie-Mellon Univ., Pittsburgh, PA. Software Engineering Inst.
A CONCEPT STUDY FOR A NATIONAL SOFTWARE ENGINEERING DATABASE Final Report
PATRICIA B. VANVERTH Jul. 1992 71 p
(Contract F19628-90-C-0003)
(AD-A258254; CMU/SEI-92-TR-23; ESC-TR-92-023) Avail: CASI HC A04/MF A01

Substantial segments of the software engineering community perceive a need for high-quality software engineering data at a national level. A national software engineering database has been proposed as one way to satisfy this need. But is such a database feasible and can it really satisfy these needs? This report provides information obtained from an informal survey of members of the software engineering community about a national database. The survey served as a means of getting a sense of the expectations that are to be met by building a national database, and provided the opportunity to learn from the experiences of those surveyed about data collection and use. The report summarizes this material in a manner that is informative and expository rather than prescriptive. DTIC

N93-18359*# Columbia Univ., New York, NY.
DECISION PATHS IN COMPLEX TASKS Final Technical Report
EUGENE GALANTER 1991 9 p
(Contract NAGW-860)
(NASA-CR-192121; NAS 1.26:192121) Avail: CASI HC A02/MF A01

Complex real world action and its prediction and control has escaped analysis by the classical methods of psychological research. The reason is that psychologists have no procedures to parse complex

tasks into their constituents. Where such a division can be made, based say on expert judgment, there is no natural scale to measure the positive or negative values of the components. Even if we could assign numbers to task parts, we lack rules i.e., a theory, to combine them into a total task representation. We compare here two plausible theories for the amalgamation of the value of task components. Both of these theories require a numerical representation of motivation, for motivation is the primary variable that guides choice and action in well-learned tasks. We address this problem of motivational quantification and performance prediction by developing psychophysical scales of the desireability or aversiveness of task components based on utility scaling methods (Galanter 1990). We modify methods used originally to scale sensory magnitudes (Stevens and Galanter 1957), and that have been applied recently to the measure of task 'workload' by Gopher and Braune (1984). Our modification uses utility comparison scaling techniques which avoid the unnecessary assumptions made by Gopher and Braune. Formula for the utility of complex tasks based on the theoretical models are used to predict decision and choice of alternate paths to the same goal. Author

N93-18409# Westinghouse Hanford Co., Richland, WA.
MEETING THE CHALLENGE OF RESPONDING TO STAKEHOLDER INFORMATION NEEDS: A PROGRAM MODEL
V. L. BIRKLAND (Boeing Computer Services Co., Richland, WA.) Sep. 1992 5 p Presented at the Infotech 1992, Oak Ridge, TN, 21-23 Oct. 1992
(Contract DE-AC06-87RL-10930)
(DE93-002047; WHC-SA-1480; CONF-9210158-1) Avail: CASI HC A01/MF A01

In a dynamic, changing environment, effective decision-making is reached at the lower levels of an organization. With this concept in mind, Westinghouse Hanford Company designed a comprehensive information release program to manage information as close as possible to the original source. This paper describes that program and the issues associated with implementing its objectives: to improve the release process to respond to stakeholder requirements and liability for noncompliance. DOE

N93-18716*# California Univ., Berkeley, CA. Astronomy Dept.
DAILY QUALITY ASSURANCE SOFTWARE FOR A SATELLITE RADIOMETER SYSTEM Abstract Only
P. B. KEEGSTRA, G. F. SMOOT, C. L. BENNETT, J. AYMON, C. BACKUS, G. DEAMICI, G. HINSHAW, P. D. JACKSON, A. KOGUT, C. LINEWEAVER et al. *In* NASA. Goddard Space Flight Center, Goddard Visiting Scientist Program for the Space and Earth Sciences Directorate 1 p 1 Dec. 1992
Avail: CASI HC A01/MF A03

Six Differential Microwave Radiometers (DMR) on COBE (Cosmic Background Explorer) measure the large-angular-scale isotropy of the cosmic microwave background (CMB) at 31.5, 53, and 90 GHz. Quality assurance software analyzes the daily telemetry from the spacecraft to ensure that the instrument is operating correctly and that the data are not corrupted. Quality assurance for DMR poses challenging requirements. The data are differential, so a single bad point can affect a large region of the sky, yet the CMB isotropy requires lengthy integration times (greater than 1 year) to limit potential CMB anisotropies. Celestial sources (with the exception of the moon) are not, in general, visible in the raw differential data. A 'quicklook' software system was developed that, in addition to basic plotting and limit-checking, implements a collection of data tests as well as long-term trending. Some of the key capabilities include the following: (1) stability analysis showing how well the data RMS averages down with increased data; (2) a Fourier analysis and autocorrelation routine to plot the power spectrum and confirm the presence of the 3 mK 'cosmic' dipole signal; (3) binning of the data against basic spacecraft quantities such as orbit angle; (4) long-term trending; and (5) dipole fits to confirm the spacecraft attitude azimuth angle. Author

N93-19098# Air Force Inst. of Tech., Wright-Patterson AFB, OH.
CORPORATE INFORMATION MANAGEMENT AND BUSINESS PROCESS IMPROVEMENT UNDER THE UNIT COST PROGRAM: AN ANALYSIS OF A SYSTEM FOR THE AIR FORCE INSTITUTE OF TECHNOLOGY M.S. Thesis
KEVIN D. KETTELL and FREDRICK T. ZIEGLER, II Dec. 1992 374 p
(AD-A258984; AFIT/GIR/LSP/92D-7) Avail: CASI HC A16/MF A03

DOD has been undergoing changes toward a competitive business-type environment as a result of the Packard Commission and the Goldwater-Nichols Act. As a result of the Goldwater-Nichols Act, two programs directly affect the Air Force Institute of Technology (AFIT): Defense Management Report Decision 971, better known as the Defense Business Operations Fund (DBOF); and, the Corporate Information Management (CIM) initiative. DBOF requires that organizations provide unit cost per output figures as the basis for organizational funding. Unit cost resourcing changes the way federal managers manage and allocate resources, and promotes quality management and continuous improvement principles. Defense Information Management recognizes information as a resource to be managed. CIM initiatives use information as the basis to improve the way organizations operate. This research effort purports to identify strategic level requirements that will allow the establishment of an integrated information system which will provide AFIT insight into the cost and value of their products and services. DTIC

N93-19438# Midwest Research Inst., Golden, CO.
MEASUREMENT UNCERTAINTY ANALYSIS TECHNIQUES APPLIED TO PV PERFORMANCE MEASUREMENTS
C. WELLS Oct. 1992 20 p Presented at the Photovoltaics Performance and Reliability Workshop, Golden, CO, 16-18 Sep. 1992
(Contract DE-AC02-83CH-10093)
(DE93-000019; NREL/TP-411-5125; CONF-9209252-1) Avail: CASI HC A03/MF A01

The purpose of this presentation is to provide a brief introduction to measurement uncertainty analysis, outline how it is done, and illustrate uncertainty analysis with examples drawn from the PV field, with particular emphasis toward its use in PV performance measurements. The uncertainty information we know and state concerning a PV performance measurement or a module test result determines, to a significant extent, the value and quality of that result. What is measurement uncertainty analysis? It is an outgrowth of what has commonly been called error analysis. But uncertainty analysis, a more recent development, gives greater insight into measurement processes and tests, experiments, or calibration results. Uncertainty analysis gives us an estimate of the interval about a measured value or an experiment's final result within which we believe the true value of that quantity will lie. Why should we take the time to perform an uncertainty analysis? A rigorous measurement uncertainty analysis: Increases the credibility and value of research results; allows comparisons of results from different labs; helps improve experiment design and identifies where changes are needed to achieve stated objectives (through use of the pre-test analysis); plays a significant role in validating measurements and experimental results, and in demonstrating (through the post-test analysis) that valid data have been acquired; reduces the risk of making erroneous decisions; demonstrates quality assurance and quality control measures have been accomplished; define Valid Data as data having known and documented paths of: Origin, including theory; measurements; traceability to measurement standards; computations; uncertainty analysis of results. DOE

N93-19784# Naval Air Warfare Center, China Lake, CA. Weapons Div.
ADAPTIVE AUTONOMOUS TARGET CUER

CHI-KIN LAM, DANIEL SEARLE, and WAYNE TANAKA *In* AGARD, Advanced Aircraft Interfaces: The Machine Side of the Man-Machine Interface 8 p Oct. 1992
Copyright Avail: CASI HC A02/MF A03

The Navy is exploring the use of an adaptive autonomous target cuer that is potentially more reliable than existing systems. Variations in the operational environment and target type are major factors that can degrade an autonomous sensor-based cuer performance. The solution presented here is to have several parallel algorithms for each functional component in our target cuer. Each algorithm is tuned to handle a particular situation. Based on certain indicator functions, a fuzzy logic expert system controller will select the most suitable algorithm and optimal parameters to process the sensor data. Although the proposed system is essentially comprised of conventional components such as image preprocessing, feature extraction, and correlation, it distinguishes itself because of its use of fuzzy logic in decision making and its adaptive nature. In designing an expert system, we will select the optimal set of indicator functions using the Taguchi process-control methodology. Preliminary results will be presented. Author

N93-19800*# National Aeronautics and Space Administration, Washington, DC.
THE AGARD TIP RESEARCH AGENDA FOR SCIENTIFIC AND TECHNICAL INFORMATION (STI)
WALTER R. BLADOS *In* AGARD, A Research Agenda for Scientific and Technical Information 4 p Nov. 1992
Copyright Avail: CASI HC A01/MF A01

The Research Agenda contains three themes: information management, provision of information, and access to information. Provision of information is further divided into two subordinate themes, dissemination and bibliographic control; access to information is also further divided into two subordinate themes, barriers and equity and networking. Each theme or sub-theme was examined from four possible aspects, namely, human resources, quality assurance, cost, and technology. It was concluded that, in fact, a theme or sub-theme need not contain all four aspects. Author

N93-21221# National Inst. of Standards and Technology, Gaithersburg, MD.
SOFTWARE QUALITY ASSURANCE: DOCUMENTATION AND REVIEWS
DELORES R. WALLACE, WENDY W. PENG, and LAURA M. IPPOLITO Sep. 1992 61 p
(PB93-113694; NISTIR-4909) Avail: CASI HC A04/MF A01

The study examines the contents of a software quality assurance standard for nuclear applications. The study includes recommendations for the documentation of software systems. Background information on the standard, documentation, and the review process is provided. The report includes an analysis of the applicability, content, and omissions of the standard and compares it with a general software quality assurance standard produced by the Institute for Electrical and Electronics Engineering. Information is provided for the content of the different types of documentation. The report describes information for use in safety evaluation reviews. Many recommendations in the report are applicable for software quality assurance in general. NTIS

N93-24550*# University of North Texas, Denton, TX. Dept. of Computer Science.
A SURVEY OF QUALITY MEASURES FOR GRAY-SCALE IMAGE COMPRESSION
AHMET M. ESKICIOGLU and PAUL S. FISHER *In* NASA. Goddard Space Flight Center, The 1993 Space and Earth Science Data Compression Workshop p 49-61 Apr. 1993
Avail: CASI HC A03/MF A02

Although a variety of techniques are available today for gray-scale image compression, a complete evaluation of these techniques cannot be made as there is no single reliable objective criterion for measuring the error in compressed images. The traditional subjective criteria are burdensome, and usually inaccurate or inconsistent. On the other hand, being the most common objective criterion, the mean square error (MSE) does not have a good correlation with the viewer's response. It is now understood that in order to have a reliable quality measure, a representative model of the complex human visual system is required. In this paper, we survey and give a classification of the criteria for the evaluation of monochrome image quality. Author

N93-24947*# Analex Corp., Brook Park, OH.
FEDERAL COMMUNICATIONS COMMISSION (FCC) TRANSPONDER LOADING DATA CONVERSION SOFTWARE. USER'S GUIDE AND SOFTWARE MAINTENANCE MANUAL, VERSION 1.2
PAUL G. MALLASCH Jan. 1993 82 p
(Contract NAS3-25776; RTOP 144-10-10)
(NASA-CR-191067; E-7570; NAS 1.26:191067) Avail: CASI HC A05/MF A01

This volume contains the complete software system documentation for the Federal Communications Commission (FCC) Transponder Loading Data Conversion Software (FIX-FCC). This software was written to facilitate the formatting and conversion of FCC Transponder Occupancy (Loading) Data before it is loaded into the NASA Geosynchronous Satellite Orbital Statistics Database System (GSOSTATS). The information that FCC supplies NASA is in report form and must be converted into a form readable by the database management software used in the GSOSTATS application. Both the User's Guide and Software Maintenance Manual are contained in this document. This volume of documentation passed an independent quality assurance review and certification by the Product Assurance and Security Office of the Planning Research Corporation (PRC). The manuals were reviewed for format, content, and readability. The Software Management and Assurance Program (SMAP) life cycle and documentation standards were used in the development of this document. Accordingly, these standards were used in the review. Refer to the System/Software Test/Product Assurance Report for the Geosynchronous Satellite Orbital Statistics Database System (GSOSTATS) for additional information. Author

N93-26582# West Virginia Univ., Morgantown, VA. Dept. of Management.
A HYPERTEXT FRAMEWORK FOR GROUP SUPPORT SYSTEMS Interim Report, Jul. - Dec. 1991
MICHAEL D. WOLFE and KENNETH J. MOEN Nov. 1992 47 p
(AD-A261731; AL-TR-1992-0165) Avail: CASI HC A03/MF A01

The formula, generic description, and framework for the study of Decision Support Systems (DSS's) developed by Bonczek, Change, Holsapple, and Whinston is extended to Group Support Systems (GSS's). The original description was based on three components: a language system, a knowledge system, and a problem processing system. This was later extended to a hyperknowledge framework, which was a comprehensive foundational framework. The hyperknowledge framework for DSS is extended to a GSS framework which includes multiple copies of individual DSS (IDSS), the communications between the IDSS, and a special system for a facilitator. A representative selection of the most common commercially available GSS's are presented together; these are all shown to fit the framework. In addition, the framework suggests directions for the design of an architecture to support multicultural GSS, which may cross international and/or interfunctional boundaries. DTIC

N93-27426* National Aeronautics and Space Administration, Washington, DC.
THE NASA SCIENTIFIC AND TECHNICAL INFORMATION PROGRAM: EXPLORING CHALLENGES, CREATING OPPORTUNITIES
RONALD P. SEPIC May 1993 58 p Original contains color illustrations
(NASA-SP-7103; NAS 1.21:7103) Avail: CASI Stock Only - No Charge

The NASA Scientific and Technical Information (STI) Program offers researchers access to the world's largest collection of aerospace information. An overview of Program activities, products and services, and new directions is presented. The R&D information cycle is outlined and specific examples of the NASA STI Program in practice are given.

Domestic and international operations and technology transfer activities are reviewed and an agenda for the STI Program NASA-wide is presented. Finally, the incorporation of Total Quality Management and evaluation metrics into the STI Program is discussed. CASI

N93-27652# Army Inst. for Research in Management Information and Computer Sciences, Atlanta, GA.
SOFTWARE QUALITY AND TESTING: WHAT DOD CAN LEARN FROM COMMERCIAL PRACTICES Study Report
MARK R. KINDL 31 Aug. 1992 38 p
(AD-A262332; ASQB-GI-92-012) Avail: CASI HC A03/MF A01

With regard to software testing in DoD, we can summarize our conclusions in two fundamental ideas. First, DoD knows how to produce quality software at low cost. This is because organizations such as DoD STEP, Army STEP, and Software Engineering Institute have already researched and documented policies for DoD. A few commercial software developers practice many of the DoD policies and directives now, and produce quality software (for example, IBM FSC Houston). Second, quality cannot be tested into software. Only a well-defined, well-disciplined process with a continuous improvement cycle can ensure software quality. However, testing cannot be underestimated. Systematic testing activities that detect error earliest in the life cycle are necessary to drive process improvement and optimize the development of quality software. Such testing methods as formal inspection find defects early. This enables cost-effective error resolution, identification and removal of defect causes, and thus, prevention of future defect insertion. If practiced with discipline, such methods can evolve a self-correcting software development process that is stable, modeled, measured, and therefore, predictable. This development process engineers quality software faster at reduced cost. DTIC

N93-27714*# National Inst. of Standards and Technology, Gaithersburg, MD.
DATA MANAGEMENT STANDARDS IN COMPUTER-AIDED ACQUISITION AND LOGISTIC SUPPORT (CALS)
DAVID K. JEFFERSON *In* NASA, Washington, Technology for Space Station Evolution. Volume 2: Data Management System/Environmental Control and Life Support Systems p 197-225 1990
Avail: CASI HC A03/MF A04; 1 functional color page

Viewgraphs and discussion on data management standards in computer-aided acquisition and logistic support (CALS) are presented. CALS is intended to reduce cost, increase quality, and improve timeliness of weapon system acquisition and support by greatly improving the flow of technical information. The phase 2 standards, industrial environment, are discussed. The information resource dictionary system (IRDS) is described. CASI

N93-27717*# Stanford Univ., CA. Computer Systems Lab.
AN OVERVIEW OF MCC AND ITS RESEARCH
STEPHEN F. LUNDSTROM *In* NASA, Washington, Technology for Space Station Evolution. Volume 2: Data Management System/Environmental Control and Life Support Systems p 285-313 1990
Avail: CASI HC A03/MF A04; 1 functional color page

Viewgraphs on Microelectronics and Computer Technology Corporation (MCC) are presented. The MCC is a cooperative enterprise whose mission is to strengthen and sustain America's competitiveness in information technologies. Their objective is excellence in meeting broad industry needs through application-driven research, development, and timely deployment of innovative technology. Research programs include: software technology; VLSI/computer aided design; packaging/interconnect; electronic applications of high temperature superconductors; and advanced computing technology. Derived from text

N93-29129 National Academy of Sciences - National Research Council, Washington, DC. *Computer Science and Telecommunications Board.*
NATIONAL COLLABORATORIES: APPLYING INFORMATION TECHNOLOGY FOR SCIENTIFIC RESEARCH
1993 114 p
(Contract NSF CDA-90-21110)
(LC-93-83795; ISBN-0-309-04848-6) Copyright Avail: CASI HC A06

To further explore the concept of a collaboratory as it was first articulated and discussed in 1989 (Towards a National Collaboratory, 1989), the Computer Science and Telecommunications Board of the National Research Council convened a committee in December 1991 to study the need for and benefits of collaboration in scientific research, factors determining the effectiveness of collaboration, and the ability of information technology—specifically of electronically integrated collaboratories—to support and enhance interactive scientific research. In addressing these issues, the committee focused on three discrete areas of scientific investigation—oceanography, in which the difficulty and expense of gathering data and the interdependence of modelers and experimentalists provide motivation for greater collaboration (Chapter 2); space physics, which has of necessity used extensive computational technology in the analysis of data collected by cooperatively fielded space- and ground-based instruments (Chapter 3); and gene mapping and sequencing research that has led to construction of and reliance on massive databases (Chapter 4). Research in these fields is sponsored by a variety of agencies, including the National Science Foundation, the National Institutes of Health, the National Aeronautics and Space Administration, the (Defense) Advanced Research Projects Agency, the Office of Naval Research, and the Department of Energy. The committee's investigations suggested technical requirements and social and practical issues (Chapter 5) that must be considered and dealt with as part of the process of initiating a national collaboratory program (Chapter 6) in support of scientific research. Derived from text

N93-29915# Cornell Univ., Ithaca, NY.
CENTER OF EXCELLENCE IN BIOTECHNOLOGY (RESEARCH) Final Report, 22 Dec. 1986 - 21 Dec. 1992
L. JELINSKI and MILTON ZAITLIN Mar. 1993 32 p
(Contract DAAL03-87-K-0004)
(AD-A263598; ARO-24629.68-LS-UIR) Avail: CASI HC A03/MF A01

The ARO Center of Excellence in Biotechnology was established within the Cornell University Biotechnology Program in 1986. The research focus of the Center was protein structure and function, with special emphasis on enzymes and receptors. Research projects funded through the Center represented a multidisciplinary attack on the molecular basis of how proteins and enzymes work, how energy and enzymic processes are coupled through cell membranes, how membrane receptors are used to transmit signals to the cell, and how signals are transmitted in the nervous system. The final report summarizes the results of the research. DTIC

N93-30050# Sandia National Labs., Albuquerque, NM.
SOFTWARE TESTING USING THE IEEE STANDARDS
J. KLAMERUS and J. WEEKS 1992 23 p Presented at the STAR 1993: Software Testing Analysis and Review: INGRES World 1993 Conference, Monterey, CA; Santa Clara, CA, 2-6 May 1993; 9-13 May 1993
(Contract DE-AC04-76DP-00789)
(DE93-009833; SAND-92-2521C; CONF-9305160-1; CONF-9305161-1) Avail: CASI HC A03/MF A01

Testing is an important part of the software application development process. To achieve quality software deliverables and to avoid costly redevelopment of program code or repair of bad data, testing must be performed throughout the software development life cycle. A software engineering process to produce a software test plan based upon the 'IEEE (Institute of Electrical and Electronics Engineers) Software Engineering Standards Collection' guidelines and corporate guidelines is discussed. Demonstrated examples of the software testing process involving interactive graphical user interface and standard ASCII text forms-based software are provided. Sandia National Laboratories has a Software Quality Assurance Department which provides corporate guidelines, in

addition to recommending the use of IEEE processes. Both corporate guidelines and a specific subset of the IEEE guidelines were applied to the software development projects discussed. The rationale for applying a specific subset of the IEEE guidelines for each of the software on development projects are given. The development of the test procedures in the INGRES/WINDOWS 4GL environment (graphical user interface) as well as in the INGRES/ABF environment (Applications-By-Forms, ASCII Text) are be presented and contrasted. The documentation of the testing process and results are explained. DOE

N93-30547# Mitre Corp., McLean, VA. Washington C3 Div.
AN APPROACH TO SOFTWARE QUALITY PREDICTION FROM ADA DESIGNS Final Report, Oct. 1989 - Sep. 1990
W. W. AGRESTI, W. M. EVANCO, M. C. SMITH, and D. R. CLARSON
Dec. 1992 62 p
(Contract F19628-89-C-0001)
(AD-A264731; MTR-90W00135; RL-TR-92-315) Avail: CASI HC A04/MF A01

An ongoing research project on estimating software quality from Ada designs is discussed. The research is motivated by the need for technology to analyze designs, when they are first represented, for their likely effect on quality factors. The objective of this research is to build multivariate models relating design characteristics and environmental factors to reliability and maintainability. Early results of the research are discussed, including alternative definitions of reliability and maintainability, a representation of Ada design structure, characteristics of software project data used for analysis, and preliminary statistical results testing hypotheses concerning the effects of design structure on reliability and maintainability. DTIC

N93-32418# Rome Lab., Griffiss AFB, NY.
INITIAL DEFINITION OF A KNOWLEDGE-BASED SOFTWARE QUALITY ASSISTANT
JOSEPH A. CAROZZONI Feb. 1993 104 p
(Contract AF PROJ. 5581)
(AD-A265866; RL-TR-93-28) Avail: CASI HC A06/MF A02

Prior and current research in the area of software quality reveals the necessity for a more innovative approach. This project suggests the need for further exploratory work in the application of knowledge-based and expert system technology to areas related to software quality. Prior investigation have focused on the development of an expert system to support the specification and generation of software quality factor goals. This project contemplates the creation and development of a comprehensive Knowledge-Based Software Quality Assistant (KBQA), which would eventually encompass the entire software development life cycle. DTIC

03
STRATEGIC PLANNING FOR CONTINUAL IMPROVEMENT

A92-20592* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
THE USE OF ACTIVITY-BASED COST ESTIMATION AS A MANAGEMENT TOOL FOR CULTURAL CHANGE
HUMBOLDT MANDELL (NASA, Johnson Space Center, Houston, TX) and CURT BILBY (Arrowsmith Navigation, Inc., Austin, TX) IAF, International Astronautical Congress, 42nd, Montreal, Canada, Oct. 5-11, 1991. 19 p.
(IAF PAPER 91-640) Copyright

It will be shown that the greatest barrier to American exploration of the planet Mars is not the development of the technology needed to deliver humans and return them safely to earth. Neither is it the cost of such an undertaking, as has been previously suggested, although certainly, such a venture may not be inexpensive by some measures. The predicted costs of exploration have discouraged serious political dialog on the subject. And, in fact, even optimistic projections of the NASA budget do not contain the resources required, under the existing development and management paradigm, for human space exploration programs. It will be demonstrated that the perception of the costs of such a venture, and the cultural responses to the perceptions are factors inhibiting American exploration of the moon and the planet Mars. Cost models employed in the aerospace industry today correctly mirror the history of past space programs, and as such, are representative of the existing management and development paradigms. However, if, under this current paradigm no major exploration programs are feasible, then cost analysis methods based in the past may not have great utility in exploring the needed cultural changes. This paper explores the use of a new type of model, the activity based cost model, which will treat management style as an input variable, in a sense providing a tool whereby a complete, affordable program might be designed, including both the technological and management aspects. Author

A92-24329#
COMMERCIAL SPACE OPERATIONS AT CCAFS - 'LOGISTICS CONCERNS'
RALPH DE PALMA (Booz, Allen & Hamilton, Inc., Florida Space Systems Office, Titusville) IN: AIAA/SOLE Space Logistics Symposium, 4th, Cocoa Beach, FL, Nov. 4-6, 1991, Technical Papers 1991 8 p refs
(AIAA PAPER 91-4053) Copyright

The focus of this paper will be to comment on the existing environment at Cape Canaveral Air Force Station (CCAFS), with considerations for the effects on commercial space operations and ongoing infrastructure modernization efforts. The concerns will be analyzed with their existing relationships and comparisons to similar concerns in other industries (i.e., an analogy to the Air Transport Industry). Supportability, commonality, competitiveness, and profitability concerns are discussed in a concurrent engineering approach. High-level recommendations will be made for the integration of commercial and government operations. A summary will outline the potential of a competitive environment and the dangers of continuing business as usual. Author

A92-24337#
CALS - ORGANIZATIONAL IMPACT OF LOGISTICAL CONSIDERATIONS IN CONCURRENT ENGINEERING
B. MICHELET (CISI Ingenierie, Rungis, France) IN: AIAA/SOLE Space Logistics Symposium, 4th, Cocoa Beach, FL, Nov. 4-6, 1991, Technical Papers 1991 8 p
(AIAA PAPER 91-4068) Copyright

Concurrent engineering (CE) principles have both an organizational impact and also modify the practices of the various disciplines involved. But CE usually involves a single company and its subcontractors. Integrated logistics support is an extension of CE, where a new discipline (logistics) must be integrated in the armament industry's design process. Since logistics involve long-term decisions, the DoD must remain responsible for logistical aspects, thus becoming part of industry's decision process. Optimal changes in organization and engineering practices depend on the processes' specific characteristic adopted for each discipline. Since computer-aided acquisition and logistics support (CALS) tend to impose a uniform approach both in the decision process and in data exchange, the industry adaptation should lead to a standardization of industrial practices and organizations, involving all engineering aspects. Part of the CALS effort should therefore address the problem of defining common integrated practices. Author

A92-24348#
SUPPORTING SPACE BASED SYSTEMS
RONALD J. RANCONT (Vitro Corp., Silver Spring, MD) IN: AIAA/SOLE Space Logistics Symposium, 4th, Cocoa Beach, FL, Nov. 4-6, 1991, Technical Papers 1991 9 p refs
(AIAA PAPER 91-4087) Copyright

Eight supportability functions that any space-based system must provide as part of its design and operation throughout its useful life are described. A conceptual approach to implementing a concurrent engineering model for supportability is presented. The need for a new field of space logistics is stressed. C.D.

A92-24390#
CONCURRENT ENGINEERING IN GROUND SUPPORT OPERATIONS
RICHARD RIGGS (Lockheed Space Operations Co., Titusville, FL) AIAA and Society of Logistics Engineers, Space Logistics Symposium, 4th, Cocoa Beach, FL, Nov. 4-6, 1991. 6 p refs
(AIAA PAPER 91-4102) Copyright

What is Concurrent Engineering (CE)? Most agree it is the total integration of the engineering disciplines to achieve optimum supportability through influencing the product design process. Companies practicing CE concepts assure themselves of improving product quality and life cycle support while simultaneously reducing production time. For future space transportation systems to become cost-effective and practical to maintain, the total integration of the engineering disciplines (with stringent configuration management practices) must be achieved in both the development and post-production phases. Strong CE practices are the foundation to ensuring that modifications made to established systems can be accomplished in the most efficient manner possible. With shrinking budgets and decreasing public confidence in America's space programs, CE practices must become an established reality in the pursuit of future cost-effective space exploration. Author

A92-25686*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
APPLICATION OF TAGUCHI METHODS TO DUAL MIXTURE RATIO PROPULSION SYSTEM OPTIMIZATION FOR SSTO VEHICLES
DOUGLAS O. STANLEY (NASA, Langley Research Center, Hampton, VA), RESIT UNAL (Old Dominion University, Norfolk, VA), and C. R. JOYNER (Pratt and Whitney Group, West Palm Beach, FL) AIAA, Aerospace Sciences Meeting and Exhibit, 30th, Reno, NV, Jan. 6-9, 1992. 11 p refs
(AIAA PAPER 92-0213)

The application of advanced technologies to future launch vehicle designs would allow the introduction of a rocket-powered, single-stage-to-orbit (SSTO) launch system early in the next century. For a selected SSTO concept, a dual mixture ratio, staged combustion cycle engine that employs a number of innovative technologies was selected as the baseline propulsion system. A series of parametric trade studies are presented to optimize both a dual mixture ratio engine and a single mixture ratio engine of similar design and technology level. The effect of varying lift-off thrust-to-weight ratio, engine mode transition Mach number, mixture ratios, area ratios, and chamber pressure values on overall vehicle weight is examined. The sensitivity of the advanced SSTO vehicle to variations in each of these parameters is presented, taking into account the interaction of each of the parameters with each other. This parametric optimization and sensitivity study employs a Taguchi design method. The Taguchi method is an efficient approach for determining near-optimum design parameters using orthogonal matrices from design of experiments (DOE) theory. Using orthogonal matrices significantly reduces the number of experimental configurations to be studied. The effectiveness and limitations of the Taguchi method for propulsion/vehicle optimization studies as compared to traditional single-variable parametric trade studies is also discussed. Author

A92-28775
PROJECT 21 - A VISION FOR THE 21ST CENTURY
OLOF LUNDBERG (INMARSAT, London, England) *Space Policy* (ISSN 0265-9646), vol. 8, Feb. 1992, p. 65-69. Feb. 1992 5 p
Copyright

The planning of the fourth-generation Inmarsat satellite - called Project 21 - is described in terms of principles and system designs that define the concepts and range of mobile satellite services. Project 21 involves coordinated development by Inmarsat and its subcontractors as well as an international network of service and equipment suppliers, customers, and governments. Proposals developed via the Project 21 program include novel technologies and services for untapped or emerging markets, advances in satellite and system design, and a guiding framework for the technological development. C.C.S.

A92-29069
ON MULTIPLE-OBJECTIVE DESIGN OPTIMIZATION BY GOAL METHODS
JIGUAN G. LIN (Control Research Corp., Lexington, MA) IN: 1991 American Control Conference, 10th, Boston, MA, June 26-28, 1991, Proceedings. Vol. 1 1991 2 p refs
Copyright

Goal methods have a common drawback of mistaking inferior solutions to be the optimal solutions of the original multiple-objective problem. One possible way to improve the goal-attainment method is to check the Pareto optimality of the solutions. Alternatively, a new method, or an improved goal-attainment method, is needed such that the resulting solutions are automatically Pareto optimal as well as closest possible to the set goals. I.E.

A92-33176#
HOW TO USE EVENT SEQUENCE ANALYSIS TOOLS FOR SUPPORTING CONCURRENT ENGINEERING
TYRONE JACKSON (Aerospace Corp., El Segundo, CA) AIAA, Aerospace Design Conference, Irvine, CA, Feb. 3-6, 1992. 11 p. refs
(AIAA PAPER 92-0973) Copyright

The benefits of employing the event sequence analysis method as a better means of integrating reliability analysis with the design process are presented. An example analysis illustrates that the results provided by the methodology are the same as those found utilizing reliability block diagram analysis, failure modes and effects analysis, and fault tree analysis. The purpose is to demonstrate that the technique helps to broaden the prospective of reliability analysis by providing features which have multidiscipline application. R.E.P.

A92-33184#
SYSTEMS ENGINEERING IN A DYNAMIC ENVIRONMENT - CONCURRENT ENGINEERING AND MANAGING RISK
MICHAEL J. WISKERCHEN (California, University, La Jolla) AIAA, Aerospace Design Conference, Irvine, CA, Feb. 3-6, 1992. 8 p. refs
(AIAA PAPER 92-0978) Copyright

A new systems engineering methodology, dynamics systems-engineering, has been developed and applied to space projects which has its foundation rooted in identifying, quantitatively assessing, and managing system performance and risk related to the dynamic nature of requirements, technology, and operational concepts. Although previously this methodology has been assessed and evaluated in terms of large space projects (i.e., Freedom Space Station, Space Shuttle Processing, Earth Observing System), it is equally applicable to a full range of spacecraft designs. This paper will present the basic concepts of the methodology along with specific recommendations for practical application to the spacecraft design and development process. Author

A92-38317
MANAGEMENT OF RESEARCH AND DEVELOPMENT ORGANIZATIONS - MANAGING THE UNMANAGEABLE
R. K. JAIN (U.S. Army, Corps of Engineers; Illinois, University, Champaign; MIT, Cambridge, MA) and HARRY C. TRIANDIS (Illinois, University, Urbana) New York, Wiley-Interscience, 1990, 285 p. refs
(ISBN 0-471-50791-1) Copyright

R&D organizations' management involves significant uncertainty, since their output can never be perfectly predicted on the basis of the various inputs in question. On the basis of practical experience with

research scientists and engineers, an effort is made to characterize the most productive ways of coordinating and integrating autonomous participants in research undertakings. Attention is given to theories of leadership and leadership styles, as well as to the paths to conflict within a research organization and relevant methods of performance appraisal. Issues relating to technology transfer from research organizations are noted. O.C.

A92-38754#
STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO) DATA CENTER STANDARD COMMITTEE (DCSC) - PURPOSE, OBJECTIVES, AND ACTIVITIES
H. A. HESS (Photon Research Associates, Inc., Arlington, VA) and WILLIAM A. SNYDER (U.S. Navy, Naval Research Laboratory, Washington, DC) AIAA, Space Programs and Technologies Conference, Huntsville, AL, Mar. 24-27, 1992. 10 p refs
(AIAA PAPER 92-1707) Copyright

The Data Center Standards Committee (DCSC) of the SDI Organization (SDIO) was established in response to needs for coordinated computer hardware acquisition, software development, and sound data management practices at the SDIO Data Centers, which archive and manage data resulting from SDIO experiments. This paper reviews the history, objectives, past accomplishments, present activities, and future challenges of the DCSC. C.D.

A93-13376#
TRANSITIONING TO A CONCURRENT ENGINEERING ENVIRONMENT
MARK S. KNODLE, STEVE S. KEWLEY, and ROBERT S. ZURAWSKI (General Dynamics Corp., Space Systems Div., San Diego, CA) Aug. 1992 10 p. AIAA, Aircraft Design Systems Meeting, Hilton Head Island, SC, Aug. 24-26, 1992
(AIAA PAPER 92-4205) Copyright

A structured concurrent engineering implementation approach is presented, that encompasses five phases: process understanding, pilot project, metrics and lessons, instituting the process, and continuous improvement. The emphasis has been placed on process development, process definition, and process measurement. An integrated product development process was implemented on a pilot project. It is concluded that concurrent engineering principles made it possible to make substantial cost, quality, and schedule performance improvements. O.G.

A93-17100
MANAGING MISTAKES
SIMON ELLIOTT *Flight International* (ISSN 0015-3710) vol. 142, no. 4343 Nov. 4, 1992 p. 47, 48, 50.
Copyright

An overview is presented of how airline-maintenance executives around the world minimize maintenance errors. The principal factors in controlling the impact of human elements in aircraft maintenance include basic training, refresher training, guaranteeing appropriate levels of certification of staff and engineers, and identifying areas of recurring problems. Attention is given to the adoption of total quality management concepts to improve overall efficiency and to insure that all levels of maintenance-involved personnel are thoroughly briefed. R.E.P.

A93-17376
WORK SYSTEM CHANGE IN TECHNICAL ORGANIZATIONS - PROBLEMS AND PROSPECTS FOR AVOIDING THEM
JOHN L. HUNSUCKER (Houston Univ., TX) and REX J. WALHEIM (USAF, Edwards AFB, CA) *IEEE Transactions on Engineering Management* (ISSN 0018-9391) vol. 39, no. 4 Nov. 1992 p. 303-311. refs
Copyright

Changes brought about by a new data system for supporting Space Shuttle flights are discussed focusing on their impact on the Mechanical Systems Section of Space Shuttle flight control. Particular attention is given to a strategy for overcoming resistance to the implementation of the Real Time Data System. This strategy encompasses three elements: anticipation of human effects and their planning in the implementation process; involvement of the systems experts in the design process and appointment of a senior person to lead the project; and consideration of the dynamic nation of the change process. O.G.

A93-26922
INSIDE NASA - HIGH TECHNOLOGY AND ORGANIZATIONAL CHANGE IN THE U.S. SPACE PROGRAM
HOWARD E. MCCURDY (American Univ., Washington) Baltimore, MD Johns Hopkins University Press 1993 230 p. refs
(ISBN 0-8018-4452-5) Copyright

An investigation is conducted into the relationship between the performance of the U.S. space program and NASA's organizational culture. Attention is given to the effects of the conclusion of the first decade of space flight (1958-1969), when public and political support began to wane and budgets for space exploration declined. The rise of an institutionalized bureaucracy within NASA as the space program matured is examined with a view to its implications for the management of public sector high-technology programs. O.C.

A93-35909
PDT APPROACH FOR DEVELOPING RAH-66 COMANCHE AIRFRAME SYSTEMS
BRUCE F. KAY (Sikorsky Aircraft, Trumbull, CT) *In* AHS, Annual Forum, 48th, Washington, June 3-5, 1992, Proceedings. Vol. 1 Alexandria, VA American Helicopter Society 1992 p. 121-131.
Copyright

Boeing-Sikorsky is using a Product Development Team approach to meet the challenging weight, cost, supportability and military requirements of the Comanche helicopter. This paper will describe how the airframe system teams are organized and how they operate. The First Team is also making extensive use of advanced engineering tools such as three-dimensional CATIA electronic mockups as part of the design process. The Electronic mockups not only benefit Engineering but greatly facilitate development of manufacturing plans and MANPRINT evaluations. Several exemplary cases of how concurrent engineering, as embedded in the PDT process, are used to accomplish otherwise difficult tasks will also be discussed. Author

A93-36201
AEROSPACE TESTING SEMINAR, 13TH, MANHATTAN BEACH, CA, OCT. 8-10, 1991, PROCEEDINGS
Mount Prospect, IL Institute of Environmental Sciences 1991 401 p. For individual items see A93-36202 to A93-36228
Copyright

The papers presented in this volume focus on the currently used aerospace test techniques, with attention given to the management of risk, cost, and problems encountered in attaining effective test methods. Topics discussed include a software environment for satellite environmental testing, modeling, and simulation; TQM as an operational process in testing; low-earth orbit global cellular communications network; and in place assembly and testing of satellites. Papers are also presented on lessons learned from modal testing of aerospace structures; the testability of software for the Space Station Freedom program; vibration testing of large structures; and solar probe shield development testing. AIAA

A93-37047
MULTIDISCIPLINARY MODELING AND DESIGN OF A SPACE SYSTEM
JOHN T. TESTER and DAVID G. ROBINSON (USAF, Inst. of Technology, Wright-Patterson AFB, OH) *In* IEEE International Conference on Systems Engineering, Dayton, OH, Aug. 1-3, 1991, Proceedings New York Institute of Electrical and Electronics Engineers, Inc. 1991 p. 446-449. refs
Copyright

The application of concurrent engineering approach to the design of a large flexible space structure is discussed. A full system model using bond graphs incorporating orbital and ballistic dynamics, controls, optics, and vibrational analyses is developed. Design of experiment techniques is used to analyze the entire system and determine the optimum set of design parameters. The objective of the design effort involved the simultaneous design of the control algorithm, structural characteristics, and optical geometry. The system size and mass were limited by current space shuttle capabilities. The satellite was required to track the missile plume of an ICBM with minimum line-of-site error and transmit the position data to earth. Author

A93-40659
ROTATING COMPONENTS - A CHALLENGE FOR SPF/DB
CHARLES F. BARTH (Barnes Group, Inc., Jet Die, Lansing, MI) Jun. 1992 18 p. Society of Manufacturing Engineers, Superplastic Forming and Bonding of Metallic Alloys Conference, Dayton, OH, June 16, 17, 1992
(SME PAPER MF92-188) Copyright

The challenges with applying Superplastic-Diffusion Bonding (SPF/DB) technologies to the fabrication of hollow-titanium rotating components for aircraft turbine engines are examined. The critical importance of Concurrent Engineering is emphasized. Process control factors are also examined: including thinning prediction and control, bond integrity assurance, impact of SPF/DB processing on mechanical properties, and design vs. cast issues. Author

A93-41364
A THERMAL/STRUCTURAL ANALYSIS PROCESS INCORPORATING CONCURRENT ENGINEERING
TERRI A. WELLS (McDonnell Aircraft Co., Saint Louis, MO) Jul. 1992 10 p. SAE, International Conference on Environmental Systems, 22nd, Seattle, WA, July 13-16, 1992 refs
(SAE PAPER 921185) Copyright

The design of advanced aircraft structure requires that the design, structural, and thermal disciplines work in unison during the configuration synthesis iteration process. Automatic transfer of data between the disciplines is required to reduce duplication of work and overall cycle time. This paper presents a state-of-the-art process that incorporates concurrent engineering principles and allows a thermal engineer to provide accurate temperature distributions for large structural models (8000+ elements) in approximately two weeks. The primary tasks include obtaining CAD geometry from the structural designer, defining finite elements, applying thermal boundary conditions, computing temperatures, plotting results as X-Y or color contour plots, and transferring the temperatures to a corresponding structural model. Author (revised)

A93-41599
INCREASING THE YIELD OF FINE TITANIUM POWDER USING DESIGN OF EXPERIMENTS
D. R. CLEMENS and R. E. ANDERSON, JR. (Pratt and Whitney Group, West Palm Beach, FL) *In* P/M in aerospace, defense and demanding applications - 1993; Proceedings of the 3rd International Conference, San Diego, CA, Feb. 7-10, 1993 Princeton, NJ Metal Powder Industries Federation 1993 p. 355-361. refs
Copyright

A short review of the Refractory Metal Atomization Facility at Pratt and Whitney is given. Overviews of the rotary atomization rigs are discussed including details on the types and quantities of alloys that have been atomized. The demand for fine (-325 mesh, less than 44 microns) powder has increased during the past several years. The powder is used in support of various metal matrix composite and plasma spray programs for a wide range of applications for the next generation of jet engines. A Taguchi based design of experimental program was performed to increase yield using a nonconsummable electrode cold hearth rig, pouring onto an atomizer disk. Yield of fine powder was increased to 35 percent, with no increase in charge weight. Discussions include the parameters varied, results obtained, and interpretation of same. At present, work is under way on a similar experiment using one of the plasma torch cold hearth rigs. Progress to date is reported. Author (revised)

A93-41928
MULTIOBJECTIVE OPTIMIZATION OF LARGE-SCALE STRUCTURES
RAMANA V. GRANDHI, GEETHA BHARATRAM (Wright State Univ., Dayton, OH), and VIPPERLA B. VENKAYYA (USAF, Flight Dynamics Directorate, Wright-Patterson AFB, OH) *AIAA Journal* (ISSN 0001-1452) vol. 31, no. 7 July 1993 p. 1329-1337. refs
(Contract F33615-88-C-3204)

This paper presents a multiobjective optimization algorithm based on generalized compound scaling techniques. The algorithm handles any number of objective functions, similar to handling behavior constraints. This technique generates a partial Pareto set while solving the optimization problem. A reliability-based decision criterion is used for selecting the best compromise design. The example cases considered in this work include various disciplines in airframe structures, such as stress, displacement, and frequency with hundreds of design variables and constraints. This paper also discusses the concept of Pareto-optimal solutions in the context of a multiobjective structural optimization problem and the commonly used methods of generating Pareto-optimal solutions. Author

A93-42104
SEI IN-SPACE OPERATIONS AND SUPPORT CHALLENGES
RONALD CALDWELL (Rockwell International Corp., Space Systems Div., Downey, CA) *In* Engineering, construction, and operations in space III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 2 New York American Society of Civil Engineers 1992 p. 1476-1487. refs
Copyright

A modeling and assessment process used to integrate SEI operations and support (OAS) planning processes with the systems engineering design, and system integration disciplines. Four areas of the OAS activity require the development of large infrastructures to maintain an operational capability: earth, orbital, transorbital, and lunar/Martian surface locations. An analytical process that can be used to develop OAS requirements is illustrated. Relationships of manufacturing, prelaunch operations, and orbital operations when deriving requirements are shown. If a concurrent engineering process is used, a more operationally efficient design can be defined early in the program to support all functions. Challenges associated with SEI logistics, the necessity for using functional analyses in the development of system requirements, some candidate operational lunar or Mars systems, and analytical modeling results on the candidate designs are discussed. AIAA

A93-43684
NETWORKING OPENS WINDOWS ON A CAD/CAM REVOLUTION
JOHN KNESEK (Lockheed Engineering and Sciences Co., Houston, TX) *Aerospace America* (ISSN 0740-722X) vol. 31, no. 6 June 1993 p. 38-41.
Copyright

CAD/CAM system vendors are striving to reduce the number of different architectures, operating systems, and software interfaces; such industry-wide standards are also simplifying the operation and management of networking systems and making facilities easier to use. These technologies are laying the groundwork for concurrent engineering, which will revolutionize the way in which products are designed, developed, and manufactured. Local area networks and high throughput fiber-distributed data interface standards are additional factors in the emerging power of CAD/CAM networks. AIAA

A93-49642
SPACE PROPULSION SYNERGY GROUP ETO TECHNOLOGY ASSESSMENTS
JAMES BRAY (Martin Marietta Manned Space Systems, New Orleans, LA) *In* TABES 93 - Annual Technical and Business Exhibition and Symposium, 9th, Huntsville, AL, May 11, 12, 1993, Submitted Papers Huntsville, AL Huntsville Association of Technical Societies 1993 10 p.
(TABES PAPER 93-641)
Copyright

The Space Propulsion Synergy Group (SPSG), which was chartered to support long-range strategic planning, has, using a broad industry/government team, evaluated and achieved consensus on the vehicles, propulsion systems, and propulsion technologies that have the best long-term potential for achieving desired system attributes. The breakthrough that enabled broad consensus was developing criteria that are measurable a priori. The SPSG invented a dual prioritization approach that balances long-term strategic thrusts with current programmatic constraints. This enables individual program managers to make decisions based on both individual project needs and long-term strategic needs. Results indicate that an SSTO using an integrated modular engine has the best long-term potential for a 20 Klb class vehicle, and that health monitoring and control technologies are among the highest dual priority liquid rocket technologies. AIAA

A93-50057*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
A COMPARISON OF NUCLEAR THERMAL ROCKET DEVELOPMENT COST AND SCHEDULE FOR PILOTED MISSIONS TO MARS
JOHN S. CLARK, STANLEY K. BOROWSKI, ROBERT J. SEFCIK, and THOMAS J. MILLER (NASA, Lewis Research Center, Cleveland, OH) Jun. 1993 14 p. AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 29th, Monterey, CA, June 28-30, 1993 refs
(AIAA PAPER 93-2263) Copyright

In Fiscal Year 1992, NASA led a team, including DOE, universities, and industry, that evaluated various schedule and cost scenarios for development of nuclear thermal rocket propulsion systems for piloted Mars exploration. This paper summarizes the results of two of these studies: (1) a so-called 'Fast Track' approach, that would result in technology readiness level 6 (TRL-6-system ground testing complete) by the year 2000, and (2) a slower program that results in TRL-6 by 2006. Both scenarios included a concurrent engineering approach. Costs and schedules for the two scenarios are compared. In addition to the six-year schedule delay, the TRL-6 in 2006 scenario is estimated to increase the cost of the program from $4.7 billion to $5.8 billion (in real-year dollars). On the positive side, the technical program should be better, since nuclear testing of fuel elements may be possible prior to concept down-select, resulting in a more informed decision. Author (revised)

N92-10710# General Accounting Office, Washington, DC.
MANAGEMENT ISSUES AT THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
FRANK C. CONAHAN 1 Aug. 1991 19 p
(GAO/T-NSIAD-91-48) Avail: CASI HC A03/MF A01

Testimony before the Subcommittee on investigations and Oversight Committee on Science, Space, and Technology of the House of Representatives is presented. Management issues at the National Aeronautics and Space Administration (NASA), primarily major assignments performed at NASA in the past four years, are discussed. The discussion is within the framework of experience gained from performing general management reviews of executive branch agencies. The most common issues emerging from the general management reviews concern basic management activities, such as developing strategic planning systems to prepare the agency for further challenges; dealing with leadership problems that result from a high rate of turnover and lack of accountability; addressing long-standing problems involving information resources management, financial management, and internal controls; and focusing on how managers and workers are recruited and trained. The work at NASA is discussed with specific regard to strategic planning, organizational management, human resources management, program and project management, financial management, and information management. Author

N92-11676# Defense Systems Management School, Fort Belvoir, VA.
PROCEEDINGS OF THE ACQUISITION RESEARCH SYMPOSIUM: IMAGNINATION, INNOVATION, AND *IMPLEMENTATION, 1991, VOLUME 1*
1991 390 p Symposium held in Washington, DC, 1991
(AD-A240260) Avail: CASI HC A17/MF A04

The proceedings of the symposium are presented. Some areas of discussion are as follows: Acquisition Keyed to a Specific Program; ADP Hardware and Software; Automated Procurement; Industrial Preparedness; International Aspects of Acquisition; Manpower, Personnel, and Training Acquisition Work Force; Program Management from A to Z; Research, Reforms, and Trends in Acquisition; Total Quality Management (TQM) and Total Quality Control (TQC). DTIC

N92-11677# Defense Systems Management School, Fort Belvoir, VA.
PROCEEDINGS OF THE ACQUISITION RESEARCH SYMPOSIUM: ACQUISITION FOR THE FUTURE, IMAGINATION, INNOVATION, AND IMPLEMENTATION, 1991, VOLUME 2
1991 602 p Symposium held in Washington, DC, 1991
(AD-A240261) Avail: CASI HC A99/MF A06

The proceedings of the symposium are presented. Some areas of discussions are as follows: Acquisition Keyed to a Specific Program; ADP Hardware and Software; Automated Procurement; Budget and Costs; Industrial Preparedness; International Aspects of Acquisition; Manpower, Personnel, and Training Acquisition Workforce; Program Management from A to Z; Research, Reforms, and Trends in Acquisition; Total Quality Management (TQM) and Total Quality Control (TQC); Miscellaneous. DTIC

N92-13446# Defense Logistics Agency, Alexandria, VA. Operations Research and Economic Analysis Office.
SAMPLING PLAN DEVELOPMENT IN SUPPORT OF DLA'S QUALITY ASSURANCE LABORATORY TESTING PROGRAM Final Report
MARK S. MELIUS Sep. 1991 62 p
(AD-A241287; DLA-91-P00204) Avail: CASI HC A04/MF A01

The Defense Logistics Agency's Logistics Management Division (DLA-QL) initiated actions to improve DLA's Quality Assurance Program by establishing a program of laboratory testing. However, to effectively implement the program, statistically sound sampling plans needed to be developed. Such plans would be used by the agency in determining appropriate sampling requirements and confidence levels of estimating material conformance levels. DLA-QL requested analytical support from DLA's Operations Research and Economic Analysis Management Support Office (DORO) in developing the required sampling plans as well as a forecasting tool which would be used in predicting the change in conformance levels over time. This report describes the methodology DORO used in developing the sampling plans and forecasting tool. An analysis of the prototype sampling plans and forecasting tool is also provided. DTIC

N92-16601*# Naval Civil Engineering Lab., Port Hueneme, CA. Shore Facilities Dept.
IMPROVING NAVFAC'S TOTAL QUALITY MANAGEMENT OF CONSTRUCTION DRAWINGS WITH CLIPS
ALBERT ANTELMAN *In* NASA. Johnson Space Center, Second CLIPS Conference Proceedings, Volume 2 p 357-364 Sep. 1991
Avail: CASI HC A02/MF A03

A diagnostic expert system to improve the quality of Naval Facilities Engineering Command (NAVFAC) construction drawings and specification is described. C Language Integrated Production System (CLIPS) and computer aided design layering standards are used in an expert system to check and coordinate construction drawings and specifications to eliminate errors and omissions. Author

N92-16988*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
PARTNERSHIP FOR CONTINUOUS IMPROVEMENT Summary Report
May 1990 170 p Presented at the 6th Annual NASA/ Contractors Conference on Quality and Productivity, Huntsville, AL, 31 Oct. - 1 Nov. 1989 (ISSN 1049-667X)
(NASA-TM-105464; NAS 1.15:105464) Avail:CASI HCA08/MF A02

The proceedings are presented of the sixth annual conference on quality control between NASA and its contractors. The emphasis is placed on a commitment to quality and excellence that guarantees mission success. A forum is provided for representatives from government, industry, and academia to exchange ideas and experiences, encouraging total quality performance that results in high quality products and services. Key points are highlighted from the presentations and activities are described that have resulted in a broad range of improvements in products and services from government, industry, and academia. Long term commitment to quality is an essential requirement that ensures future success. That commitment reinterates the dedication to excellence in space exploration and to national quality and productivity improvement. E.R.

N92-18243*# NASA Scientific and Technical Information Facility, Baltimore-Washington International Airport, MD.
ACQUISITION PLAN FOR DIGITAL DOCUMENT STORAGE (DDS) PROTOTYPE SYSTEM
Apr. 1990 82 p
(Contract NASW-4070)
(NASA-CR-189792; NAS 1.26:189792) Avail:CASI HCA05/MF A01

NASA Headquarters maintains a continuing interest in and commitment to exploring the use of new technology to support productivity improvements in meeting service requirements tasked to the NASA Scientific and Technical Information (STI) Facility, and to support cost effective approaches to the development and delivery of enhanced levels of service provided by the STI Facility. The DDS project has been pursued with this interest and commitment in mind. It is believed that DDS will provide improved archival blowback quality and service for ad hoc requests for paper copies of documents archived and serviced centrally at the STI Facility. It will also develop an operating capability to scan, digitize, store, and reproduce paper copies of 5000 NASA technical reports archived annually at the STI Facility and serviced to the user community. Additionally, it will provide NASA Headquarters and field installations with on-demand, remote, electronic retrieval of digitized, bilevel, bit mapped report images along with branched, nonsequential retrieval of report subparts. Author

N92-19120*# National Aeronautics and Space Administration, Washington, DC.
VISION 21: THE NASA STRATEGIC PLAN
Jan. 1992 48 p
(NASA-TM-107805; NAS 1.15:107805) Avail:CASI HCA03/MF A01

The NASA Strategic Plan, Vision 21, is a living roadmap to the future to guide the men and women of the NASA team as they ensure U.S. leadership in space exploration and aeronautics research. This multiyear plan consists of a set of programs and activities that will retain our leadership in space science and the exploration of the solar system; help rebuild our nation's technology base and strengthen our leadership in aviation and other key industries; encourage commercial applications of space technology; use the unique perspective of space to better understand our home planet; provide the U.S. and its partners with a permanent space based research facility; expand on the legacy of Apollo and initiate precursor activities to establish a lunar base; and allow us a journey into tomorrow, journey to another planet (Mars), and beyond. Author

N92-19433*# IBM Federal Systems Div., Houston, TX.
COST AND QUALITY PLANNING FOR LARGE NASA PROGRAMS
KYLE Y. RONE *In* NASA. Goddard Space Flight Center, Proceedings of the 15th Annual Software Engineering Workshop 25 p Nov. 1990 Avail: CASI HC A03/MF A06

The Software Cost and Quality Engineering methodology developed over the last two decades at IBM Federal Sector Div. is used to plan the NASA Space Station Data Management System (DMS). An ongoing project to capture this methodology, which is built on a foundation of experiences and lessons learned, has resulted in the development of a PC-based tool that integrates cost and quality forecasting methodologies and data in a consistent manner. This tool, Software Cost and Quality Engineering Starter Set (SCQESS), is being used to assist in the DMS costing exercises. At the same time, DMS planning serves as a forcing function and provides a platform for the continuing, iterative development, calibration, and validation and verification of SCQESS. The data that forms the cost and quality engineering data base is derived from more than 17 years of development of NASA Space Shuttle software, ranging from low criticality, low complexity support tools to highly complex and highly critical onboard software. Author

N92-19950# National Science Foundation, Washington, DC.
SCIENCE AND TECHNOLOGY INTEGRATION IN EUROPE AND INFLUENCES ON US-EUROPEAN COOPERATION: A REPORT OF THE NATIONAL SCIENCE BOARD COMMITTEE ON EUROPE IN 1992 Final Report
F. K. WILLENBROCK, R. E. BRADSHAW, D. N. LANGENBERG, J. H. MOORE, and J. W. LYONS Nov. 1990 41 p
(PB92-100676; NSB-90-172) Avail: CASI HC A03/MF A01

Science and Technology (S&T) in Western Europe is quickly evolving toward an umbrella structure for strategic policy planning, research coordination, and resources development and allocation. The EC Commission is becoming the largest source of funding and administrative and planning resources for such cooperation. It is assuming a growing but contentious role in stimulating, guiding, and making this cooperative paradigm operational. The Commission is also moving quickly to develop EC policies and activities for international cooperation in S&T, particularly in fields such as environmental protection and global warming. However, the EC member nations' primary responsibility for research support, facilities and human resources remains paramount; the EC superstructure is to be integrative, and supplementary of member state S&T activity. This implies challenges for U.S. decision makers, by way of: assessing the pace and directions of European S&T integration; achieving U.S. interagency consensus on exercising U.S. influence on that process; and allocating resources among bilateral and multilateral cooperative activities. Policy and operational recommendations are provided for appropriate U.S. government responses. Author

N92-20013# Department of Energy, Richland, WA.
STANDARD REVIEW PLAN FOR THE REVIEW OF ENVIRONMENTAL RESTORATION REMEDIAL ACTION QUALITY ASSURANCE PROGRAM PLANS
Sep. 1991 224 p
(DE92-004254; DOE/RL-91-36) Avail: CASI HC A10/MF A03

This plan establishes both the scope of the review and the acceptance criteria to be utilized for the review of Quality Assurance Program Plans (QAPPs) developed in accordance with the requirements of DOE/RL-90-28. DOE/RL-90-28, the Environmental Restoration Remedial Action (ERRA) Quality Assurance Requirements Document (QARD) defines all quality assurance (QA) requirements governing activities that affect the quality of the ERRA program at the Hanford Site. These requirements are defined in three parts, Part 1 of Quality Management and Administration tasks, Part 2 for Environmental Data Operations, and Part 3 of the Design and Construction of items, systems, and facilities. The purpose of this document is to identify the scope of the review by the DOE Field Office, Richland staff, and establish the acceptance criteria that the DOE Field Office, Richland staff will utilize to evaluate the participant QAPPs. Use of the standard review plan will (1) help ensure that participant QAPPs contain the information required by DOE/RL-90-28, (2) aid program participant and DOE Field Office, Richland staff in ensuring that the information describing the participant's QAPP is complete, (3) help persons regarding DOE/RL-90-28 to locate information, and (4)

contribute to decreasing the time needed for the review process. In addition, the Standard Review Plan (SRP) ensures the quality and uniformity of the staff reviews and presents a well-defined base from which to evaluate compliance of participant quality programs against DOE/RL-90-28. DOE

N92-23183# Allied-Signal Aerospace Co., Kansas City, MO.
PROCEDURE IMPROVEMENT ENTERPRISES
P. L. DAVIS Jan. 1992 24 p Presented at the Pro SIG Trade Conference, St. Petersburg, FL, 18-20 Nov. 1991
(Contract DE-AC04-76DP-00613)
(DE92-003222; KCP-613-4758; CONF-9111183-1) Avail: CASI HC A03/MF A01

At Allied-Signal's Kansas City Division (KCD), we recognize the importance of clear, concise and timely procedures for sharing information, promoting consistency and documenting the way we do business. For these reasons, the KCD has gathered a team of employees to analyze the process we currently use to publish procedures, identify the procedure needs of KCD employees, and design a system that meets or exceeds the requirements and expectations of DOE. The name of our group is the Procedure Improvement Enterprise Critical Process Team, or PIE CPT. The mission statement of Procedure Improvement Enterprise is to develop and implement within the Kansas City Division an effective, flexible procedure system that will establish a model of excellence, will emphasize team work and open communication, and will ensure compliance with corporate/government requirements. DOE

N92-24995*# Strategic Defense Initiative Organization, Washington, DC. Producibility and Manufacturing Div.
SDIO PRODUCIBILITY AND MANUFACTURING INTELLIGENT PROCESSING PROGRAMS
GREG STOTTLEMYER *In* NASA, Washington, The Federal Conference on Intelligent Processing Equipment p 78-89 Apr. 1992
Avail: CASI HC A03/MF A03

SDIO has to fashion a comprehensive strategy to insert the capability of an industrial base into ongoing design tradeoffs. This means that there is not only a need to determine if something can be made to the precision needed to meet system performance, but also what changes need to be made in that industry sector to develop a deterministic approach to fabrication precision components. Developing and introducing advanced production and quality control systems is part of this success. To address this situation, SDIO has developed the MODIL (Manufacturing Operations Development and Integration Labs) program. MODILs were developed into three areas: Survivable Optics, Electronics and Sensors, and Spacecraft Fabrication and Test. Author

N92-25297# Federal Aviation Administration, Washington, DC.
AVIATION SYSTEM: CAPITAL INVESTMENT PLAN
Dec. 1991 342 p
Avail: CASI HC A15/MF A03

The Federal Aviation Administration's (FAA) second annual Aviation System Capital Investment Plan (CIP) is presented. The plan describes the facilities and equipment programs that the FAA will pursue in addressing key concerns of the National Aerospace system (NAS), such as safety, efficiency, traffic demands, equipment and facilities, and airspace use. The CIP creates a plan for the evolution of the existing NAS through the use of new technologies and the development of new products obtained from continuing research. Specific topics covered include a system description; requirements that expand, relocate, or consolidate existing facilities/equipment; projects that refurbish structures, replace obsolete equipment, or relocate facilities to maintain service, improve effectiveness, or reduce cost; and projects that support logistics, provide for personnel training, and manage the information and human resource aspects of NAS modernization. Author

N92-26368# Department of the Treasury, Washington, DC. Office of the Deputy Assistant Secretary for Information Systems.
EXECUTIVE SUMMARY OF INFORMATION SYSTEMS PLANS: FISCAL YEARS 1993 TO 1997
Nov. 1991 108 p
(PB92-158351) Avail: CASI HC A06/MF A02

The report outlines the major systems and strategic planning issues in Treasury information systems for fiscal year (FY) 1993-1997. The summary is an overview of the major information systems that the Department expects to implement and maintain over the next five years. It provides Treasury and other government officials, as well as the public, with information on how Treasury addresses strategic issues and plans the development and implementation of information systems that are important not only for Treasury, but for the Federal government as a whole. NTIS

N92-28055# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, ID.
PRODUCT ASSURANCE PLANNING IN AN ENVIRONMENT OF INCREASED NEED FOR ACCOUNTABILITY
V. ESPARZA and C. CASEY Oct. 1991 20 p
(Contract DE-AC07-76ID-01570)
(DE92-010850; EGG-EE-9965) Avail: CASI HC A03/MF A01

Projects producing data are too often providing a product that is neither defensible nor usable. Instead of planning for data of known and required quality, managers are too often asking for (and getting) the wrong thing. The problem is a lack of correct planning strategy. A planning strategy to produce usable, defensible data requires communication from the customer to top-level management and from top-level management to the project leader, who must then communicate with the technical experts who will run the project. EPA requires that data quality objectives (DQOs) be derived for RI/FS projects. The DQO process is a top-down planning process that requires two-way communication; some organizations do not have structures suited for implementing DQOs as mandated by EPA. This paper discusses specific tools for imposing structure that will make the DQO process easier to follow for many organizations. The tools include a steering committee, a test design team, and Quality Function Deployment (QFD) matrices. The steering committee is a strong technical forum that can develop technical issues systematically and break down technical issues into manageable pieces that can be stated as test objectives. The test design team plans each test, systematically designs the test matrix, and guides the completion of test documentation that will be used to defend the data collected. QFD matrices are used as tools by both steering committee and test design team as a highly structured, systematic means of relating top-level (customer) requirements to data quality needs and measurement system design. DOE

N92-29934# Logistics Management Inst., Bethesda, MD.
APPLICATION CENTER OF EXCELLENCE (ACE) PROGRAM Final Report
DENNIS J. OCONNOR Oct. 1991 22 p
(Contract MDA903-90-C-0006)
(AD-A248694; LMI-PL019R1) Avail: CASI HC A03/MF A01

The Application Center of Excellence (ACE) program increases the effectiveness of the Office of the Assistant Secretary of Defense (Production and Logistics) OASD (P and L) by exploiting the capabilities of installed computing equipment and augmenting those capabilities of installed computing equipment and/augmenting those capabilities with new technologies. In FY91, its first year of operation, the program has developed capabilities for more effective management presentations and improved connectivity to external systems. The OASD (P and L) staff is now able to produce engaging presentations in a variety of media and to connect to many external systems from the desktop. For OASD (P and L) to derive the full benefits of the program, the ACE program manager should establish guidelines for future operations. Our recommendations pertain to guidelines on the ACE infrastructure (program participants and resources) and the process used to conduct ACE business. DTIC

N92-30959*# Office of Space Science and Applications, Washington, DC.
SPACE SCIENCE AND APPLICATIONS: STRATEGIC PLAN 1991
6 Apr. 1991 68 p
(NASA-TM-107811; NAS 1.15:107811) Avail: CASI HC A04/MF A01

The Office of Space Science and Applications (OSSA) 1991 Strategic Plan reflects a transitional year in which we respond to changes and focus on carrying out a vital space science program and strengthening our research base to reap the benefits of current and future missions. The Plan is built on interrelated, complementary strategies for the core space science program, for Mission to Planet Earth, and for Mission from Planet Earth. Each strategy has its own unique themes and mission priorities, but they share a common set of principles and a common goal - leadership through the achievement of excellence. Discussed here is the National Space Policy; an overview of OSSA activities, goals, and objectives; and the implications of the OSSA space science and applications strategy. Author

N92-33321*# Defense Systems Management School, Fort Belvoir, VA.
ACQUISITION STREAMLINING: A CULTURAL CHANGE
JESSE STEWART *In* NASA. Lyndon B. Johnson Space Center, Third SEI Technical Interchange: Proceedings p 178-205 1992
Avail: CASI HC A03/MF A05

The topics are presented in viewgraph form and include the following: the defense systems management college, educational philosophy, the defense acquisition environment, streamlining initiatives, organizational streamlining types, defense law review, law review purpose, law review objectives, the Public Law Pilot Program, and cultural change. Author

N92-33323*# Lockheed Missiles and Space Co., Sunnyvale, CA.
SKUNK WORKS TYPE APPROACH FOR F-SAT
GARY F. TURNER *In* NASA. Lyndon B. Johnson Space Center, Third SEI Technical Interchange: Proceedings p 228-238 1992
Avail: CASI HC A03/MF A05

The topics are presented in viewgraph form and include the following: the F-SAT Program, the classic program organization, design/configuration management, procurement/material, manufacturing, quality assurance, the facility, and personnel management. Author

N93-11596# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, ID.
A DEVELOPMENT APPROACH FOR NUCLEAR THERMAL PROPULSION
D. BUDEN 1992 11 p Presented at the American Nuclear Society Meeting, Jackson Hole, WY, 16-19 Aug. 1992
(Contract DE-AC07-76ID-01570)
(DE92-018020; EGG-M-92359; CONF-9208114-1) Avail: CASI HC A03/MF A01

The cost and time to develop nuclear thermal propulsion systems are very approach dependent. The objectives addressed are the development of an 'acceptable' nuclear thermal propulsion system that can be used as part of the transportation system for people to explore Mars and to enhance the performance of other missions within highly constrained budgets and schedules. To accomplish this, it was necessary to identify the cost drivers considering mission parameters, safety of the crew, mission success, facility availability and time and cost to construct new facilities, qualification criteria, status of technologies, management structure, and use of such system engineering techniques as concurrent engineering. DOE

N93-14209 Brandeis Univ., Waltham, MA.
INFORMATION FOR MANAGEMENT, PLANNING, AND DECISION-MAKING IN NONPROFIT ORGANIZATIONS: TOWARD A COMPREHENSIVE MODEL Ph.D. Thesis
CAROLYN MARGARET GRAY 1992 231 p Avail: Univ. Microfilms Order No. DA9227594

The major thesis of this work is that the collection, organization, and utilization of critical information can help nonprofits become more effective in management, planning, and decision making. Increasing the capacity of nonprofit organizations to collect, organize, and utilize information offers the potential benefit of improving their capacity to deliver human services more effectively. This research is concerned with how nonprofit organizations collect, organize, and use information. The research incorporates a descriptive survey with responses from 230 nonprofit human service organizations in Massachusetts, retrospective analysis of the use of marketing information in home health care organizations, a case study of a large nonprofit organization, and a prescriptive model with practical tools for information management in nonprofit organizations. Since information utilization involves locating, analyzing, and applying information, the main concern of this work is to create a model that will inform practice and help managers understand the important dimensions of information management to improve organizational effectiveness. The model provides a conceptual framework by which the nonprofit manager can apply conclusions from this research while working with information in their own unique environment. The research builds upon theoretical and practical research in nonprofit theory, management, organizational theory, information theory, knowledge utilization, and evaluation research. After a review of the historical and sociological roots of nonprofits, a series of propositions are developed from the literature for examination and discussion. The prescriptive element of the research draws conclusions from research activities and describes actions determined useful to nonprofit organizations in their management, planning, and decision making efforts. The model serves as a practical guide for professionals, management, and boards in assessing organization information management and includes suggestions for increasing organizational information management capacity. The model includes descriptive, analytical, and prescriptive elements, which are: (1) a typology of information including sources and ways information is helpful or not helpful; (2) an anaytical tool for assessing organizational 'readiness' to use information; and (3) successful methods and procedures for utilization of information. The model is designed with indices which can be used to evaluate the 'information health' of an organization. Dissert. Abstr.

N93-16859*# California Univ., San Diego, La Jolla, CA. California Space Inst.
THE FUTURE OF MANAGEMENT: THE NASA PARADIGM
PHILIP R. HARRIS *In* NASA. Johnson Space Center, Space Resources. Volume 4: Social Concerns p 120-142 1992
Avail: CASI HC A03/MF A03; SOD HC; 4 functional color pages

Prototypes of 21st century management, especially for large scale enterprises, may well be found within the aerospace industry. The space era inaugurated a number of projects of such scope and magnitude that another type of management had to be created to ensure successful achievement. The challenges will be not just in terms of technology and its management, but also human and cultural in dimension. Futurists, students of management, and those concerned with technological administration would do well to review the literature of emerging space management for its wider implications. NASA offers a paradigm, or demonstrated model, of future trends in the field of management at large. More research is needed on issues of leadership for Earth based project in space and space based programs with managers there. It is needed to realize that large scale technical enterprises, such as are undertaken in space, require a new form of management. NASA and other responsible agencies are urged to study excellence in space macromanagement, including the necessary multidisciplinary skills. Two recommended targets are the application of general living systems theory and macromanagement concepts for space stations in the 1990s. E.R.

N93-18680*# Edinburgh Univ. (Scotland). Dept. of Artificial Intelligence.
REALIZATION OF HIGH QUALITY PRODUCTION SCHEDULES: STRUCTURING QUALITY FACTORS VIA ITERATION OF USER SPECIFICATION PROCESSES
TAKASHI HAMAZAKI *In* NASA. Ames Research Center, Working Notes from the 1992 AAAI Spring Symposium on Practical Approaches to Scheduling and Planning p 97-101 May 1992
Avail: CASI HC A01/MF A02

This paper describes an architecture for realizing high quality production schedules. Although quality is one of the most important aspects of production scheduling, it is difficult, even for a user, to specify precisely. However, it is also true that the decision as to whether a scheduler is good or bad can only be made by the user. This paper proposes the following: (1) the quality of a schedule can be represented in the form of quality factors, i.e. constraints and objectives of the domain, and their structure; (2) quality factors and their structure can be used for decision making at local decision points during the scheduling process; and (3) that they can be defined via iteration of user specification processes. Author

N93-19870# Defense Systems Management School, Fort Belvoir, VA.
PROGRAM MANAGER: JOURNAL OF THE DEFENSE SYSTEMS MANAGEMENT COLLEGE, VOLUME 21, NUMBER 6, NOVEMBER-DECEMBER 1992
Dec. 1992 43 p
(AD-A258766; DSMC-111-VOL-21-NO-6) Avail: CASI HC A03/MF A01

The following topics dealing with real time software manipulation for weapons systems are discussed: cutting a path to quality through concurrent teamwork; manufacturing notes; lessons learned in manufacturing modernization; the army reuse center-cost avoidance through software reuse; results-oriented program management as a leadership/management model; organization development; the software development process; evolutionary acquisition and DOD's revised acquisition strategy; annual reliability and maintainability symposium. DTIC

N93-20904# General Accounting Office, Washington, DC.
NASA ISSUES
Dec. 1992 26 p
(GAO/OCG-93-27TR; AD-A263027) Avail: CASI HC A03/MF A01; GAO, PO Box 6015, Gaithersburg, MD 20877 HC

In response to a request, this transition series report discusses major policy, management, and program issues facing the Congress and the new administration at the National Aeronautics and Space Administration (NASA). This report recognizes the changes that have occurred since our first NASA transition report 4 years ago and summarizes the current challenges facing the agency: (1) bringing plans in line with likely budgets; (2) managing systems development more efficiently; (3) improving operations and oversight; and (4) preserving U.S. aeronautics leadership. Author

N93-21561# Wichita State Univ., KS. National Inst. for Aviation Research.
AIRLINE QUALITY ISSUES 1992: PROCEEDINGS OF THE INTERNATIONAL FORUM ON AIRLINE QUALITY
DEAN E. HEADLEY, ed. and BRENT D. BOWEN, ed. Mar. 1992 297 p Conference held in Washington, DC, 6-7 Mar. 1992
(NIAR-92-10) Avail: CASI HC A13/MF A03

Proceedings of the International Forum on Airline Quality are included. Topics covered include: airline quality ratings; airline quality; airline quality perspectives; and concerns regarding airline quality. Author (revised)

N93-22870*# National Aeronautics and Space Administration, Washington, DC.
FLIGHT PROJECT DATA BOOK National Aeronautics and Space Administration
1992 147 p
(NASA-TM-108657; NAS 1.26:108657) Avail: CASI HC A07/MF A02

The Office of Space Science and Applications (OSSA) is responsible for the overall planning, directing, executing, and evaluating that part of the overall NASA program that has the goal of using the unique characteristics of the space environment to conduct a scientific study of the universe, to understand how the Earth works as an integrated system, to solve practical problems on Earth, and to provide the scientific and technological research foundation for expanding human presence beyond Earth orbit into the solar system. OSSA guides its program toward leadership through its pursuit of excellence across the full spectrum of disciplines. OSSA pursues these goals through an integrated program of ground-based laboratory research and experimentation, suborbital flight of instruments on airplanes, balloons, and sounding rockets; flight of instruments and the conduct of research on the Shuttle/Spacelab system and on Space Station Freedom; and development and flight of automated Earth-orbiting and interplanetary spacecraft. The OSSA program is conducted with the participation and support of other Government agencies and facilities, universities throughout the United States, the aerospace contractor community, and all of NASA's nine Centers. In addition, OSSA operates with substantial international participation in many aspects of our Space Science and Applications Program. OSSA's programs currently in operation, those approved for development, and those planned for future missions are described. Derived from text

N93-23746*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
COMPUTATIONAL SIMULATION FOR CONCURRENT ENGINEERING OF AEROSPACE PROPULSION SYSTEMS
C. C. CHAMIS and S. N. SINGHAL (Sverdrup Technology, Inc., Brook Park, OH.) Feb. 1993 23 p Presented at the 1992 AIAA Aerospace Design Conference, Irvine, CA, 3-6 Feb. 1992 Previously announced in IAA as A92-33285
(Contract RTOP 323-57-40)
(NASA-TM-106029; E-7592; NAS 1.15:106029) Avail: CASI HC A03/MF A01

Results are summarized for an investigation to assess the infrastructure available and the technology readiness in order to develop computational simulation methods/software for concurrent engineering. These results demonstrate that development of computational simulation methods for concurrent engineering is timely. Extensive infrastructure, in terms of multi-discipline simulation, component-specific simulation, system simulators, fabrication process simulation, and simulation of uncertainties—fundamental to develop such methods, is available. An approach is recommended which can be used to develop computational simulation methods for concurrent engineering of propulsion systems and systems in general. Benefits and issues needing early attention in the development are outlined. Author (revised)

N93-24680*# Hughes Aircraft Co., Los Angeles, CA.
SYSTEMS ENGINEERING FOR VERY LARGE SYSTEMS
PAUL E. LEWKOWICZ *In* NASA, Washington, Readings in Systems Engineering p 17-22 1993
Avail: CASI HC A02/MF A03

Very large integrated systems have always posed special problems for engineers. Whether they are power generation systems, computer networks or space vehicles, whenever there are multiple interfaces, complex technologies or just demanding customers, the challenges are unique. 'Systems engineering' has evolved as a discipline in order to meet these challenges by providing a structured, top-down design and development methodology for the engineer. This paper attempts to define the general class of problems requiring the complete systems engineering treatment and to show how systems engineering can be utilized to improve customer satisfaction and profit ability. Specifically, this work will focus on a design methodology for the largest of systems, not necessarily in terms of physical size, but in terms of complexity and interconnectivity. Author

N93-24686*# National Aeronautics and Space Administration, Washington, DC.
THE IMPORTANCE OF COST CONSIDERATIONS IN THE SYSTEMS ENGINEERING PROCESS
JOHN D. HODGE *In its* Readings in Systems Engineering p 115-125 1993
Avail: CASI HC A03/MF A03

This paper examines the question of cost, from the birth of a program to its conclusion, particularly from the point of view of large multi-center programs, and suggests how to avoid some of the traps and pitfalls. Emphasis is given to cost in the systems engineering process, but there is an inevitable overlap with program management. (These terms, systems engineering and program management, have never been clearly defined.) In these days of vast Federal budget deficits and increasing overseas competition, it is imperative that we get more for each research and development dollar. This is the only way we will retain our leadership in high technology and, in the long run, our way of life.
Derived from text

N93-25952*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
RENDEZVOUS, PROXIMITY OPERATIONS AND CAPTURE QUALITY FUNCTION DEPLOYMENT REPORT
STEPHEN L. LAMKIN, ed. Dec. 1991 66 p
(Contract RTOP 593-14-00)
(NASA-TM-108752; NAS 1.15:108752; JSC-25458) Avail: CASI HC A04/MF A01

Rendezvous, Proximity Operations, and Capture (RPOC) is a missions operations area which is extremely important to present and future space initiatives and must be well planned and coordinated. To support this, a study team was formed to identify a specific plan of action using the Quality Function Deployment (QFD) process. This team was composed of members from a wide spectrum of engineering and operations organizations which are involved in the RPOC technology area. The key to this study's success is an understanding of the needs of potential programmatic customers and the technology base available for system implementation. To this end, the study team conducted interviews with a variety of near term and future programmatic customers and technology development sponsors. The QFD activity led to a thorough understanding of the needs of these customers in the RPOC area, as well as the relative importance of these needs. Author (revised)

N93-26375# Naval Surface Warfare Center, Dahlgren, VA.
AEGIS MEASURES DEFINITION Final Report
EDWARD J. DUDASH and DAVID E. MCCONNELL Mar. 1992 45 p
(AD-A261494; NSWCDD/TR-92/119) Avail: CASI HC A03/MF A01

As part of an effort to improve the development and maintenance processes for AEGIS computer programs at the Naval Surface Warfare Center Dahlgren Division, a software measurement program has been initiated. The measurement program is based on a structure representing the process employed, the products involved, the resources required, and the management controls specified. A standard set of attributes is defined across the software engineering entities as a means of obtaining complete measurement coverage. A life-cycle process model is specified to standardize the collection of required data. Then a set of measures that spans the entities and attributes and a method for validation of the defined measures is described. The defined measures are intended to be employed as part of a mechanism to provide the objective management necessary to support continuous improvement of AEGIS lifetime processes. DTIC

N93-26458# Executive Office of the President, Washington, DC.
TECHNOLOGY FOR AMERICA'S ECONOMIC GROWTH: A NEW DIRECTION TO BUILD ECONOMIC STRENGTH
WILLIAM J. CLINTON and ALBERT GORE, JR. 22 Feb. 1993 47 p
(AD-A261553) Avail: CASI HC A03/MF A01

Investing in technology is investing in America's future: a growth economy with more high-skill, high-wage jobs for American workers; a cleaner environment where energy efficiency increases profits and reduces pollution; a stronger, more competitive private sector able to maintain U.S. leadership in critical world markets; an educational system where every student is challenged; and an inspired scientific and technological research community focused on ensuring not just our national security but our very quality of life. American technology must move in a new direction to build economic strength and spur economic growth. The traditional federal role in technology development has been limited to support of basic science and mission-oriented research in the Defense Department, NASA, and other agencies. This strategy was appropriate for a previous generation but not for today's profound challenges. We cannot rely on the serendipitous application of defense technology to the private sector. We must aim directly at these new challenges and focus our efforts on the new opportunities before us, recognizing that government can play a role helping private firms develop and profit from innovations. DTIC

N93-29204# Environmental Protection Agency, Research Triangle Park, NC. Atmospheric Research and Exposure Assessment Lab.
ANALYSIS OF PROTOCOL GASES: AN ON-GOING QUALITY ASSURANCE AUDIT
AVIS P. HINES Mar. 1993 10 p
(PB93-168839; EPA/600/A-93/055) Avail: CASI HC A02/MF A01

The Environmental Protection Agency (EPA) has initiated a national QA program on the suppliers of protocol gases. In the program, which will operate continuously, protocol gases are obtained and analyzed by EPA. The results of the EPA analysis are then compared to the Certificate of Analysis supplied with the protocol gas. Reported here is a comparison between the assay results obtained by EPA on protocol gases for SO2 and NO and the concentrations provided by the suppliers of the protocol gases. The results are being released on the Technology Transfer Network operated by the Office of Air Quality Planning and Standards of the EPA, Durham, N.C. NTIS

N93-29439# Industrial Coll. of the Armed Forces, Washington, DC.
INFORMATION TECHNOLOGY: A FORCE FOR ORGANIZATIONAL CHANGE
WILLIAM R. BOWEN Apr. 1992 30 p
(AD-A261986; NDU-ICAF-92-S10) Avail: CASI HC A03/MF A01

Information Technology is changing the face of the world as we know it. Business use of technologies like Decision Support Systems and Electronic Data Interchange allow organizations to re-engineer their processes to eliminate unnecessary layers of management. New emerging technologies under the umbrella of Artificial Intelligence are helping us to replace the human being with computer technology that simulates expert advice or learns as it matures. To take advantage of these new technologies requires new organization structures and new ways of approaching problem solving. These new technologies are explored and related to organizational change. Author (revised)

N93-30134*# National Aeronautics and Space Administration, Washington, DC.
THE 1992 TOWN MEETINGS: TOWARD A SHARED VISION
Apr. 1993 65 p
(NASA-NP-205; NAS 1.83:205) Avail: CASI HC A04/MF A01

With the goal of developing a shared vision for the future of NASA, the U.S. civil aeronautics and space agency conducted a series of town meetings across the country in Nov. and Dec. 1992. Specifically, NASA sought comment on the Agency's new vision statement and mission values, which were developed by the Agency's employees in an effort to redefine NASA's priorities and purpose for the 1990's and beyond. In practice, the meetings constituted a sort of nationwide brainstorming session on how to make aeronautics and space research more relevant to people's daily lives. Primary findings, NASA's action plan, town meeting proceedings, and conclusions are described. Derived from text

N93-30715*# National Aeronautics and Space Administration, Washington, DC.
HIGH PERFORMANCE COMPUTING AND COMMUNICATIONS PROGRAM
LEE HOLCOMB *In its* Technology Transfer and the Civil Space Program. Volume 2: Workshop Proceedings 6 p 1992
Avail: CASI HC A02/MF A04

A review of the High Performance Computing and Communications (HPCC) program is provided in vugraph format. The goals and objectives of this federal program are as follows: extend U.S. leadership in high performance computing and computer communications; disseminate the technologies to speed innovation and to serve national goals; and spur gains in industrial competitiveness by making high performance computing integral to design and production. CASI

N93-32229*# Hampton Univ., VA.
THE 1992 LANGLEY AEROSPACE RESEARCH SUMMER SCHOLARS (LARSS) PROGRAM Final Report 2 Jul. 1993
96 p
(Contract NCC1-166)
(NASA-CR-193371; NAS 1.26:193371) Avail: CASI HC A05/MF A01

The overwhelming majority of the LARSS participants rated their overall summer research experience as good or excellent. Even though the 1992 LARSS Program has met its goals, all areas of the program need to be considered for continuous improvement. Of the various recommendations provided by the participants, the following will be implemented in the 1993 LARSS Program: (1) LARSS participants will be housed in two or three apartment complexes; (2) mentors will be encouraged to contact their student before the beginning of the LARSS Program; (3) LARSS participants will be notified of a tentative payroll schedule before the Program begins; (4) LARSS participants will be strongly encouraged to give an oral presentation on their research project in their respective Divisions; and (5) a Career Conference, in conjunction with a forum where the participants can share their individual research projects will be held. The participant recommendations made in the 1992 LARSS Student Exit Survey will ensure a more successful and improved LARSS Program in 1993. Author

04
HUMAN RESOURCE UTILIZATION

A92-10171
EMPOWERING THE ORGANIZATION
RODNEY E. STUBBS (Martin Marietta Corp., Bethesda, MD) IN: International SAMPE Symposium and Exhibition, 36th, San Diego, CA, Apr. 15-18, 1991, Proceedings. Book 1 1991 12 p
Copyright

The implementation of the Total Quality Management (TQM) approach at Martin Marietta Space Launch Systems is described. The fundamentals of the TQM process and the principal stages of process implementation are briefly reviewed. In particular, attention is given to people empowerment through High Performance Work Teams and installation of Manufacturing Resource Planning. The early successes and benefits of the program are summarized. V.L.

A92-11189
THE EFFECTIVENESS OF AERONAUTICAL DECISIONMAKING TRAINING
ALAN DIEHL (USAF, Inspection and Safety Center, Norton AFB, CA) IN: Human Factors Society, Annual Meeting, 34th, Orlando, FL, Oct. 8-12, 1990, Proceedings. Vol. 2 1990 5 p refs
Copyright

Several programs have been developed and tested to reduce the frequency of aircrew decisional errors. 'Aeronautical decisionmaking' (ADM) materials are intended to enhance the judgment abilities of the individual aviators. A review of six empirical ADM studies reveals that such programs reduced the frequency of pilot errors from 8 to 46 percent. The use of such materials by a large commercial operator resulted in 54 percent decrease in their accident rate. Author

A92-11190
A COMPARISON OF TWO TYPES OF TRAINING INTERVENTIONS OF TEAM COMMUNICATION PERFORMANCE
DONALD L. LASSITER, JEREMY S. VAUGHN, VIRGINIA E. SMALTZ, BEN B. MORGAN, JR. (Central Florida, University, Orlando, FL), and EDUARDO SALAS (U.S. Navy, Naval Training Systems Center, Orlando, FL) IN: Human Factors Society, Annual Meeting, 34th, Orlando, FL, Oct. 8-12, 1990, Proceedings. Vol. 2 1990 5 p refs
Copyright

The purpose of this research was to examine the effects of different types of training interventions on team communication. Forty-five teams of two persons each viewed one of three training videotapes and then performed a low-fidelity helicopter simulation exercise. Trained raters were used to rate teams in terms of levels of their communications and mission performances. Finally, attitudes concerning aircrew coordination were measured before and after training. Results indicated that team communication skills were affected by the type of training intervention the team received. Specifically, the communication of teams in the skills group was significantly better than that of the other two groups. No significant effect of training intervention was found for the mission performance or the attitude data, although a significant correlation was found between team communication performance and team mission performance. Author

A92-13837
HUMAN RESOURCE MANAGEMENT IN AVIATION
ERIC FARMER, ED. (RAF, Institute of Aviation Medicine, Farnborough, England) Aldershot, England and Brookfield, VT, Avebury Technical, 1991, 205 p. For individual items see A92-13838 to A92-13849.
Copyright

The present conference on human-resource management in aviation encompasses the fields of selection and training of pilot candidates, the use and effects of incorporating simulation into pilot training, and issues related to the operation of aircraft. Specific issues addressed include a validation study of a pilot-selection process, a system for selecting ab initio pilot candidates, the use of computer-aided testing, psychological testing in aviation, the Defense Mechanism Test, the simulation of obstacle avoidance, and the simulation of cognitive load in a two-man helicopter. Also addressed are a microcomputer flight-decision simulator, the effectiveness of providing a pilot with two sources of information, a no-smoking trial for chartered flights, a flight-training program, and a conceptualization of aviation psychology on the civil flight deck. C.C.S.

A92-13842
PSYCHOLOGICAL TESTING IN AVIATION - AN OVERVIEW
PAUL KLINE (Exeter, University, England) IN: Human resource management in aviation 1991 5 p refs
Copyright

Testing procedures in the field are discussed in terms of the psychometric models used, the choice of variables and tests, and gaging by means of factor loading. Also addressed are the specific problems of selection for personality and motivation testing including the objective treatment of projective tests and the problems of the Defense Mechanism Test. The testing procedures in the aviation field are based on logical

concepts and are to varying degrees effective, but more powerful tools are required to improve predictive success. C.C.S.

A92-13848
AN INTEGRATED PRIVATE AND INSTRUMENT PILOT FLIGHT TRAINING PROGRAMME IN A UNIVERSITY
HENRY L. TAYLOR, ROBERT H. KAISER, SYBIL PHILLIPS, RICKY A. WEINBERG, and OMER BENN (Illinois, University, Savoy) IN: Human resource management in aviation 1991 19 p refs
Copyright

A comparison of several flight-instruction techniques is conducted with groups of pilots using integrated contact/instrument training, accelerated instrument flight training, and traditional training methods. The groups of students are given the Instrument Rating Practical Test, and the control group using the traditional method is given a standard test. The two experimental groups are found to have similar test scores, and all three groups are then tested in terms of VOR and ADF navigation and VOR/DME and NDB approach. It is shown that the integrated contact/instrument flight training program is effective when instrument procedures are emphasized early in the program. The integrated contact/instrument group is not significantly different from the accelerated instrument group, however, which is attributed to the sequence of training. C.C.S.

A92-18530* National Aeronautics and Space Administration, Washington, DC.
SPACE EDUCATION IN THE CONTEXT OF U.S. GOVERNMENT MULTIAGENCY EFFORTS IN SCIENCE AND MATHEMATICS EDUCATION
MARGARET G. FINARELLI and ROBERT W. BROWN (NASA, Office of External Relations, Washington, DC) IAF, International Astronautical Congress, 42nd, Montreal, Canada, Oct. 5-11, 1991. 9 p. refs
(IAF PAPER 91-524) Copyright

The status of a multiagency endeavor to involve U.S. Federal agencies in the attainment of National Education Goals for the 1990's is presented. Emphasis is placed on the educational activities of NASA, which is one of 16 Federal agencies on the Federal Coordinating Council for Science, Engineering and Technology. NASA's is a prototype education program for achieving excellence in mathematics and sci ence in the coming generations of Americans. R.E.P.

A92-20363
HOW 'THIRD FORCE' PSYCHOLOGY MIGHT VIEW HUMANS IN SPACE
ALBERT A. HARRISON and JOSHUA SUMMIT (California, University, Davis) *Space Power - Resources, Manufacturing and Development* (ISSN 0883-6272), vol. 10, no. 2, 1991, p. 185-203. refs
Copyright

While avoiding alarmist positions, recent reviews of psychology and spaceflight have tended to focus on performance decrements, dwindling motivation, emotional instability, social conflict, and other adverse consequences of prolonged spaceflight. Drawing on 'third force' or humanistic psychology, the present paper describes some of the psychological benefits of manned space missions. These include enhanced competence and mastery, self-actualization, heightened imagination, peak experiences (or overview effects), increased ability to deal with stress, high social cohesion, and serving as an inspiration for others. Third force psychology, with its emphasis on human talent and resourcefulness, has clear implications for space mission design. Author

A92-33190#
CONSIDERATIONS FOR THE TESTING OF REAL-TIME SPACECRAFT SOFTWARE
DIPA SURI (Lockheed Missiles and Space Co., Inc., Sunnyvale, CA) AIAA, Aerospace Design Conference, Irvine, CA, Feb. 3-6, 1992. 8 p.
(AIAA PAPER 92-0998) Copyright

The object of this paper is to provide insight into those characteristics that have emerged as important constituents of the testing of real-time spacecraft (flight) software/firmware. The test approach has been one that placed emphasis on ensuring that the test team is assembled to attract talent from the inception of the requirements definition/allocation phase such that it (the team) is involved in the definition of testable requirements; the test bed configuration is defined with special emphasis on the development of hardware/software emulations which have proven to be indispensable; the phased test approach for preliminary qualification test is adopted to (1) provide adaptability in the face of volatile system requirements - and ultimately software requirements, (2) minimize the magnitude of regression testing, and (3) to be a natural precursor to the final qualification test; and finally, a scheme for rigorous configuration management and orderly anomaly resolution. Author

A92-33225#
IMPACT OF THE NASA/USRA ADVANCED DESIGN PROGRAM ON THE DEVELOPMENT OF SPACE ENGINEERING AT THE UNIVERSITY OF TEXAS AT AUSTIN
WALLACE T. FOWLER, GEORGE W. BOTBYL, and STEVEN P. NICHOLS (Texas, University, Austin) AIAA, Aerospace Design Conference, Irvine, CA, Feb. 3-6, 1992. 11 p. Feb. 1992 11 p refs
(AIAA PAPER 92-1044) Copyright

An overview is presented of participation by the University of Texas at Austin in the NASA/USRA Advanced Design Program (ADP) since the pilot project in 1985. It is seen that participation in the ADP has had a very positive influence on undergraduate and graduate engineering education at the university. Involvement in the ADP has resulted in greatly increased student learning and motivation, refinements in the design courses, and improved university interfaces with NASA and USRA. R.E.P.

A92-33805
THE DEVELOPMENT AND EVALUATION OF FLIGHT INSTRUCTORS - A DESCRIPTIVE SURVEY
IRENE HENLEY (Newcastle, University, Australia) *International Journal of Aviation Psychology* (ISSN 1050-8414), vol. 1, no. 4, 1991, p. 319-333. 1991 15 p refs
Copyright

Results from a survey of flight instructors and flight training standards inspectors in Canada show that flight instructor training is still heavily influenced by traditional methods of instruction, such as rote learning and the mimicking of another instructor's speech pattern. Both inspectors and flight instructors stated that training should provide competency in teaching techniques and a more complete knowledge of evaluation and learning theories. Senior instructors who teach the flight instructor course are urged to receive additional training before they are authorized to instruct others how to teach as the quality of flight training rests with them. R.E.P.

A92-38312
GIVING DIRECTION TO THE DREAM - NEW EXPERIENCES IN SPACE EDUCATION
FRANK SIETZEN, JR. IN: Space Congress, 27th, Cocoa Beach, FL, Apr. 24-27, 1990, Proceedings 1990 9 p
Copyright

An approach to aerospace education for children is outlined that was based on the development of a model of the Space Shuttle in a science museum. The model of the Space Shuttle is the centerpiece of an educational program that provides experience in making decisions and forming teamwork concepts. Also included is an outreach program of workshops for educators to learn how to teach space subjects. The program demonstrates the development of successful aerospace education without NASA involvement and shows that hands-on exhibits are important for educational programs. The establishment of central clearinghouse is proposed for the distribution and exchange of technological and programmatic advances to the user community on a timely basis. C.C.S.

A92-38627#
COMMUNITY ORGANIZATION UNDER DIFFERING SOUTH POLE LEADERS
S. M. BLAIR (Uniformed Services University of the Health Sciences, Bethesda, MD) AIAA, Space Programs and Technologies Conference, Huntsville, AL, Mar. 24-27, 1992. 8 p. refs
(AIAA PAPER 92-1528) Copyright

This paper compares community organization in a small isolated and confined work environment, the South Pole Antarctic Station, under two markedly different leaders in two successive years. One leader personally selected crew members, engendering group solidarity among selected members but isolating members not selected. Under the second, more passive leader, a loss structure with a surrogate community organizer developed. This community showed more adaptive flexibility and achieved mission goals despite weak leadership thanks to a majority of reasonably competent members. C.D.

A92-38740*# National Aeronautics and Space Administration, Washington, DC.
SPACE EDUCATION IN THE CONTEXT OF U.S. GOVERNMENT MULTIAGENCY EFFORTS IN SCIENCE AND MATHEMATICS EDUCATION
MARGARET G. FINARELLI, ROBERT W. BROWN, and FRANK C. OWENS (NASA, Washington, DC) AIAA, Space Programs and Technologies Conference, Huntsville, AL, Mar. 24-27, 1992. 9 p. refs
(AIAA PAPER 92-1687) Copyright

The educational activities of NASA which is one of 16 agencies on the Federal Coordinating Council for Science, Engineering and Technology is discussed. NASA's education mission is to utilize its unique facilities and its specialized workforce to conduct and to leverage externally conducted science, mathematics, and technology education programs and activities. These efforts aimed at meeting the national education goals should help to preserve U.S. leadership in aeronautics, space science, and technology. O.G.

A92-39504* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
HUMAN FACTORS ISSUES FOR INTERSTELLAR SPACECRAFT
MARC M. COHEN and ADAM R. BRODY (NASA, Ames Research Center; Sterling Software, Inc., Moffett Field, CA) IN: Space Congress, 28th, Cocoa Beach, FL, Apr. 23-26, 1991, Proceedings 1991 11 p refs
Copyright

Developments in research on space human factors are reviewed in the context of a self-sustaining interstellar spacecraft based on the notion of traveling space settlements. Assumptions about interstellar travel are set forth addressing costs, mission durations, and the need for multigenerational space colonies. The model of human motivation by Maslow (1970) is examined and directly related to the design of space habitat architecture. Human-factors technology issues encompass the human-machine interface, crew selection and training, and the development of spaceship infrastructure during transtellar flight. A scenario for feasible instellar travel is based on a speed of 0.5c, a timeframe of about 100 yr, and an expandable multigenerational crew of about 100 members. Crew training is identified as a critical human-factors issue requiring the development of perceptual and cognitive aids such as expert systems and virtual reality. C.C.S.

A92-39532
WORKFORCE 2000 AND ITS EDUCATIONAL IMPLICATIONS FOR SPACE ORGANIZATIONS
BETTY P. PREECE IN: Space Congress, 28th, Cocoa Beach, FL, Apr. 23-26, 1991, Proceedings 1991 7 p refs
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A study concerning the aerospace employment market is described with attention given to developing trends and potential policy initiatives. Specific predictions are made regarding the evolution of the U.S. economy and the changes foreseen in the demographic composition and skill level of the emerging workforce. The paper identifies six challenges for US policymakers including: (1) stimulating balanced world growth; (2) improving productivity in service industries; (3) insuring adaptability in the aging workforce; and (4) improving workers' education. Attention is given to the special needs of women, minority, and disabled workers, and recommendations are made regarding strategic workforce planning in space organizations. The primary recommendations involve the promotion of science and mathematics education and the enhancement of employer programs for training and accommodating all segments of the workforce. C.C.S.

A92-39533
EXCELLENCE IN EDUCATION THROUGH SPACE EXPLORATION
LISA G. BARTOSIK (McDonnell Douglas Space Systems Co., Huntington Beach, CA) IN: Space Congress, 28th, Cocoa Beach, FL, Apr. 23-26, 1991, Proceedings 1991 6 p refs
Copyright

The potential contribution of the aerospace industry to the revitalization of the U.S. educational system is discussed emphasizing the use of space exploration. A corporate program is described which exploits students' interest in space exploration in order to enhance their study of science, mathematics, and other areas of interest to the aerospace community. The program comprises several areas of interest to the current directions of the U.S. space program such as the technology of exploration, the study of earth, and the exploration of the moon and Mars. Based on a pilot version of the program revisions are proposed to the curriculum, reading level, and activities employed in the program. The program on space education is shown to be an effective example of supplementary educational programs sponsored by corporations that address issues specific to the aerospace industry. C.C.S.

A92-44942
INSTRUCTIONAL STRATEGY FOR AIRCREW COORDINATION TRAINING
ROBERT W. SWEZEY, ROBERT E. LLANERAS (InterScience America, Sterling, VA), CAROLYN PRINCE, and EDUARDO SALAS (U.S. Navy, Naval Training Systems Center, Orlando, FL) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1 1991 6 p refs

A review is presented of research conducted by the Naval Training Systems Center (NTSC) on training strategies designed to enhance coordination and management in the cockpit that can be employed to provide skill practice and feedback to aircrews. This work has led NTSC to develop an Aircrew Coordination Training program that specifically provides crew coordination training that is skill-based, behavioral, mission specific, and capable of integration into existing training programs. NTSC's skill-based training approach is shown to be behavioral, designed to change performances, rather than attitudes or knowledge of trainees. R.E.P.

A92-44944
DEVELOPMENT OF AIRCREW COORDINATION EXERCISES TO FACILITATE TRAINING TRANSFER
DAVID P. BAKER (U.S. Navy, Naval Training Systems Center, Orlando, FL), MITCH BAUMAN (U.S. Marine Corps, Washington, DC), and MARY D. ZALESNY (Kent State University, OH) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1 1991 6 p refs

This paper describes and reports the trainee reactions to two new exercises that have been pilot tested in an Aircrew Coordination Training (ACT) program. The exercises were developed to allow for the active practice of aircrew coordination skills. Both quantitative and qualitative reactions to the exercises were collected. These data indicated positive reactions by the trainees. In addition a review of the qualitative responses suggested that trainees who participated in these exercises could cite specific ways in which they planned to use this information during subsequent missions as opposed to pilots who had not participated in these exercises during training. Author

A92-44946* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
LESSONS FROM CROSS-FLEET/CROSS-AIRLINE OBSERVATIONS - EVALUATING THE IMPACT OF CRM/ LOFT TRAINING
ROY E. BUTLER (NASA/University of Texas Crew Performance Project, Austin) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1 1991 6 p refs (Contract NCC2-286)

A review is presented of the crew resource management/line oriented flight training (CRM/LOFT) program to help determine the level of standardization across fleets and airlines in the critical area of evaluating crew behavior and performance. One of the goals of the project is to verify that check airmen and LOFT instructors within organizations are evaluating CRM issues consistently and that differences observed between fleets are not a function of idiosyncracies on the part of observers. Attention is given to the research tools for crew evaluation. R.E.P.

A92-44952* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
CREW MEMBER AND INSTRUCTOR EVALUATIONS OF LINE ORIENTED FLIGHT TRAINING
JOHN WILHELM (NASA/University of Texas Crew Performance Project, Austin) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1 1991 6 p refs (Contract NCC2-286)

Results obtained from the NASA/UT/LOFT survey of 8300 crew members from four airlines is presented. As simulator training is very expensive and excellence in training is the objective, some effort is justified in evaluating LOFT and in determining what it is about the best scenarios that creates positive effects. Attention is given to the effects of different scenarios, self reports of crew resource management behaviors, organization, fleet and crew position differences. R.E.P.

A92-44956
EXOGENOUS AND ENDOGENOUS DETERMINANTS OF COCKPIT MANAGEMENT ATTITUDES
HANS-JUERGEN HOERMANN and PETER MASCHKE (DLR, Institut fuer Flugmedizin, Hamburg, Federal Republic of Germany) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1 1991 7 p refs

During a selection campaign of cockpit crews for a charter airline 768 licensed airline pilots were examined with a temperament-structure-scales (TSS) multidimensional personality questionnaire and the cockpit management attitudes questionnaire. The TSS-scales and prior flight experience data were compared as determinants of differing cockpit management attitudes. Implications for the predictive power and construct validity of the TSS and the CMAQ are discussed. R.E.P.

A92-44959
A NEW GENERATION OF CREW RESOURCE MANAGEMENT TRAINING
NEIL A. JOHNSON, DAVID H. SHROYER, and JAMES B. GREWE (Hernandez Engineering, Inc., Denver, CO) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1 1991 6 p refs

The nature of the evolution and the present capability of crew resource management programs are discussed. This paper focuses on the training strategy that was adopted in the late seventies as a reaction to incidents and accidents caused by human factors and to determine how the training strategy has changed as a result of lessons learned. It is indicated that most contemporary programs continue to follow the training strategy of 1979, while demonstrating some positive evolution from academic-oriented training to activity-oriented training. R.E.P.

A92-44962
PERSONALITY DIFFERENCES AMONG SUPERVISORY SELECTION PROGRAM CANDIDATES
DANA BROACH (FAA, Civil Aeromedical Institute, Oklahoma City, OK) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1 1991 4 p refs

This study examines the supposition that persons who strive for achievement, with the accompanying cost in irritability and impatience characterizing the Type A behavioral syndrome seen among controllers, would more likely succeed in completing multiple hurdles in a supervisory selection process. Logistic regression is employed to test this hypothesis. The analyses demonstrated that achievement striving and impatience/ irritability did not provide useful information about characteristics predicting completion of multiple hurdles in the selection process. R.E.P.

A92-44963
ATCS FIELD TRAINING PERFORMANCE AND SUCCESS IN A SUPERVISORY SELECTION PROGRAM
CAROL A. MANNING (FAA, Civil Aeromedical Institute, Oklahoma City, OK) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1 1991 6 p refs

A discussion of the types of air traffic control facilities is presented and the various training programs provided by each facility type are described. The question of whether the available measures of technical performance that were found previously to be predicted by selection test scores are in turn predictive of success in the supervisory identification and development program is examined. It is shown that for air traffic controllers in general, the mean instructor rating assigned during on-the-job technical training is predictive of whether the controller passes the peer/supervisory assessment and continues in the supervisory selection and development process. R.E.P.

A92-44964
CANDIDATE PERFORMANCE IN A SUPERVISORY SELECTION PROGRAM AND SUBSEQUENT SELECTION DECISIONS
JENNIFER G. MYERS (FAA, Civil Aeromedical Institute, Oklahoma City, OK) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1 1991 5 p refs

It is noted that the FAA previously implemented the Air Traffic Supervisory Identification and Development Program (SIDP) to change the emphasis on technical performance in promotability decisions to include other skills, such as communication and decision-making, that reflect supervisory potential. This report examines whether measures of technical performance distinguish between successful versus unsuccessful candidates at different phases of the SIDP while also examining specific measures of SIDP performance. The results of the analysis of the referral variable identified important differences between the referred and not referred groups on the peer-supervisory assessment performance and dimensions ratings. R.E.P.

A92-44965
PERFORMANCE IN THE ATC SCREEN PROGRAM AND SUPERVISORY SELECTION PROGRAM OUTCOME
PAMELA S. DELLA ROCCO (FAA, Civil Aeromedical Institute, Oklahoma City, OK) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1 6 p

A study is presented to examine the relationship between performance in the FAA Academy screening programs and the supervisory selection program ratings of the supervisory identification and development program (SIDP) applicants. The purpose of this study was to investigate the hypothesis that ATC Specialist applicants to the SIDP program who were successful in the first stage of selection, had shown better performance in the Academy programs. Results of the analyses

demonstrated that there were small but statistically significant correlations between all of the Academy measures and the peer/supervisory assessment technical rating, except for the controller phase test, for the en route option. R.E.P.

A92-44966
COGNITIVE INDICATORS OF ATCS TECHNICAL ABILITY AND PERFORMANCE IN A SUPERVISORY SELECTION PROGRAM
DAVID J. SCHROEDER (FAA, Civil Aeromedical Institute, Oklahoma City, OK) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1 1991 5p refs

A study was developed to determine the relationship between entry level information of an applicant's cognitive capabilities (aptitudes) to function as an ATC Specialist (ATCS), as measured by the OPM selection battery, and subsequent selection as a potential supervisor through the SIDP. Specifically, the interest is in determining if scores on the initial selection tests predict technical performance ratings received by the SIDP applicants. Given the current measures of aptitudes for the ATCS profession there was little support shown for any relationship between these aptitudes and either overall ratings during the skill based interview or selection as a supervisor. R.E.P.

A92-44973
THE HUMAN ELEMENT IN AIR TRAFFIC CONTROL (ATC)
EDMUND SPRING (MiTech, Inc., Washington, DC) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1 1991 5 p

This report focuses on the decision of where to draw the line on the human-computer interface that will likely become critical to the continued safe and efficient management of the air traffic control system. Automation of the ATC system is gradually shifting this work from one of intense personal involvement and individual performance to one of monitoring the performance of machines. The solution to this human-machine interface problem will necessitate close cooperation between the technologists and the psychologists, but it is noted that the potential payoffs in system performance, capacity, and safety gains should be extensive. R.E.P.

A92-44974
INFORMATION TRANSFER LIMITATIONS IN ATC
RICHARD J. ADAMS (Advanced Aviation Concepts, Inc., Jupiter, FL) and PETER V. HWOSCHINSKY (FAA, Washington, DC) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1 1991 6 p refs

This paper analyzes the historical role of air traffic controller information transfer, the limitations which lead to operational errors, slips, incidents and accidents, and the need for specialized training to combat and overcome these limits. Human attributes which contribute to information transfer deficiencies are discussed. The impact of distractions, forgetting, failure to monitor, expectancy and complacency on the controller's job performance are illustrated by using operational error data and examples. Author

A92-44976
REAL-TIME CONTROL TOWER SIMULATION FOR EVALUATION OF AIRPORT SURFACE TRAFFIC AUTOMATION
STEVEN R. BUSSOLARI (MIT, Lexington, MA) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 1 1991 6 p refs

High fidelity, real-time aircraft simulation has been a valuable tool for the human factors evaluation of flight deck automation, but no equivalent simulation has been available for the Air Traffic Control Tower (ATCT) environment. The capacity, flexibility, and data collection requirements placed on a research simulation preclude the use of existing tower training systems. Using a network of computer workstations, an ATCT real-time simulation has been developed that is capable of reproducing the traffic environment found at major airports. The simulation will be used for preliminary evaluation of the impact of automation upon tower controller workload and situational awareness. Author

A92-45080
GETTING TEST ITEMS TO MEASURE KNOWLEDGE AT THE LEVEL OF COMPLEXITY WHICH LICENSING AUTHORITIES DESIRE - ANOTHER DIMENSION TO TEST VALIDITY
GRAHAM J. F. HUNT (Massey University, Palmerston North, New Zealand) IN: International Symposium on Aviation Psychology, 6th, Columbus, OH, Apr. 29-May 2, 1991, Proceedings. Vol. 2 1991 9p refs

Initial findings are presented from a study that may be fundamentally relevant to training/licensing examinations; a very significant mismatch is noted between the intent of competency specifications and their reality. A methodology is presented for the reduction of this discrepancy through explication of desirable attributes for each content- and process-level intercept. It is recommended that more emphasis be placed on the development of test construction technologies which facilitate a 'content-process construct' of validity, which may be as important to overall test validity as the conventional 'criterion-referenced' validity. O.C.

A92-45379
A FRAMEWORK FOR OPTIMIZING TOTAL TRAINING SYSTEMS - APPLICATION TO MAINTENANCE TRAINING AND TEAM TRAINING SYSTEMS
ROBERT F. BACHERT and TENNY A. LINDHOLM (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH) IN: International Pacific Air and Space Technology Conference and Aircraft Symposium, 29th, Gifu, Japan, Oct. 7-11, 1991, Proceedings 1991 10 p refs
(SAE PAPER 911972) Copyright

The USAF has been applying systems approaches to the development of methods for the definition of training systems requirements and their implementation. The systems methodology further supports the integration of training efforts with other aspects of USAF operations and to establish frameworks within which operational efficiencies can be determined. O.C.

A92-45452
SOCIO-CULTURAL ISSUES DURING LONG DURATION SPACE MISSIONS
NICK KANAS (California, University; USVA, Medical Center, San Francisco) IN: International Pacific Air and Space Technology Conference and Aircraft Symposium, 29th, Gifu, Japan, Oct. 7-11, 1991, Proceedings 1991 6 p refs
(SAE PAPER 912075) Copyright

Sociocultural issues that can affect the work of space crews during long missions are briefly discussed. The most important of these issues are language differences between crew members, cultural and racial biases, gender stereotyping, and differences in career motivation. Measures that can be taken to deal with these issues are considered. C.D.

A92-48534
THE IMPACT OF MANPOWER, PERSONNEL, AND TRAINING (MPT) ON LIFE CYCLE COST
PHILBERT A. COLE, JR. (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH) IN: NAECON 91; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1991. Vol. 2 1991 7 p refs

The author outlines all of the different elements of MPT costs that are considered during the O&S (operating and support) portion of an LCC (life cycle cost) estimate. The basic structure for the estimation of manpower, personnel, and training costs is presented. It is noted that, since the field of O&S cost analysis is relatively new, the structure and methodology for the determination of MPT costs vary. There has been a significant amount of literature which has tried to improve and standardize this area of cost analysis. Much more effort must be devoted to this area since MPT is a significant portion of O&S costs. I.E.

THE EXPERIENCE OF THE GAGARIN COSMONAUTS TRAINING CENTER IN THE FIELD OF INTERNATIONAL COOPERATION

P. I. KLIMUK (Cosmonauts Training Centre, Zvezdny Gorodok, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 5 p. Aug. 1992 5 p
(IAF PAPER 92-0286) Copyright

An overview is presented of the activities conducted at the Gagarin Cosmonauts Training Center focusing on the programs of international cooperation, such as the Apollo/Soyuz mission. During a period of several years, various space missions have been performed in accordance with bilateral agreements reached with different countries, e.g., England, France, Austria, and Germany. Consideration is given to some aspects of cosmonaut training and the training devices employed in this training. R.E.P.

A92-55724

INTERNATIONAL CREW SELECTION AND TRAINING FOR LONG-TERM MISSIONS

A. ALEKSANDROV (NPO Energiia, Moscow, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 5 p. Aug. 1992 5 p
(IAF PAPER 92-0294) Copyright

The selection and training of 'cosmonaut researchers' for long-term space station missions is discussed, with special attention given to the training and selection of members of international crews. It is suggested that all cosmonaut researchers should know the theory of all facilities to be used during space flight and be trained in using the facilities on the transportation vehicle and the orbital station and in performing scientific experiments; they should also undergo training in low-pressure chamber and training for the activities after splashdown. The paper lists particular systems of which a foreign cosmonaut researcher for a space station mission should have the knowledge and skills to operate; the fields of education from which these crew members might be selected; and the medical tests that should be passed by prospective crew members. At present, two candidates have started training at the Yu. A. Gagarin Cosmonauts Training Center. I.S.

A92-56951

UNDERSTANDING THE RELATIONS BETWEEN SELECTION FACTORS AND PILOT TRAINING PERFORMANCE - DOES THE CRITERION MAKE A DIFFERENCE?

THOMAS R. CARRETTA (USAF, Armstrong Laboratory, Brooks AFB, TX) *International Journal of Aviation Psychology* (ISSN 1050-8414), vol. 2, no. 2, 1992, p. 95-105. 1992 11 p refs
Copyright

UPT (undergraduate pilot training) rankings generated from a training evaluation algorithm have been shown to be closely related to advanced training recommendations for fighter vs. nonfighter aircraft. This suggests that the ranking algorithm is a reasonable indicator of pilot candidate quality because fighter aircraft assignments are considered more prestigious than nonfighter assignments. It is noted that when the ranking algorithm was modified to include UPT eliminees, however, it showed little utility in adding to the understanding of the relation between preselection personnel test scores and training performance. For pilot candidate selection the training criterion used to estimate the regression weights for the selection equation was found to have little impact on the ranking of the applicants once the predictors were held constant. L.M.

A93-10334

AN ASSESSMENT OF TURKISH AIR FORCE PILOTS' ANXIETY AND DEPRESSION LEVELS

MUZAFFER CETINGUC (Turkish Air Force Aeromedical Centre, Eskisehir, Turkey) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562) vol. 63, no. 10 Oct. 1992 p. 31 905-907. refs
Copyright

A method was developed for assessing stress levels in individuals, using the anxiety and depression scores in 345 active duty Turkish Air Force pilots and 70 nonflying Air Force officers (used as control group) subjected to Spielberger's State Trait Personality Inventory Trait and Zung's Depression Scale. It was found that the pilots had lower anxiety and depression scores than the nonfliers; the results are believed to be related to higher motivation and job satisfaction as well as to higher ego of fliers. I.S.

A93-13411

AIRLINE TRAINING FOR ADVANCED TECHNOLOGY COCKPITS

JEREMY BUTLER (British Airways, PLC, London, United Kingdom) *In* Human factors on advanced flight decks; Proceedings of the Conference, London, United Kingdom, Mar. 14, 1991 London Royal Aeronautical Society 1991 p. 5.1-5.7.
Copyright

One of the most important aspects of aircrew training in the mastery of advanced technology cockpits remains the clear establishment of the fundamentals of aircraft operation. On this foundation, training must proceed to give attention to the human factors of teamwork and coordination, in light of Line-Oriented Flight Training (LOFT) principles. In LOFT, the crew are asked to resolve problems and achieve the desired outcome within a realistic, hardware/software-defined in-flight environment. O.C.

A93-14376

AIRCREW INTEGRATED MANAGEMENT

EDDY L. RACCA (Aeroformation, Blagnac, France) *In* ICAS, Congress, 18th, Beijing, China, Sept. 20-25, 1992, Proceedings. Vol. 2 Washington American Institute of Aeronautics and Astronautics, Inc. 1992 p. 1819-1825.
Copyright

A review of the human factors module recently introduced for application in flight crew transition courses is presented. Attention is given to an aircrew integrated management course focusing on the integration of the human factors elements of in-flight management by flight crews. Consideration is given to such specific areas of coordination as safety factors, efficiency, schedule, passenger comfort, regulations, and operating specifications. R.E.P.

A93-18353

SOME RESTRUCTURING TRENDS IN THE TRAINING OF AVIATION SPECIALISTS [O NEKOTORYKH NAPRAVLENIIAKH PERESTROIKI V PODGOTOVKE AVIATSIONNYKH SPETSIALISTOV]

N. I. VLADIMIROV and V. Z. SHESTAKOV *In* Improvement of aircraft maintenance methods Riga Rizhskii Institut Inzhenerov Grazhdanskoi Aviatsii 1991 p. 3-8. In Russian. refs
Copyright

Some deficiencies in the current organization of the training of aviation specialists are identified, and improvements to the training process are proposed which allow for ICAO documents and market conditions. In particular, attention is given to the general structure of educational institutions involved in the training of aviation specialists, development of new unified requirements for the qualification and certification of flight and ground personnel, and development of new curricula for the training of aviation specialists. V.L.

A93-27133

FUTURE AVAILABILITY OF AIRCRAFT MAINTENANCE PERSONNEL

WILLIAM T. SHEPHERD (FAA, Office of Aviation Medicine, Washington) and JAMES F. PARKER, JR. (Biotechnology, Inc., Falls Church, VA) *In* Human Factors Society, Annual Meeting, 35th, San Francisco, CA, Sept. 2-6, 1991, Proceedings. Vol. 1 Santa Monica, CA Human Factors Society 1991 p. 33-36. refs
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Trends in the availability of aircraft maintenance personnel projected into the next century are examined. It is pointed out that the number of

people available in this decade and in future years for the aircraft maintenance jobs is steadily diminishing. The downtrend may well accelerate as industry increasingly recognizes the skills available in the aircraft maintenance personnel workforce. This paper investigates various demographic and industry operational forecasts and discusses their impact on aircraft maintenance and inspection. I.S.

A93-27149
TAILORING THE PILOT'S ASSOCIATE TO MATCH PILOT PREFERENCES
CAROL L. A. JUDGE (USAF, Cockpit Integration Directorate, Wright-Patterson AFB, OH), RICHARD A. SMITH, and CARL A. BEAUDET (GreyStone, Defense Systems Div., San Diego, CA) *In* Human Factors Society, Annual Meeting, 35th, San Francisco, CA, Sept. 2-6, 1991, Proceedings. Vol. 1 Santa Monica, CA Human Factors Society 1991 p. 121-124. refs
Copyright

The research described in this paper documents the creation, development, implementation, and initial evaluation of a prototype intelligent system tailoring tool called the Mission Support Tool (MST). The MST is a ground-based, pre-mission interface between the fighter pilot, a larger global mission planning system and the electronic crew-member or Pilot's Associate (PA). The primary function of the MST is to furnish pilots with a means for tailoring the PA to their individual preferences for air-to-air combat missions. The MST helps the PA operate in a predictable manner by allowing the pilot to preselect, weigh, and tailor plans to be proposed to the pilot by the PA prior to the mission, which domain experts agree will pay high dividends in pilot acceptance, trust, and human-electronic crew-member teamwork. Author

A93-28710
LIVING AND WORKING IN SPACE - EVOLUTION OF NURSING IN A NEW ENVIRONMENT
JANET M. BURGE (Alabama Univ., Huntsville) *Holistic Nursing Practice* (ISSN 0887-9311) vol. 6, no. 4 July 1992 p. 67-74. refs
Copyright

A93-35220
ADAPTATION OF YOUNG PILOTS TO NEW CONDITIONS OF THEIR WORK (SOCIAL-PSYCHOLOGICAL ASPECTS) [ADAPTATSIIA MOLODYKH LETCHIKOV K NOVYM USLOVIIAM PROFESSIONAL'NOI DEIATEL'NOSTI / SOTSIAL'NO-PSIKHOLOGICHESKIE ASPEKTY/]
N. G. KORSHEVER and I. P. BONDAREV *Aviakosmicheskaia i Ekologicheskaia Meditsina* (ISSN 0233-528X) vol. 26, no. 2 Mar.-Apr. 1992 p. 22-25. In Russian. refs
Copyright

The adaptation of 146 young pilots to flying conditions was investigated. The pilots filled in a questionnaire containing questions on motivation, performance of flight duties, a self-assessment of professional achievements, and one's attitude toward other members of one's flight unit. The experimental findings can be used to improve the psychological relationships of young pilots during their adaptation to new work conditions. AIAA

A93-35227
AGE AND LENGTH OF SERVICE OF FLIGHT PERSONNEL IN THE CASE OF CHRONIC DISEASES [VOZRAST I DLITEL'NOST' LETNOI RABOTY PRI KHRONICHESKIKH ZABOLEVANIIAKH]
V. V. VLASOV *Aviakosmicheskaia i Ekologicheskaia Meditsina* (ISSN 0233-528X) vol. 26, no. 2 Mar.-Apr. 1992 p. 55-57. In Russian. refs
Copyright

Cases of chronic diseases have been investigated for 1433 pilots and navigators. The length of service of the personnel after the occurrence of the disease was found to follow a bimodal distribution. The first peak coincides with the time of the initially diagnosed illness, while the second, delayed peak in older individuals approximates the first one. Thus, for persons who had a chronic disease initially diagnosed when they were 20 years old, this diagnosis was confirmed in 18 to 20 years, while in persons who were 35 when the disease was initially diagnosed, the diagnosis was confirmed in 2 to 4 years. AIAA

A93-35249
CONTROL OF THE DEVELOPMENT OF OCCUPATIONALLY IMPORTANT QUALITIES WITH THE AIM OF IMPROVING FLIGHT-PERSONNEL TRAINING [UPRAVLENIE RAZVITIEM PROFESSIONAL'NO VAZHNYKH KACHESTV S TSEL'IU SOVERSHENSTVOVANIIA PODGOTOVKI LETNOGO SOSTAVA]
I. V. AGAPOV and V. A. PONOMARENKO *Aviakosmicheskaia i Ekologicheskaia Meditsina* (ISSN 0233-528X) vol. 26, no. 4 July-Aug. 1992 p. 14-19. In Russian. refs
Copyright

Issues concerning the development of occupationally important qualities (OIQs) of pilots using a specially devised set of psychological, pedagogical, and psychophysiological methods are examined. Some mechanisms for the creation of an integrated system of OIQs during pilot training are discussed. The features characterizing OIQ effects on the specific aspects and parameters of pilot activity are examined. AIAA

A93-36216* National Aeronautics and Space Administration, Washington, DC.
TESTING - SMART STRATEGY FOR SAFETY AND MISSION QUALITY
GEORGE A. RODNEY (NASA, Office of Safety and Mission Quality, Washington) *In* Aerospace Testing Seminar, 13th, Manhattan Beach, CA, Oct. 8-10, 1991, Proceedings Mount Prospect, IL Institute of Environmental Sciences 1991 p. 251-254.
Copyright

The paper is concerned with the need for a comprehensive test plan for the Space Station Freedom (SST) that would fully verify specification compliance and be based on an error budget. In particular, attention is given to some lessons learned from other NASA programs and the principal challenges for SSF testing, including phase C/D/E agreements, testing parameters, phase testing, and the human element. The importance of close teamwork between the NASA/Contractor systems engineers and assurance engineers is emphasized. AIAA

A93-39572
STRUCTURED INTERVIEWS FOR PILOT SELECTION - NO INCREMENTAL VALIDITY
LAURIE C. WALTERS, MARK R. MILLER, and MALCOLM J. REE (USAF, Armstrong Lab., Brooks AFB, TX) *International Journal of Aviation Psychology* (ISSN 1050-8414) vol. 3, no. 1 1993 p. 25-38. refs
Copyright

An investigation of a structured interview for the selection of U.S. Air Force pilots was conducted on a sample of 223 pilot trainees. The interview yielded seven ratings of subject attributes, including educational background, self-confidence and leadership, flying motivation, success in training, and success in flying various classes of aircraft. Two other types of predictors were also available - paper-and-pencil aptitude tests and computer-driven cognitive tests of information processing and personality. Using linear models, the validity and incremental validity of the interview as compared to the other classes of tests were evaluated. The interview was found to be valid but not incrementally so. Last, a partial test of a single aspect of the Dipboye (1989) process model of interviews was conducted. Author

A93-46467* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
TRADITIONAL AND NONTRADITIONAL INTERNSHIPS IN

GOVERNMENT
FREDA F. STOHRER (Old Dominion Univ., Norfolk, VA) and THOMAS E. PINELLI (NASA, Langley Research Center, Hampton, VA) The Technical Writing Teacher vol. 7, no. 3 Spring 1980 p. 133-138.
Copyright

Traditional and nontraditional methods for training technical writers-editors within the federal government are discussed. It is concluded that cooperative education that combines work experience with classroom instruction provides an excellent method for locating and training competent and reliable young professionals. AIAA

A93-54892* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
MODELING PERSONNEL TURNOVER IN THE PARAMETRIC ORGANIZATION
EDWIN B. DEAN (NASA, Langley Research Center, Hampton, VA) May 1991 11 p. International Society of Parametric Analysis, Annual Conference, 13th, New Orleans, LA, May 21-24, 1991, Paper refs
Copyright

A model is developed for simulating the dynamics of a newly formed organization, credible during all phases of organizational development. The model development process is broken down into the activities of determining the tasks required for parametric cost analysis (PCA), determining the skills required for each PCA task, determining the skills available in the applicant marketplace, determining the structure of the model, implementing the model, and testing it. The model, parameterized by the likelihood of job function transition, has demonstrated by the capability to represent the transition of personnel across functional boundaries within a parametric organization using a linear dynamical system, and the ability to predict required staffing profiles to meet functional needs at the desired time. The model can be extended by revisions of the state and transition structure to provide refinements in functional definition for the parametric and extended organization. AIAA

A93-55161
FLIGHT LEADS AND CRISIS DECISION-MAKING
EARL H. MCKINNEY, JR. (U.S. Air Force Academy, Colorado Springs, CO) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562) vol. 64, no. 5 May 1993 p. 359-362. refs
Copyright

Flight leads of fighter aircraft are typically considered to be superior airmen. However, little research has explicitly studied the decision-making ability of flight leads. In this study, the crisis decision-making of pilots in the role of flight lead is examined. Data from 156 fighter aircraft mechanical breakdown mishaps are used to compare the decision-making of flight leads to that of wingmen. The results suggest decision-making performance of flight leads is significantly inferior to wingmen. Further, we demonstrate this effect of flight leadership only affects experienced pilots, not inexperienced pilots. Explanations for this counter-intuitive finding include stress, training practices, and communication limitations.

N92-11630# Air Force Human Resources Lab., Brooks AFB, TX. Manpower and Personnel Research Div.
THE DEVELOPMENT OF BEHAVIORALLY ANCHORED RATING SCALES (BARS) FOR EVALUATING USAF PILOT TRAINING PERFORMANCE Interim Technical Paper, Oct. 1989 - Mar. 1991
THOMAS R. CARRETTA and LAURIE C. WALTERS Jul. 1991 32 p
(AD-A239969; AL-TP-1991-0022) Avail: CASI HC A03/MF A01

The purpose of this study was to develop Behaviorally Anchored Rating Scales (BARS) which could be used by instructor pilots (IP's) to evaluate their students on eight personality characteristics considered important to flying fighter-type aircraft. IP's generated behavioral examples which reflected good, average, and poor job behaviors for each personality dimension. These job behaviors were randomized and presented to another group of IP's who tried to match each behavior with the personality characteristic it best represented. The IP's demonstrated sufficient agreement to develop BARS for four of the eight personality characteristics (achievement motivation, assertiveness, cooperativeness, and stress tolerance). The behavioral examples generated for the retained personality characteristics were evaluated for their use as scale anchor points. Several uses of BARS in the flying training environment were discussed. DTIC

N92-11635# Dayton Univ., OH.
LESSONS LEARNED IN THE DEVELOPMENT OF THE C-130 AIRCREW TRAINING SYSTEM: A SUMMARY OF AIR FORCE ON-SITE EXPERIENCE Final Report, Jan. 1990 - Mar. 1991
RON DUKES, MARTY R. ROCKWAY, and ROBERT T. NULLMEYER Aug. 1991 47 p
(Contract F33615-90-C-0005)
(AD-A240554; AL-TP-1991-0032) Avail: CASI HC A03/MF A01

The current trend within the Air Force is to design aircrew training programs as total integrated systems. This trend has been coupled with a concurrent shift to contracting out the design, delivery and support of aircrew training. These changes have introduced a new set of technical and management issues which impact the design, acquisition, and operation of aircrew training programs. The Aircrew Training Research Division of the Armstrong Laboratory is conducting research and development (R and D) to address several of these issues in order to provide principles, procedures, and user-oriented guidelines to support Air Force acquisition and operational training agencies. This paper is one of a series concerned with the identification of lessons learned by contractor and government personnel directly involved in the acquisition and utilization of contracted aircrew training systems (ATSs). It documents some of the major experiences and lessons learned by Lt Col Ron Dukes of the Military Airlift Command during his long involvement with the C-130 ATS program. The report provides a general description of the C-130 ATS program and summaries Lt Col Dukes' experiences and lessons learned in the areas of courseware, training management, test and evaluation, quality assurance, and configuration management. DTIC

N92-13548# Centre Medical de Psychologie Clinique de l'Armee de l'Air, Paris (France).
THE PILOT FLIGHT SURGEON BOND
J. R. GALLE-TESSONNEAU *In* AGARD, Neurological, Psychiatric and Psychological Aspects of Aerospace Medicine 5 p Sep. 1991
Copyright
Avail: CASI HC A01/MF A01

To become a physician it is necessary to learn medicine and to know diseases, but it is also necessary to have some notions about medicine psychology. To become a flight surgeon, it is necessary to know medicine and aeronautic medicine, but it is also necessary to have some notions about pilot psychology and pilot-flight surgeon relationships. Pilots are not ordinary patients; pilots present some particularities about health, diseases, medicine, and physicians. In the psychological cause, an initiation in theoretical notions and practical attitudes likely to clarify and make understandable phenomena which would otherwise risk appearing unintelligible is presented for the benefit of flight surgeons. As an introduction, three specific and important aspects in the psychology of a pilot are presented: his body, his motivation, and his environment. Author

N92-14067# Dayton Univ., OH.
TRAINING EVALUATION OF THE F-15 ADVANCED AIR COMBAT SIMULATION Final Technical Paper, Dec. 1988 - Mar. 1990
MICHAEL R. HOUCK, GARY S. THOMAS, and HERBERT H. BELL Sep. 1991 79 p
(Contract F33615-90-C-0005)
(AD-A241675; AL-TP-1991-0047) Avail: CASI HC A05/MF A01

The objective of this investigation was to evaluate the utility of existing multiship simulations for training air combat tasks. Our previous evaluation, based on a limited sample of F-15 pilots, found that such simulator-based training was perceived to supplement existing F-15

continuation training. The present evaluation replicated the prior investigation with a broader subject sample of F-15 pilots. Mission-ready F-15 pilots and air weapons controllers participated in four days of training in simulated air combat missions. The simulation was designed to train two-ship F-15 tactics in an unrestricted combat environment that included multiple air and ground threats, electronic warfare, and real-time kill removal. Participants were surveyed before training to identify combat tasks for which they desired additional training. Following training, the participants rated the value of their continuation training and the simulation for practicing these air combat tasks. The results confirmed the previous evaluation in that pilots identified virtually the same cluster of combat tasks for which they felt the simulation provided desired and valuable training to supplement their continuation training. In summary, both pilots and air weapons controllers perceived that such simulator-based training could enhance their combat proficiency. DTIC

N92-15546# Georgia Inst. of Tech., Atlanta, GA. Center for Human-Machine Systems Research.

INTELLIGENT TUTORING FOR DIAGNOSTIC PROBLEM SOLVING IN COMPLEX DYNAMIC SYSTEMS

VIJAY VASANDANI Sep. 1991 391 p

(Contract N00014-87-K-0482)

(AD-A242619; CHMSR-91-4) Avail: CASI HC A17/MF A04

Maintenance training for diagnostic problem solving in complex dynamic systems is carried out either on the job or on simulators. When simulators are used for training, their effectiveness can be improved by integrating intelligent tutoring systems (ITS) into the training programs. Research results from ITSs developed for simpler task domains are generally not very useful in complex engineered domains due to lack of appropriate knowledge representation techniques. The focus of our research is the development of a methodology for decomposing, organizing, and representing domain knowledge of complex dynamic systems for building functional computer-based intelligent tutors. Using our knowledge representation methodology, we implemented an ITS on an Apple Macintosh II computer for the marine power plant domain. The ITS is comprised of a simulated power plant, the tutor, and mouse-based direct manipulation graphical interfaces. The ITS was experimentally evaluated using Naval ROTC cadets as subjects. Performance of the subjects was analyzed using measures such as percentage of premature and correct diagnosis and percentage of relevant and irrelevant diagnostic tests. Results show that a simulator alone is inadequate, whereas a simulator in conjunction with an ITS can help develop efficient troubleshooting skills. DTIC

N92-15906# National Science Foundation, Washington, DC. Div. of Science Resources Studies.

WOMEN AND MINORITIES IN SCIENCE AND ENGINEERING

Jan. 1990 174 p

(NSF-90-301) Avail: CASI HC A08/MF A02

This report, the fifth in a biennial series mandated by the Science and Technology Equal Opportunities Act of 1980, presents information on the participation of women, racial/ethnic minorities, and persons with physical disabilities in science and engineering (S&E). In keeping with its purpose as an information resource, this report makes no recommendations on programs or policies. The report does present information that may be used to address issues concerned with the full utilization of the Nation's human resources in science and engineering. Several major themes emerge from the data and analyses in this report: (1) Despite rapid growth between 1978 and 1988, women, blacks, and Hispanics continue to be underrepresented in S&E employment based on their representation in the overall U.S. workforce. (2) Underrepresentation is more acute in engineering and some natural science fields than in the life or social sciences. (3) The general underrepresentation of women and minorities reflects a number of factors, including their relatively low participation in precollege science and mathematics courses and in undergraduate and graduate science and engineering education programs. (4) Women and minorities who complete their education in S&E fields and seek employment in the S&E workforce generally encounter higher unemployment rates and earn lower annual salaries that the majority. (5) The fundamental concern for underrepresented minorities is the quality of their educational experiences. Lower performance by these groups in mathematics and science emerges as early as the elementary school level. Specific findings presented in this report on women, racial minorities, Hispanics, and persons with physical disabilities are summarized. The report is designed to provide essential information to Congress, the Administration, and others concerned with both the overall strength of U.S. science and engineering and the provision of equal opportunities and equal treatment for women and minorities in this area. Author

N92-15907# National Science Foundation, Washington, DC. Directorate for Education and Human Resources.

MATCHING ACTIONS AND CHALLENGES

DALE EWEN and DAVID MERTES May 1991 23 p Presented at a NSF Workshop on Science, Engineering, and Mathematics Education in Two-Year Colleges, Washington, DC, 13-14 May 1991

(NSF-91-111) Avail: CASI HC A03/MF A01

Sixty instructional faculty and administrators from two-year colleges met with National Science Foundation (NSF) staff to discuss concerns, to develop strategies for addressing critical issues, and to state specific recommendations for improving the quality of science, mathematics, engineering, and technology education. The focus of this workshop was to reaffirm the important role that two-year colleges play in the education of the nation's undergraduates, especially since community, junior, and technical colleges often serve as institutions of choice for minority and other underrepresented student populations. In particular, they recommended: (1) the expansion of NSF's faculty enhancement program to include a comprehensive program designed for faculty who emphasize lower division collegiate education; (2) encouragement and support by NSF and other agencies for the development of curricula to meet the needs of increasingly diverse groups of students; and (3) concrete steps that all involved could take to make it possible for community college faculty to assume their leadership roles in these activities. Author

N92-18595# Aeronautical Systems Div., Wright-Patterson AFB, OH. Loads and Dynamics Branch.

APPROACH TO CREW TRAINING IN SUPPORT OF THE USAF AIRCRAFT STRUCTURAL INTEGRITY PROGRAM (ASIP)

ALFONSO G. APONTE *In* AGARD, Fatigue Management 7 p Dec. 1991 Copyright Avail: CASI HC A02/MF A03

Maintaining the safety and strength of an aircraft is dependent upon the capability of appropriate Air Force commands to perform maintenance and inspections throughout the service life of the aircraft. One of the maintenance actions involves the collection and reporting of operational usage data to support the loads/environment spectra survey (L/ESS) and Individual Aircraft Tracking (IAT) programs. The Air Force approach to training operational flight and ground crews about their responsibilities and the importance of this task which is an integral part of the Aircraft Structural Integrity Program (ASIP) is presented. Author

N92-18899# Mei Associates, Inc., Lexington, MA.

DESIGNING AN ADVANCED INSTRUCTIONAL DESIGN ADVISOR: TRANSACTION SHELL THEORY, VOLUME 6

Interim Report, Aug. 1989 - Feb. 1991

DAVID MERRILL and J. M. SPECTOR Dec. 1991 67 p

(Contract F33615-88-C-0003)

(AD-A244062; AL-TP-1991-0017-VOL-6) Avail: CASI HC A04/MF A01

The Advanced Instructional Design Advisor (AIDA) is an R&D project being conducted by the Armstrong Laboratory Human Resources Directorate and is aimed at producing automated instructional design guidance for developers of computer-based instructional materials. The process of producing effective computer-based instructional materials is complex and time-consuming. Few experts exist to insure the effectiveness of the process. As a consequence, the Air Force is committed to providing its courseware developers with up-to-date guidance appropriate for the creation of computer-based instruction. The assistance should be provided in an integrated automated setting. This paper addresses the nature of the automated setting in which the assistance is to be provided. DTIC

N92-19246# Mei Associates, Inc., Lexington, MA.
DESIGNING AN ADVANCED INSTRUCTIONAL DESIGN ADVISOR: CONCEPTUAL FRAMEWORKS, VOLUME 5 Interim Report, Aug. 1989 - Feb. 1991
ROBERT M. GAGNE, ROBERT D. TENNYSON, and DENNIS J. GETTMAN Dec. 1991 63 p
(Contract F33615-88-C-0003)
(AD-A244061; AL-TP-1991-0017-VOL-5) Avail: CASI HC A04/MF A01

The Advanced Instructional Design Advisor is an R and D project being conducted by the Armstrong Laboratory Human Resources Directorate and is aimed at producing automated instructional design guidance for developers of computer-based instructional materials. The process of producing effective computer-based instructional materials is complex and time-consuming. Few experts exist to insure the effectiveness of the process. As a consequence, the Air Force is committed to providing its courseware developers with up-to-date guidance appropriate for the creation of computer-based instruction. The assistance should be provided in an integrated automated setting. This paper addresses design specifications for an instructional design advisor. Instructional System Development (ISD), artificial intelligence, and expert systems are discussed. DTIC

N92-20995# Naval Postgraduate School, Monterey, CA.
PREPARING FOR THE UNEXPECTED, CONTRACTING IN CONTINGENCY SITUATIONS M.S. Thesis
SCOTT J. KOSTER Dec. 1991 121 p
(AD-A245064) Avail: CASI HC A06/MF A02

The purpose was to evaluate the quality of the preparation that contracting professionals receive prior to contingency contracting situations. This was accomplished by exploring the literature on this subject and then comparing the findings and recommendations found with recent experience of contracting professionals returning from Desert Shield and Desert Storm. Contingency contracting issues analyzed include the identification of critical demands, effectiveness of current preparation, effects of laws and regulations, and contingency contracting tools. As a result of this analysis, it can be concluded that current instruction and on-the-job training is sufficient to provide contracting professionals with the requisite competence for contingency contracting situations. There is a need to involve contracting professionals early in the contingency planning process. Current laws and regulations did not constrain procurement of supplies and services during Desert Shield/Storm. The use of contingency contracting tools are paramount to the success of the contracting function in a contingency contracting situation and need to be assembled well in advance. This study recommends the continued education and training of contracting professionals in its present form, raising the thresholds for SF 44's and small purchase procedures for contingency situations, and improvement of contingency contracting kits. DTIC

N92-21021# School of Aerospace Medicine, Brooks AFB, TX.
FIELD STUDY EVALUATION OF AN EXPERIMENTAL PHYSICAL FITNESS PROGRAM FOR USAF FIREFIGHTERS Final Report, Jun. 1985 - Sep. 1986
L. G. MYHRE, W. GRIMM, G. R. VAN KIRK, R. TATTERSFIELD, and E. T. SHERRILL May 1991 30 p
(AD-A244498; AFESC/ESL-TR-90-22) Avail: CASI HC A03/MF A01

Under emergency conditions, firefighting demands extraordinary levels of physical effort in performing tasks under some of the most life threatening conditions. Success in performing these tasks depends on the firefighters physical fitness, particularly his/her cardiovascular endurance. Studies have shown that firefighters, both in the civilian and military sectors, are generally less fit than their age-related sedentary American counterparts. This report describes a field study to evaluate the safety and effectiveness of an experimental physical conditioning program that could be prescribed on an individual basis. Special emphasis was placed on a conservative program for older, less fit firefighters who would be most susceptible to exercise-related injury. DTIC

N92-21403# National Academy of Sciences - National Research Council, Washington, DC.
DOCTORATE RECIPIENTS FROM UNITED STATES UNIVERSITIES Summary Report
DELORES H. THURGOOD and JOANNE M. WEINMAN 1992 106 p
(Contract NSF SRS-85-17008)
Avail: CASI HC A06/MF A02

A summary of the results of the 1889-1990 Survey of Earned Doctorates (SED), compiled from questionnaires distributed to graduates as they complete requirements for their doctoral degrees is presented. The first section shows a trend analysis of the number of doctorate recipients, which is broken down into seven sections; field of doctorate, gender, citizenship status, time-to-degree, status, postdoctoral location and plans, and employment sector in the U.S. labor force. The second section examines financial support of doctoral education through primary source of support and indebtedness. The third section specifically examines U.S. citizen minority doctorates under the same subsets as sections one and two. Finally, the appendixes contain a number of data tables, as well as a sample of the questionnaire used for the survey. H.A.

N92-27893# Royal Aerospace Establishment, Farnborough (England).
A TEAMWORK MODEL OF PILOT AIDING: PSYCHOLOGICAL PRINCIPLES FOR MISSION MANAGEMENT SYSTEMS DESIGN
R. M. TAYLOR and S. J. SELCON *In* AGARD, Air Vehicle Mission Control and Management 14 p Mar. 1992
Copyright Avail: CASI HC A03/MF A03

Advances in automation and control/display technology have enabled design effort to focus on how aircrew system interfaces can be created to help perform the mission and to help solve mission problems. Evidence of this development towards a concept of aiding the pilot, rather than replacing pilot functions, comes from recent systems proposed for both ground and airborne mission control and management. Interface design solutions for aircrew systems problems usually evolve pragmatically, based on considerations of convenience, availability, utility, familiarity and operator acceptance. Currently, there is no substantial theory of the pilot-aiding concept. In the absence of a theoretical basis, pilot-aiding interfaces for mission control and management will lack theoretical consistency and they will be without any formal, systematic procedures for establishing design criteria, goals and objectives. Some of the consequences of this will be sub-optimal utilization of system function, loss of situational awareness, a low level of pilot trust, and failure to reduce pilot workload. In order to address the requirements for a theory of the pilot-aiding concept, we propose a model based on the principles of teamwork, where the human and 'electronic' crew components work co-operatively towards achieving mission objectives. Characteristics of the model are incorporated into a prototype tool for auditing the quality of interface design solutions with respect to teamwork criteria. Teamwork audits are reported for several aircrew systems, including pilot aids for mission control and management, in order to test the validity of the model, and to establish its sensitivity and diagnostic power. Conclusions are drawn about interface design requirements affecting pilot-aiding and mission performance. Author

N92-30600# Office of Science and Technology, Washington, DC.
GRAND CHALLENGES 1993: HIGH PERFORMANCE COMPUTING AND COMMUNICATIONS. A REPORT BY THE COMMITTEE ON PHYSICAL, MATHEMATICAL, AND ENGINEERING SCIENCES TO SUPPLEMENT THE PRESIDENT'S FISCAL YEAR 1993 BUDGET
Jan. 1992 80 p
(PB92-160530) Avail: CASI HC A05/MF A01

The report describes the Presidential initiative in High Performance Computing and Communications. This initiative is well-coordinated, interagency research and development effort designed to sustain and extend U.S. leadership in all advanced areas of computing and networking. The

initiative, which represents over four years of planning, not only provides a farsighted vision for investment in technology but also recognizes the importance of human resources and applications that serve major national needs. NTIS

N92-33540# Air Force Occupational Measurement Center, Randolph AFB, TX.
F-16 AVIONIC SYSTEMS ATTACK CONTROL INSTRUMENT AND FLIGHT CONTROL COMMUNICATION, NAVIGATION, AND PENETRATION AIDS. TRAINING REQUIREMENTS ANALYSIS 452X2, VOLUME 1
WENDY J. SOTELLO, JOHN T. PENNER, III, and CYNTHIA K. SCHARF Mar. 1992 50 p
(AD-A252786) Avail: CASI HC A03/MF A01

The purpose of this training requirements analysis (TRA) is to assist in determining training requirements for F-16 Avionics Systems personnel in light of recent RIVET WORKFORCE (RWF) restructuring efforts. The information may be used to evaluate the adequacy, feasibility, and efficiency of the training provided within this rapidly changing specialty. Data for this TRA were gathered by means of field interviews with F-16 Avionics Systems personnel. The TRA task list was extracted from the March 1989 452X2 USAF Job Inventory (JI). A total of 21 subject- matter experts (SMEs) at 2 TAC bases and 1 ATC base were interviewed to gather task data and other training decision data. In addition, system overview information was gathered from HQ USAF, the TAC functional manager, and members of Lowry Technical Training Center (LTTC). The analysis of collected data resulted in both general and specific training recommendations. These recommendations are designed to create the best possible training environment, given realistic constraints in the areas of manpower and resources. DTIC

N92-34042# Department of Energy, Washington, DC.
GUIDE TO GOOD PRACTICES: EVALUATION INSTRUMENT EXAMPLES
Jul. 1992 64 p
(DE92-017688; DOE-STD-1006-92) Avail: CASI HC A04/MF A01

The purpose of the guide is to provide DOE contractor organizations with information that can be used to modify existing programs or to develop new programs. DOE contractors should not feel obligated to adopt all parts of this guide. Rather, they can use the information in this guide to develop programs that apply to their facility. This guide can be used as an aid in developing evaluation instruments. Examples of various methods and techniques have been included. These instruments are not intended to be used 'as is', but they provide guidance for training evaluation instrument development. The reference at the end of this guide offers additional information on the development and use of program evaluation instruments and discusses the analysis of evaluation results. DOE

N93-11445# Massachusetts General Hospital, Boston, MA. Labs. of Photomedicine.
CENTER OF EXCELLENCE IN LASER MEDICINE
J. A. PARRISH 1992 6 p
(Contract DE-FG02-91ER-61228)
(DE92-018760; DOE/ER-61228/3) Avail: CASI HC A02/MF A01

Achievements during the first six months of funding to prepare for a Center of Excellence in biomedical laser development include limited specific research projects within the Center's three broad interest areas, and program development to establish the Center and its activities. Progress in the three interest areas — new medical laser systems development, optical diagnostics, and photosensitization, is reported. Feasibility studies and prototype development were emphasized, to enhance establishing a substantial Center through future support. Specific projects are an optimized laser-catheter system for reversal of vasospasm; optical detection of major skin burn depth and cancers using fluorescent drugs, and photosensitization of vascular tissues. In addition, an interdepartmental Laser Center was established at MGH to enhance collaborations and institutional committment to the Center of Excellence. Competitive postdoctoral research fellowships, with provision for matching funds from other departments, have been anounced. DOE

N93-12061# District of Columbia Univ., Washington, DC.
A SUMMER PROGRAM IN MATHEMATICS AND COMPUTER SCIENCE FOR ACADEMICALLY ORIENTED STUDENTS, JUNE 24 - JULY 26, 1991, WASHINGTON, DC Final Report
BERNIS BARNES 26 Jul. 1991 148 p Sponsored by ONR
(AD-A249139) Avail: CASI HC A07/MF A02

The 1991 summer intervention program in mathematics and computer science for academic oriented students was one of our most successful. The five-week program provided intensive and rigorous study for thirty-six mainly ninth and tenth grade students from the D.C. area. As in the previous nine years of the program, addressing the problems of the under-representation of minorities, especially Blacks and Hispanics in engineering, natural science, and other mathematics-based fields, was given a high priority. During the summer, the students most of whom are from the under-represented groups were encouraged to strengthen their background in mathematics and to pursue careers in mathematics-based fields. They were also exposed to career opportunities in mathematics-based fields, and to how they should prepare themselves in high school to increase their career options by the time they reach college. The program faculty which has years of experience in teaching local minority students provided the encouragement and motivation, as well as a carrying and supportive environment. The purpose of this project is to implement an intensive pre-college intervention program for academically talented students, mainly ninth and tenth grade students from the District of Columbia area, that is designed to increase their representation in mathematics-based careers. By offering the program at this grade level, the students are able to take more rigorous math courses while in high school. DTIC

N93-12225# Iowa Univ., Iowa City, IA.
META-ANALYSIS OF INTEGRITY TESTS: A CRITICAL EXAMINATION OF VALIDITY GENERALIZATION AND MODERATOR VARIABLES Final Report, 28 Sep. 1991 - 30 Jun. 1992
D. S. ONES, C. VISWESVARN, and F. SCHMIDT Jun. 1992 99 p
(Contract N00014-91-J-4168)
(AD-A254681) Avail: CASI HC A05/MF A02

A comprehensive meta-analysis was conducted to investigate whether integrity test validities are generalizable and to estimate differences in validity due to potential moderating influences. The database included 665 validity coefficients across 576,464 data points. Results indicate that integrity test validities are positive and in many cases substantial for predicting both job performance and counterproductive behaviors on the job such as theft, disciplinary problems, and absenteeism. Validities were found to be generalizable. The estimated mean operational predictive validity of integrity tests for supervisory ratings of job performance is .41. For the criterion of counterproductive behaviors, results indicate that use of concurrent validation study designs may overestimate the predictive criterion-related validity applicable in selection situations. Our results based on external criterion measures (i.e., excluding self reports) and predictive validity studies using applicants indicate that integrity tests predict the broad criterion of organizationally disruptive behaviors better than they predict the narrower criterion of employee theft alone. Our results also indicated substantial evidence for the construct validity of integrity tests. Perhaps the most important conclusion of this research is that despite the influence of moderators, integrity test validities are positive across situations and settings. DTIC

N93-12252# Air Force Systems Command, Brooks AFB, TX.
INTRODUCTION TO TRAINING DECISIONS MODELING TECHNOLOGIES: THE TRAINING DECISIONS SYSTEM Final Report, Jan. 1990 - Apr. 1990
KERIC B. O. CHIN, THEODORE A. LAMB, WINSTON R. BENNETT, and DAVID S. VAUGHAN (McDonnell-Douglas Missile Systems Co., Saint Louis, MO.) Apr. 1992 27 p
(Contract AF PROJ. 1121)
(AD-A249862; AL-TP-1992-0014) Avail: CASI HC A03/MF A01

This paper is an introduction to the Training Decisions Modeling Technologies under development at the Armstrong Laboratory. These technologies are intended to support Air Force Training Managers by providing them with cost and resource information about the impact of their decisions on the AF training system. The Training Decisions System (TDS), which forms the baseline technologies for the research program, uses information about jobs performed by airmen, personnel assignment flows, course training content, and training resources to determine training capacities and the most cost-effective training options available. The TDS develops a model of a job specialty's Utilization and Training (U and T) pattern according to data collection results and simulates the flow of airmen through it. Based on this simulation, TDS tabulates the costs associated with training and evaluates the training capacity of the training system (i.e., the ability of the training system to provide training to a given number of airmen). DTIC

N93-12609# Anacapa Sciences, Inc., Fort Rucker, AL.
HUMAN FACTORS RESEARCH IN AIRCREW PERFORMANCE AND TRAINING: 1986-1991 Final Summary Report, Oct. 1986 - Dec. 1991
D. M. MCANULTY Jul. 1992 170 p
(Contract MDA903-87-C-0523)
(AD-A254455; ASI690-348-91; ARI-TR-954) Avail: CASI HC A08/MF A02

This report presents summary descriptions of the research performed by Anacapa Sciences, Inc., for the U.S. Army Research Institute for the Behavioral and Social Sciences Fort Rucker Field Unit. This effort was entitled Human Factors Research in Aircrew Performance and Training. From 9 Oct. 1986 - 31 Dec. 1991, Anacapa personnel worked on 42 research projects and 20 technical advisory services in emerging aviation systems design, manpower and personnel programs, aviator training, and aviation safety research. The report also describes research and development projects that were conducted under 17 subcontracts to Anacapa Sciences. These descriptions contain the following: (1) a background section that describes the rationale for the project and specifies the research objectives; (2) a research approach section that describes the tasks and activities required to meet the project objectives; and (3) a work completed section that may include research findings or, in the case of developmental activities, a description of the research products. DTIC

N93-12792# EG and G Energy Measurements, Inc., Idaho Falls, ID.
YOU NEED THIS DONE BY WHEN? INCREASING YOUR EFFICIENCY WITH THE SAS SYSTEM
M. S. DEHAAN 1992 4 p Presented at the 17th Annual Atomic Spectroscopy Safeguards and Security Users Group International Symposium, Honolulu, HI, 12 Apr. 1992
(Contract DE-AC07-76ID-01570)
(DE92-017894; EGG-M-91471; CONF-920426-3) Avail: CASI HC A01/MF A01

The SAS Institute publication — SAS Programming Tips: A Guide to Efficient SAS Processing defines efficiency as 'obtaining more results from fewer computer or human resources.' While this publication contains many very useful tips, it seems to concentrate mostly on computer efficiency. This paper will focus on ways of increasing your efficiency in developing, writing, and debugging SAS programs, i.e., increasing human efficiency. In my job as a consulting statistician, my programs are usually one-run programs. That is, I develop and test a program, then I run them once to get the results I need, and the program is typically never used again. Even for multiple run jobs, the greatest expense by far is the time used to develop a program, and any CPU/hardware 'expense' is relatively insignificant. I believe that this is true for most SAS system users and that not enough attention has been given to this aspect of 'cost'. While most of these tips and techniques were developed under the PC platform, nearly all are applicable and useful under all SAS supported platforms. Some of the tips the experienced SAS programmer may already be familiar with, but many should be new and useful to both novice and veteran users. DOE

N93-12907# National Science Foundation, Washington, DC.
WOMEN AND MINORITIES IN SCIENCE AND ENGINEERING: AN UPDATE
PATRICIA E. WHITE Jan. 1992 194 p
(NSF-92-303) Avail: CASI HC A09/MF A03

The Science and Technology Equal Opportunities Act, passed in December 1980, calls for the National Science Foundation (NSF) to promote the full use of human resources in science and technology through a comprehensive and continuing program to increase substantially the contribution and advancement of woman and minorities in scientific, professional, and technical careers, and for other purposes. Under this act, NSF is required to report to Congress on the status of women and minorities in science and engineering (S&E) professions on a biennial basis. This report is the sixth in the series, and, like its predecessors, it provides a comprehensive overview of the participation of women, minorities (including Hispanics), and persons with physical disabilities in S&E employment and training. The report has been designated as a reference document that allows readers to easily locate information on particular subgroups or specific aspects of participation and utilization. The Status Update provides a concise overview; summary findings are presented in the introductory overviews of each chapter. Author

N93-13278# National Science Foundation, Washington, DC. Directorate for Education and Human Resources.
GATEWAY TO DIVERSITY IN THE SCIENTIFIC AND TECHNOLOGICAL WORKFORCE
Sep. 1992 89 p
(NSF-92-99) Avail: CASI HC A05/MF A01

The National Science Foundation's (NSF) Division of Human Resource Development (HRD), within the Directorate for Education and Human Resources, has primary responsibility for broadening participation of minority groups underrepresented in science, engineering, and mathematics (SEM). The NSF minority programs reflect the Foundation's growing commitment to develop the resources of the scientific and technological community as a whole and to ensure an adequately trained research and development workforce in the next decade. The Education and Human Resources Directorate has five major long-range goals: to help ensure that a high-quality school education in science is available to every child in the United States and is of sufficient quality to enable those who are interested and talented to pursue technical careers at all levels; to help ensure that the educational pipelines carrying students to careers in science, mathematics, and engineering yield enough well-educated individuals to meet the needs of the U.S. technical workforce; to help ensure that those who select science and engineering careers have available the best possible professional education in their discipline; to help ensure that opportunities are available at the college level for interested nonspecialists to broaden their scientific backgrounds; and to support informal science education programs and to maintain public interest in, and awareness of, scientific and technological developments. The Division of Human Resource Development is one of the six divisions of the Education and Human Resources Directorate. HRD activities reflect NSF's commitment to developing the resources of the scientific and technical community as a whole. Objectives of the programs profiled in this publication are as follows: to increase opportunities for participation in the nation's scientific and technical enterprise for investigators who are monorities; young persons who are minorities; and faculty from predominantly undergraduate colleges and universities; to strengthen the capa-

bilities of institutions that have significant minority enrollments; and to foster comprehensive approaches and build effective coalitions that address the development of scientific and engineering talent, drawing from underrepresented minority groups on a nationwide basis. NSF's goals are to increase the number of minorities underrepresented in NSF-supported fields receiving B.S. degrees to more than 50,000 annually by the year 2000 and to increase the minority Ph.D. attainment to more than 2,000 annually by the same year. Minorities that are underrepresented in science and engineering are: Black's, Hispanics, American Indians, Native Alaskans, and Native Pacific Islanders (Micronesian and Polynesian). Minority programs at individual universities throughout the country are also described. Author

N93-13381# National Science Foundation, Washington, DC.
STATE AWARD SUMMARY: FISCAL YEAR 1991
1992 116 p
(NSF-92-3) Avail: CASI HC A06/MF A02

This congressional report is produced to accompany the budget submission to the Congress. The report reflects the number and dollar value of National Science Foundation (NSF) programs and contracts made in Fiscal Year 1991. It is arranged by state and then by university or institution. Four principal program activities are included from appropriations for these activities: (1) Research Activities; (2) Education and Human Resources; (3) Antarctic Program; and (4) Academic Infrastructure. R.L.B.

N93-13699# National Science Foundation, Washington, DC. Div. of Undergraduate Science Engineering and Mathematics Education.
AWARDS: 1991 UNDERGRADUATE COURSE AND CURRICULUM DEVELOPMENT PROGRAM
1992 61 p
(NSF-92-45) Avail: CASI HC A04/MF A01

Undergraduate education in the sciences and mathematics is fundamental in the preparation of our Nation's future scientists, engineers, mathematicians, and teachers, and provides literacy essential for all citizens. In recognition of this critical role, the National Science Foundation (NSF) through the Division of Undergraduate Science, Engineering, and Mathematics Education (USEME) in the Directorate of Education and Human Resources (EHR), supports the development of improved and innovative undergraduate courses and curricula in the sciences, engineering, and mathematics. The goals of the undergraduate Course and Curriculum Development (UCC) program are to encourage course and curriculum development to meet the Nation's need for high quality scientists, engineers, mathematicians, dedicated and able teachers of pre-college and college science and mathematics, and scientifically and technically literate citizens; and to inspire faculty to devote creative energy to educational activities that address the needs of their students and the Nation, and that enhance the faculty's professional and scholarly interests. The introductory-level courses, curricula, and laboratory projects which recieved awards in FY 1991 are described. L.R.R.

N93-13700# National Science Foundation, Washington, DC.
DIVERSITY IN BIOLOGICAL RESEARCH 1992
9 p Workshop held in Washington, DC, 11-12 Jul. 1991
(NSF-92-19) Avail: CASI HC A02/MF A01

The Workshop on Diversity in Biological Research met in Washington, D.C. on July 11 and 12, 1991. The purpose of the workshop was to provide advice to the National Science Foundation (NSF) on how the number of underrepresented minorities in science and engineering can be increased and on what can be done to optimize professional growth of current minority scientists. A summary of the workshop discussions including the issues to be addressed, the goals to be achieved, and the strategies for reaching these goals is presented. L.R.R.

N93-13702# National Science Foundation, Washington, DC. Div. of Undergraduate Science, Engineering, and Mathematics Education.
FISCAL YEAR 1991 HIGHLIGHTS
1992 44 p
(NSF-92-23; OMB-3145-0058) Avail: CASI HC A03/MF A01

The National Science Foundation's (NSF) undergraduate program is an agency-wide effort involving all program directorates. The division of Undergraduate Science, Engineering, and Mathematics Education (USEME within the Directorate for Education and Human Resources (EHR) serves as the focal point for NSF undergraduate activities. Presented are summaries of the FY-91 accomplishments of the programs. The following topics are discussed: the Instrumentation and Laboratory Improvement Program; the Undergraduate Course and Curriculum Development Program; the Undergraduate Curriculum Development in Mathematics: Calculus (CALC); the Undergraduate FacultyEnhancement Program; and the staff and program structure. Author

N93-14110# Air Force Occupational Measurement Center, Randolph AFB, TX.
F/FB-111 AVIONICS TEST STATION AND COMPONENT SPECIALIST/TECHNICIAN. AUTOMATIC TEST STATIONS MANUAL AND ELECTRONIC WARFARE TEST STATIONS. TRAINING REQUIREMENTS ANALYSIS (451X6), VOLUME 2
Nov. 1991 462 p
(AD-A252121) Avail: CASI HC A20/MF A01

Volume II of the training requirements analysis which includes the task analysis data for the F-111 Avionics Test Station and Component Specialty (AFSC 451X6) is included. This analysis encompasses tasks from the AFSC 451X6 USAF Job Inventory as well as additional tasks identified during interviews. The majority of the tasks analyzed were broad areas that covered many different pieces of equipment. To ensure complete coverage, every possible piece of equipment, tool, supply, activity, skill, and knowledge is listed. L.R.R.

N93-14417# California Univ., Santa Barbara, CA. Center for Quantized Electronic Structures.
THE CHANGING CULTURE OF SCIENCE: BRINGING IT INTO BALANCE
FIONA GOODCHILD, BERNARD SADOULET, ROSE SERGEANT, and KATE METROPOLIS Aug. 1992 28 p Conference held in Berkeley, CA, 21-23 Jul. 1992
(Contract N00014-92-J-1511)
(AD-A255993) Avail: CASI HC A03/MF A01

The Conference on Changing Culture of Science: Bringing it into Balance, held June 21-23, 1992 in Berkeley, California assembled a broad spectrum of people dedicated to science to explore attitudes, practices, and policies long woven into the fabric of our working culture of science. This discussion confronted three fears: the fear that many people who want to become scientists are being thwarted by the scientific community's current expectations of what paths must be followed, what choices must be made, as they progress; the fear that the scientific community is not interacting with the rest of society in a positive way; and the fear that the scientific community cannot accommodate people who do not fit the traditional picture of a scientist without lowering the quality of science. Recommendations were made on: how to build an inclusive, heterogeneous scientific community without compromising scientific excellence; how the scientific culture can affirm that child raising, elder care, and mentoring of students and colleagues are valued and respected activities; how to address the under-representation of women and minorities in administrative and management positions in the scientific community; how to make the first year in the scientific community more supportive and welcoming to people from all backgrounds; and how to increase interest in and understanding of science among the general population and among all students. DTIC

N93-14520# Wright Lab., Wright-Patterson AFB, OH.
THE HUMAN-ELECTRONIC CREW: IS THE TEAM MATURING? THE 2ND JOINT GAF/RAF/USAF WORKSHOP ON HUMAN-ELECTRONIC CREW TEAMWORK
TERRY EMERSON, MICHAEL REINECKE, JOHN REISING, and ROBERT TAYLOR 10 Jul. 1992 184 p Workshop held in Ingolstadt, Germany, 25-28 Sep. 1990
(Contract AF PROJ. 2403)

(AD-A256192; WL-TR-92-3078) Avail: CASI HC A09/MF A02

Advances in artificial intelligence (AI) will enable future fighter/attack aircraft to have a rather unique crew—one human and one electronic. The objective of the workshop was to bring together AI specialists, aircrew, and cockpit designers in order to exchange ideas relative to (1) the state of the art in aircraft applications of AI technology and (2) the impact on the cockpit of the human/electronic crew. This meeting provided a valuable forum for the experts of several countries to exchange ideas, concepts, and data relative to hardware and software capabilities that can be included in an aircraft system design to aid the human operator in performing the mission. DTIC

N93-15020# Klein Assoiciates, Inc., Fairborn, OH.

A COGNITIVE MODEL FOR TRAINING DECISION MAKING IN AIRCREWS

GARY A. KLEIN *In* Advanced Aviation Concepts, Workshop on Aeronautical Decision Making (ADM). Volume 2: Plenary Session With Presentations and Proposed Action Plan p 129-144 Aug. 1992

Avail: CASI HC A03/MF A03

The topics addressed are: (1) prescriptions for effective decision making; (2) Recognition-Primed Decision (RPD) model; (3) key features of RPD model; (4) factors affecting the use of recognitional and analytical decisions; (5) team research and observations; (6) aspects of teamwork; (7) cognitive process of teams; (8) advanced team decision making-a development model; (9) key features and critical processes of decision making teams; (10) myths about team decision making; and (11) recommendations for team decision training. I.I.C.

N93-16795*# Paul D. Camp Community Coll., Suffolk, VA. Dept. of Computer Information Systems.

DESKTOP COMPUTING INTEGRATION PROJECT

ROBERT L. TUREMAN, JR. *In* Hampton Univ., NASA/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program 1992 p 187-188 Sep. 1992

Avail: CASI HC A01/MF A03

The Desktop Computing Integration Project for the Human Resources Management Division (HRMD) of LaRC was designed to help division personnel use personal computing resources to perform job tasks. The three goals of the project were to involve HRMD personnel in desktop computing, link mainframe data to desktop capabilities, and to estimate training needs for the division. The project resulted in increased usage of personal computers by Awards specialists, an increased awareness of LaRC resources to help perform tasks, and personal computer output that was used in presentation of information to center personnel. In addition, the necessary skills for HRMD personal computer users were identified. The Awards Office was chosen for the project because of the consistency of their data requests and the desire of employees in that area to use the personal computer. Author

N93-17301*# Alabama Univ., Huntsville, AL. Dept. of Management and Marketing.

SOME EFFECTS OF TIME USAGE PATTERNS ON THE PRODUCTIVITY OF ENGINEERS

CONRAD N. JACKSON *In* Alabama Univ., 1992 NASA/ASEE Summer Faculty Fellowship Program 5 p Dec. 1992

Avail: CASI HC A01/MF A03

The performance of the 1500+ engineers at MSFC is critical to the Center's mission. Worker's performance, however, is a variable affected by ability, motivation, role understanding, and other factors. Managing subordinates' performance is a great challenges to managers. Special challenges confront the managers of engineers because engineers often work with general goals, long deadlines, and considerable autonomy. The productivity of a team or branch is a function of the productivity of each of its members. While many managers have personal theories about how to run their work group, surprisingly little systematic scientific knowledge exerts about the effects of various factors on engineers' productivity. This study is intended to help lay the foundation for such a program of research. Author

N93-17854# National Science Foundation, Washington, DC.

EHR DIRECTORY OF AWARDS, FY 1990

1991 624 p

(NSF-92-75) Avail: CASI HC A99/MF A06

This volume is the detailed record of the awards made during Fiscal Year 1990 by the National Science Foundation's Directorate for Education and Human Resources (EHR). NSF's education activities continue to grow at a rapid rate, and, in order to retain a single volume format, the record will be reported somewhat differently in the future. The introductory sections of this volume take the first step toward different content and character. Author

N93-18026# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Systems and Logistics.

RELIABILITY, MAINTAINABILITY, AND SUPPORTABILITY (RMS) EDUCATION IN ENGINEERING SCHOOLS M.S. Thesis

GREGORY T. HURST and BARRY N. KINTER Dec. 1992 125 p

(AD-A258260; AFIT/GIR/LSQ/92D-6) Avail: CASI HC A06/MF A02

The purpose of this research is to show how engineering schools, as a whole, perceive the role of reliability, maintainability, and supportability in the engineering field. This includes the degree to which these concepts are included in their curricula, whether industry recruiters look for reliability, maintainability, and supportability training when they visit college campuses and to what degree college faculties are teaching reliability, maintainability, and supportability. This is done through research of existing literature and the analysis of data from a survey completed by engineering schools. General analyses are presented of the overall responses and detailed analysis of contrasts and similarities between the responses from private and public institutions are presented. Based upon the knowledge gained in conducting this research, conclusions on the state of RMS education in engineering institutions are forwarded. DTIC

N93-18439# Office of Personnel Management, Washington, DC. Office of Executive and Management Policy.

THE STATUS OF THE SENIOR EXECUTIVE SERVICE, 1991 Sep. 1992

61 p Original contains color illustrations (SES-92-07) Avail: CASI HC A04/MF A01

This document presents an overview of the administration, activities, and membership of the Federal Senior Executive Service (SES). Major employers, positions and appointments, and demographic characteristics of SES members are described. SES agenda items such as the enhancement of executive development programs, certification and performance appraisal, succession planning, and executive pay scales are addressed. The role and activities of the Office of Executive and Management Policy in administering the SES are discussed. Finally, the recipients of the Presidential Rank Awards are listed. M.G.

N93-19405*# University of Central Florida, Orlando, FL. Dept. of Industrial Engineering and Management Systems.

TRAINING EVALUATION FINAL REPORT

JOSE A. SEPULVEDA *In its* NASA/ASEE Summer Faculty Fellowship Program p 451-458 Sep. 1992

Avail: CASI HC A02/MF A06

In the area of management training, 'evaluation' refers both to the specific evaluation instrument used to determine whether a training effort was considered effective, and to the procedures followed to evaluate specific training requests. This report recommends to evaluate new training requests in the same way new procurement or new projects are

evaluated. This includes examining training requests from the perspective of KSC goals and objectives, and determining expected ROI of proposed training program (does training result in improved productivity, through savings of time, improved outputs, and/or personnel reduction?). To determine whether a specific training course is effective, a statement of what constitutes 'good performance' is required. The user (NOT the Training Branch) must define what is 'required level of performance'. This 'model' will be the basis for the design and development of an objective, performance-based, training evaluation instrument. Author

N93-19452*# North Carolina Agricultural and Technical State Univ., Greensboro, NC. Dept. of Mechanical Engineering.

THE CENTER FOR AEROSPACE RESEARCH: A NASA CENTER OF EXCELLENCE AT NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIVERSITY

Annual Progress Report, 1 Jan. - 31 Dec. 1992

STEVEN H.-Y. LAI 12 Dec. 1992 227 p Prepared for Futron Corp., Bethesda, MD

(Contract NAGW-2924)

(NASA-CR-191362; NAS 1.26:191362) Avail: CASI HC A11/MF A03

This report documents the efforts and outcomes of our research and educational programs at NASA-CORE in NCA&TSU. The goal of the center was to establish a quality aerospace research base and to develop an educational program to increase the participation of minority faculty and students in the areas of aerospace engineering. The major accomplishments of this center in the first year are summarized in terms of three different areas, namely, the center's research programs area, the center's educational programs area, and the center's management area. In the center's research programs area, we focus on developing capabilities needed to support the development of the aerospace plane and high speed civil transportation system technologies. In the educational programs area, we developed an aerospace engineering option program ready for university approval.

N93-19844# General Accounting Office, Washington, DC. Resources, Community, and Economic Development Div.

UNIVERSITY RESEARCH: CONTROLLING INAPPROPRIATE ACCESS TO FEDERALLY FUNDED RESEARCH RESULTS. REPORT TO THE CHAIRMAN, HUMAN RESOURCES AND INTERGOVERNMENTAL RELATIONS SUBCOMMITTEE, COMMITTEE ON GOVERNMENT OPERATIONS, HOUSE OF REPRESENTATIVES

4 May 1992 36 p

(GAO/RCED-92-104; B-247087) Avail: CASI HC A03/MF A01; GAO, PO Box 6015, Gaithersburg, MD 20877 HC

The Chairman, Human Resources and Intergovernmental Relations Subcommittee, House Committee on Government Operations, has expressed concern that closer links between universities and businesses have increased the potential for conflicts of interest that would give businesses inappropriate access to, and therefore an unfair advantage in commercializing, the results of federally funded research. To assess the extent of these linkages, the Chairman requested that we survey the universities receiving the most funding from NIH and NSF in fiscal year 1989 about: (1) the extent of licensing activities for technologies developed in whole or in part with NIH or NSF funding; (2) foreign participation in industrial liaison programs that, in return for membership fees, provide companies with access to research programs; and (3) policies and procedures to control potential conflicts of interest by faculty or administrators that could give companies inappropriate access to research results. As agreed with the Subcommittee, we assessed the overall relationship between universities and businesses without seeking to identify specific instances of inappropriate access. To obtain information about the extent of linkages between universities and businesses, we sent a questionnaire to 37 universities that were among the 25 leading university recipients of funding from NIH and/or the 25 leading university recipients of funding from NSF in fiscal year 1989. All of the universities, except the Baylor College of Medicine and the University of Pennsylvania, responded to the questionnaire. We also obtained additional data through telephone interviews with administrators at the 35 universities that responded. We did not independently verify the accuracy of data that the universities reported. Author

N93-21230# Federal Coordinating Council for Science, Engineering and Technology, Washington, DC.

PROLOGUE TO ACTION. LIFE SCIENCES EDUCATION AND SCIENCE LITERACY

Mar. 1992 71 p Conference held in Columbus, OH, Jun. 1991; sponsored by US Public Health Service

(PB93-107514)

Avail: CASI HC A04/MF A01

In recommendations springing from the Prologue to Action — Life Sciences Education and Science Literacy Conference in Ohio, attendees overwhelmingly agreed that Public Health Service (PHS) should become an aggressive advocate for excellence and equality in life sciences education. Conference participants called for PHS to mobilize its corps of intramural and extramural scientists in the service of life sciences education and literacy by creatively combining the knowledge of scientists with the practical teaching skills of classroom teachers. Scientists should help train science teachers and other educators and help structure learning experiences to ensure that all students have a chance to develop the ability to think and learn on their own. Scientists should help train student teachers at the university level, for instance, and help revise undergraduate science curriculums. They should become local or national speakers, be mentors to local teachers, loan equipment to science class projects in local schools, and get involved in undergraduate and precollege curriculum development. The following summary of reports from the seven subcommittees includes overview and discussions of their perspectives, issues, and recommendations for PHS. NTIS

N93-21538*# National Aeronautics and Space Administration, Washington, DC.

PATHWAYS TO EXCELLENCE: A FEDERAL STRATEGY FOR SCIENCE, MATHEMATICS, ENGINEERING, AND TECHNOLOGY EDUCATION

Federal Coordinating Council for Science, Engineering, and Technology US Science, Mathematics, Engineering, and Technology Education Strategic Plan, FY 1994-FY 1998 1993 50 p Original contains color illustrations

(NASA-EP-288; NAS 1.19:288)

Avail: CASI HC A03/MF A01; 24 functional color pages

This Strategic Plan was developed by the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET) through its Committee on Education and Human Resources (CEHR), with representatives from 16 Federal agencies. Based on two years of coordinated interagency effort, the Plan confirms the Federal Government's commitment to ensuring the health and well-being of science, mathematics, engineering, and technology education at all levels and in all sectors (i.e., elementary and secondary, undergraduate, graduate, public understanding of science, and technology education). The Plan represents the Federal Government's efforts to develop a five-year planning framework and associated milestones that focus Federal planning and the resources of the participating agencies toward achieving the requisite or expected level of mathematics and science competence by all students. The priority framework outlines the strategic objectives, implementation priorities, and components for the Strategic Plan and serves as a road map for the Plan. The Plan endorses a broad range of ongoing activities, including continued Federal support for graduate education as the backbone of our country's research and development enterprise. The Plan also identifies three tiers of program activities with goals that address issues in science, mathematics, engineering, and technology education meriting special attention. Within each tier, individual agency programs play important and often unique roles that strengthen the aggregate portfolio. The three tiers are presented in descending order of priority: (1) reforming the formal education system; (2) expanding participation and access; and (3) enabling activities. Derived from text

N93-21753# Vector Research, Inc., Arlington, VA.

REQUIREMENTS FOR AN AUTOMATED HUMAN FACTORS, MANPOWER, PERSONNEL, AND TRAINING (HMPT) PLANNING TOOL Final Report, 1 Aug. 1991 - 31 Jan. 1992

SUSAN M. EVANS and NICOLE A. RITCHIE May 1992 85 p

(Contract F33657-91-C-2211)
(AD-A258531; VRI-AFHEL-1-FR-92-1; ASD-TR-92-5010) Avail: CASI HC A05/MF A01

This Phase 1 Small Business Innovative Research (SBIR) project investigated the impact of system design decisions on human operator performance during concept development. The research established the functional and information requirements for an effective automated design analysis and crew performance assessment methodology for use in Premilestone 1 planning. The information structure included process, task, dynamic crew performance, operator graphic and human factors parameters, and training requirements. Existing automated tools such as the IDEF sub 0 structured analysis methodology, the SAINT task network simulation model and various operator graphic and human factors models were evaluated, along with other proven methodologies such as IDEAL and the Air Force's Instructional Systems Development (ISD) process. Insights from designers and other potential users identified special functional, information, and hardware requirements which were included in the methodology. The requirements will direct the implementation of an automated Human Factors, Manpower, Personnel, and Training System in Phase 2. The resulting system will make a significant contribution to the complex problems of considering HMPT issues early in system planning. It has potential application by elements in DoD program offices and organizations, and would also be of use in the private sector by those who are involved with the early concept phases in the design of complex human-operated systems.... Manpower, Personnel and training, Human performance, Process modeling, IDEF, Simulation modeling, Concept exploration, System planning. DTIC

N93-22982# Oak Ridge National Lab., TN.
TECHNOLOGY AND THE 21ST CENTURY GOVERNMENT ORGANIZATION
B. E. TONN, M. S. BRONZINI, R. T. GOELTZ, M. HILLIARD, and M. IRBY 1992 11 p Presented at the 5th Advanced Technology Conference of the United States Postal Service, Washington, DC, 30 Nov. - 2 Dec. 1992
(Contract DE-AC05-84OR-21400)
(DE93-002506; CONF-9211120-1) Avail: CASI HC A03/MF A01

This paper presents a conceptual design for the 21st Century government organization. This design is applicable to the future US Postal Service and generalizable to other large government agencies. The design is based on conjectures in three areas: capabilities of information technology in the early 21st Century; motivations, needs, strengths, and weaknesses of members of the 21st Century workforce; and needs of large public organizations. The design addresses topics such as coordination, career tracks, communications, and the seamless integration of information resources. DOE

N93-23136*# National Aeronautics and Space Administration, Washington, DC.
FY 1991 SAFETY PROGRAM STATUS REPORT
1991 38 p
(NASA-TM-108707; NAS 1.15:108707) Avail: CASI HC A03/MF A01

In FY 1991, the NASA Safety Division continued efforts to enhance the quality and productivity of its safety oversight function. Recent initiatives set forth in areas such as training, risk management, safety assurance, operational safety, and safety information systems have matured into viable programs contributing to the safety and success of activities throughout the Agency. Efforts continued to develop a centralized intra-agency safety training program with establishment of the NASA Safety Training Center at the Johnson Space Center (JSC). The objective is to provide quality training for NASA employees and contractors on a broad range of safety-related topics. Courses developed by the Training Center will be presented at various NASA locations to minimize travel and reach the greatest number of people at the least cost. In FY 1991, as part of the ongoing efforts to enhance the total quality of NASA's safety work force, the Safety Training Center initiated development of a Certified Safety Professional review course. This course provides a comprehensive review of the skills and knowledge that well-rounded safety professionals must possess to qualify for professional certification. FY 1992 will see the course presented to NASA and contractor employees at all installations via the NASA Video Teleconference System.
Derived from text

N93-23146*# Georgia Inst. of Tech., Atlanta, GA. Space Grant Consortium.
UNDERREPRESENTED GROUPS
DAVID A. PETERS *In* JHU, First National Space Grant Conference Report p 43-47 1990
Avail: CASI HC A01/MF A02

The problem with the shortage of under represented groups in science and engineering is absolutely crucial, especially considering that U.S. will experience a shortage of 560,000 science and engineering personnel by the year 2010. Most studies by the National Science Foundation also concluded that projected shortages cannot be alleviated without significant increases in the involvement of Blacks, Hispanics, Native Americans, handicapped persons, and women. Author

N93-23148*# Michigan Univ., Ann Arbor, MI. Space Grant Consortium.
PIPELINE ISSUES
JOE T. EISLEY *In* JHU, First National Space Grant Conference Report p 55-63 1990
Avail: CASI HC A02/MF A02

The declining pool of graduates, the lack of rigorous preparation in science and mathematics, and the declining interest in science and engineering careers at the precollege level promises a shortage of technically educated personnel at the college level for industry, government, and the universities in the next several decades. The educational process, which starts out with a large number of students at the elementary level, but with an ever smaller number preparing for science and engineering at each more advanced educational level, is in a state of crisis. These pipeline issues, so called because the educational process is likened to a series of ever smaller constrictions in a pipe, were examined in a workshop at the Space Grant Conference and a summary of the presentations and the results of the discussion, and the conclusions of the workshop participants are reported. Author

N93-23160 Space Foundation, Colorado Springs, CO.
SPACE SUPPORT FORUM
WESLEY W. POSVAR (Posvar, Wesley, Pittsburgh, PA.), DONALD A. LAIDLAW (Department of Education, Washington, DC.), ROBERT BROWN (National Aeronautics and Space Administration, Washington, DC.), DOUGLAS KING (Challenger Center, Alexandria, VA.), DANIEL O. GRAHAM (High Frontier, Inc., Arlington, VA.), LINDA STRINE (Department of Transportation, Washington, DC.), MARK HOPKINS (Spacecause, Santa Monica, CA.), and CARL MCNAIR (McNair, Robert E. Foundation, Inc., Atlanta, GA.) *In its* The Eighth National Space Symposium p 82-102 1992
Copyright Avail: CASI HC A03/MF A03; 7 functional color pages

This is a report of the discussions held by the Space Support Forum on the subject of education as an investment in the future. The Space Support Forum is a gathering of representatives of various space-related organizations that interact or overlap with the mission of the Space Foundation. They reported that an international science assessment in 17 countries ranked the United States either near or at the bottom in biology, chemistry, and physics. The U.S. Department of Education has laid out 6 National Education Goals to turn this status around and is helping hundreds of communities to work towards these goals, referred to as America 2000. CASI

N93-23174*# National Aeronautics and Space Administration, Washington, DC.
NASA'S STRATEGIC PLAN FOR EDUCATION. A STRATEGY FOR CHANGE, 1993-1998

Dec. 1992 76 p
(NASA-EP-289; NAS 1.19:289) Avail: CASI HC A05/MF A01

NASA's education vision is to promote excellence in America's education system through enhancing and expanding scientific and technological competence. In doing so, NASA strives to be recognized by the education community as the premier mission agency in support of the National Education Goals and in the development and implementation of education standards. To realize this vision, NASA has clearly defined and developed three specific goals to promote excellence in education. Specific objectives and milestones are defined for each goal in the body of this strategic plan. Derived from text

N93-23466# Klein Associates, Inc., Yellow Springs, OH.
ADVANCED TEAM DECISION MAKING: A DEVELOPMENTAL METHOD
CAROLINE E. ZSAMBOK, GARY KLEIN, MOLLY M. KYNE, and DAVID W. KLINGER 3 Aug. 1992 28 p
(Contract MDA903-90-C-0117)
(AD-A259512) Avail: CASI HC A03/MF A01

This document describes Advanced Team Decision Making: A Developmental Model (ATDM). Based on our observations of numerous tactical and strategic decision making teams, and on a review of relevant literature, Klein Associates derived three key components of advanced team decision making: team self identity, team conceptual level, and team self monitoring. The model contains ten key behaviors critical to team development in these components. We developed this document for the Industrial College of the Armed Forces. It describes the ATDM model in language compatible with the needs of ICAF students who are being trained to transition into strategic-level leadership positions. ATDM was first introduced in ICAF's 1992 curriculum. This document is the second of three components of the team training program Klein Associates designed for ICAF. The first component is an introductory lecture about ATDM (called Lesson 1111 in this document) that we delivered to the faculty and student body. The third component (called Lesson 1311) is an exercise designed for experiential learning. The exercise and facilitated after-action review sessions give students an opportunity to practice, discuss, and improve their team decision-making skills in a manner consistent with the ATDM model. Copies of this document are also available from Klein Associates. DTIC

N93-23680# Executive Office of the President, Washington, DC.
LEARNING TO MEET THE SCIENCE AND TECHNOLOGY CHALLENGE
Dec. 1992 60 p
(PB93-139996) Avail: CASI HC A04/MF A01

The report provides some recommendations for reviving the U.S.'s leadership role in science and technology. Special attention is given to the development of a strong educational base for training the scientists and engineers of the future. The reports lists progress goals for all levels of education based on the National Education Goals established in 1990. The objective of the report is not to resolve all educational problems but rather to deal with a complex set of problems in a realistic and useful way. NTIS

N93-25733# Air Force Occupational Measurement Center, Randolph AFB, TX.
AIRCRAFT ELECTRICAL AND ENVIRONMENTAL SYSTEMS, AFSCS 452X5, 454X5, AND 454X6
Jan. 1993 71 p
(AD-A261213) Avail: CASI HC A04/MF A01

This is a report of an occupational survey of the Electrical and Environmental Systems career ladders conducted by the Occupational Analysis Flight, USAFOMS. The Headquarters Air Training Command (ATC) Aircraft/ Munitions maintenance Training Division requested this survey to project, plan, and develop Career Development Courses (CDC), STS's, and training for these career ladders due to the Rivet Workforce restructing of AFSC 423X0—Aircraft Electrical Systems and AFSC 423X1—Aircraft Environmental Systems. The last surveys pertaining to these career ladders were published in Feb. 1984 (AFSC 423X1) and Feb. 1985 (AFSC 423X0). The merger of the Electrical and Environmental, Strategic Electrical and Environmental, and Airlift Electrical and Environmental. Members of all these career ladders participated in this survey. In Jun. 1992, a U and TW decided to merge the three ladders into a single Aircraft Electrical and Environmental Systems career ladder (AFSC 452X5), effective Apr. 1993. DTIC

N93-26138# Civil Aeromedical Inst., Oklahoma City, OK.
CONTRIBUTION OF PERSONALITY TO THE PREDICTION OF SUCCESS IN INITIAL AIR TRAFFIC CONTROL SPECIALIST TRAINING Final Report
DAVID J. SCHROEDER, DANA BROACH, and WILLIE C. YOUNG Apr. 1993 32 p Presented at the 34th Annual Meeting of the Aerospace Medical Association, Miami, FL Sponsored by Office of Aviation Medicine
(DOT/FAA/AM-93/4; AD-A264699) Avail: CASI HC A03/MF A01

Reviews have consistently concluded that the validity of personality as a predictor of job performance is low. However, a 1991 meta-analysis of studies of personality and job performance demonstrated the utility of the 'Big Five' model of personality in personnel selection and training. This study was designed to evaluate the utility of personality in predicting student success in the FAA's Air Traffic Control Specialist (ATCS) Nonradar Screen Program ('the Screen'). The Screen follows the miniature training, testing, and evaluation paradigm, in which individuals with no prior knowledge of the occupation are taught critical aspects of the job and then assessed on a pass/fail basis for their potential to succeed as controllers. The NEO personality Inventory was administered to 723 men and 307 women at entry into the 9-week Screen. NEO-PI scale scores and cognitive aptitude measures were used to predict final composite scores (COMP) of students. Men and women air traffic students exhibited lower average scores in Neuroticism, higher average scores in Extroversion, Openness to Experience, and Conscientiousnous, and no difference on Agreeableness when compared to normative samples. Correlations between the personality scales and COMP were low for both sexes, ranging from .000 with Impulsiveness, a facet of Neuroticism, to -0.148 with Excitement-seeking, a facet of the Extraversion dimension. Despite the low zero-order correlations, several of the personality facets proved useful in a regression equation, explaining an additional 3 percent of variance in performance over that explained by cognitive aptitude measures. These included the following: Excitement-seeking, Fantasy, Activity, and Ideas. While these results were not entirely consistent with Barrick and Mount (1991), they do offer some support for the role of personality variables in the prediction of success in the ATCS Screen. Continued research is needed to assess the relationship of theoretically-based measures of personality to success on the job over time. Author (revised)

N93-26205*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
DESIGN AND IMPLEMENTATION OF A PILOT ORIENTATION PROGRAM FOR NEW NASA ENGINEERING EMPLOYEES
RONALD E. GRAHAM, RANDALL B. FURNAS, and MARIA BABULA May 1993 14 p
(NASA-TM-105907; E-7687; NAS 1.15:105907) Avail: CASI HC A03/MF A01

This paper describes the design and field testing of an orientation program for new employees of NASA Lewis Research Center's Engineering Directorate. A group of new employees designed the program using a series of TQM analysis techniques. The program objectives were: provide consistent treatment for new employees; assist management and clerical staff with their responsibility for orientation; introduce the employee to as many facets of the organization as possible; allow the employee to feel like a member of the organization as early as possible; maximize the use of existing services; and use up-to-date information. The major aspects of the program included: training of management and clerical staff; lab tours and briefings describing the organization; shepherding, using senior employees as shepherds; a handbook of information about the center and the directorate; a package of information about northeast Ohio; and social activities involving the new employees and shepherds. The program was tested on a pilot group of six new

employees over a four month period and was considered to be highly successful by both the employees and management. Aspects of the program have subsequently been adopted for center-wide use. Author

N93-27126*# Texas Univ., Austin, TX.
THE CENTER OF EXCELLENCE FOR HYPERSONICS TRAINING AND RESEARCH AT THE UNIVERSITY OF TEXAS AT AUSTIN Final Report
DAVID S. DOLLING Apr. 1993 15 p
(Contract NAGW-964)
(NASA-CR-193070; NAS 1.26:193070) Avail: CASI HC A03/MF A01

Over the period of this grant (1986-92), 23 graduate students were supported by the Center and received education and training in hypersonics through MS and Ph.D. programs. An additional 8 Ph.D. candidates and 2 MS candidates, with their own fellowship support, were attracted to The University of Texas and were recruited into the hypersonics program because of the Center. Their research, supervised by the 10 faculty involved in the Center, resulted in approximately 50 publications and presentations in journals and at national and international technical conferences. To provide broad-based training, a new hypersonics curriculum was created, enabling students to take 8 core classes in theoretical, computational, and experimental hypersonics, and other option classes over a two to four semester period. The Center also developed an active continuing education program. The Hypersonics Short Course was taught 3 times, twice in the USA and once in Europe. Approximately 300 persons were attracted to hear lectures by more than 25 of the leading experts in the field. In addition, a hypersonic aerodynamics short course was offered through AIAA, as well as short courses on computational fluid dynamics (CFD) and advanced CFD. The existence of the Center also enabled faculty to leverage a substantial volume of additional funds from other agencies, for research and graduate student training. Overall, this was a highly successful and highly visible program. Author

N93-28864# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
OPERATOR AND AUTOMATION CAPABILITY ANALYSIS: PICKING THE RIGHT TEAM
R. M. TAYLOR and S. J. SELCON *In* AGARD, Combat Automation for Airborne Weapon Systems: Man/Machine Interface Trends and Technologies 17 p Apr. 1993
Copyright Avail: CASI HC A03/MF A03

A review of the role of operator and automation capability analysis in aircrew systems design is provided. The changing perceptions of human and machine functionality with increasing machine capability, from early pilot-in-the-loop control, through to the division and sharing of responsibilities for systems management and mission problem solving, are charted. Concepts for the integration of human and machine resources in the performance of physical and cognitive tasks, including decision-making, are discussed in the context of developments in machine intelligence. Operator capability and task analysis, and the modeling of human performance, are seen to have developed from providing tools for system design, to giving critical support for real-time dynamic function allocation in advanced adaptive systems. A model of cooperative teamwork, with the machine conceived of as an electronic-crew teaming resource, is proposed as broad framework for thinking about future adaptive systems requirements. The results of a recent study of human-electronic crew teamwork with RAF Harrier and Tornado aircrew are reported. The results provide evidence for the validity of the teamwork model, and indicate directions for extending the capability for cooperative functioning in future aircrew adaptive systems. Author (revised)

N93-29329# Pacific Northwest Lab., Richland, WA.
TECHNOLOGY TRANSFER PERSONNEL EXCHANGE AT THE BOEING COMPANY
Z. I. ANTONIAK Mar. 1993 68 p
(Contract DE-AC06-76RL-01830)
(DE93-010190; PNL-8549) Avail: CASI HC A04/MF A01

The objective of the exchange was to transfer Pacific Northwest Laboratory (PNL) technology and expertise in advanced ceramic fabric composites (ACFC) to the Boeing Defense & Space Group (Boeing Aerospace). Boeing Aerospace was especially interested in applying PNL-developed ACFC technology to its current and future spacecraft and space missions. Boeing has on-going independent research and development (R&D) programs on advanced radiators and heat pipes; therefore, PNL research in ceramic fabric heat pipes was of particular interest to Boeing. Thus, this exchange assisted in the transfer of PNL's ACFC heat pipe technology and other related research capabilities to private industrial application. The project was proposed as an initial step in building a long-term collaborative relationship between Boeing and PNL that may result in future Cooperative Research and Development Agreements (CRADA's) and/or other types of collaborative efforts. DOE

N93-29733*# Idaho Univ., Moscow, ID.
EXERCISE/RECREATION FACILITY FOR A LUNAR OR MARS ANALOG
In Universities Space Research Association, Houston, Proceedings of the Seventh Annual Summer Conference. NASA/USRA: University Advanced Design Program p 155-158 1991
Avail: CASI HC A01/MF A03

The University of Idaho, NASA/USRA project for the 1990-91 school year is an exercise/recreation station for an Earth-based simulator of a lunar or martian habitat. Specifically, a stationary bicycle that will help people keep fit and prevent muscular atrophy while stationed in space was designed. To help with motivation and provide an element of recreation during the workout, the bicycle is to be enhanced by a virtual reality system. The system simulates various riding situations, including the choice of a mountain bike or a road bike. The bike employs a magnetic brake that provides continuously changing tension to simulate actual riding conditions. This braking system is interfaced directly with the virtual reality system. Also, integrated into the virtual reality display will be a monitoring system that regulates heart rate, work rate, and other functions during the course of the session. Author

N93-30556# Navy Personnel Research and Development Center, San Diego, CA.
INDEPENDENT RESEARCH AND INDEPENDENT EXPLORATORY DEVELOPMENT PROGRAMS Annual Report, Oct. 1991 - Sep. 1992
WILLIAM E. MONTAGUE Apr. 1993 85 p
(AD-A264735; NPRDC-AP-93-4) Avail: CASI HC A05/MF A01

This report documents research efforts conducted at the Navy Personnel Research and Development Center under the Independent Research/Independent Exploratory Development (IR/IED) program. The FY-92 IR program included the following: Brain Mechanisms and Cognition: Advanced Signal Analysis Using the Wavelet Transform; An Exploratory Examination of Artificial Neural Networks as an Alternative to Linear Regression, Artificial Neural Networks and Training; Individual Differences in Information Acquisition and Processing Style; Cognitive Resources, Performance Feedback, and Decision Processes in a Simulated Work Environment; and The Role of Feedback in Computer-Based Training: Follow-On Work. Progress reports on IED projects included: Effects of Administration Method and Anonymity/Identification on Survey Responses; Biodata and Personality: Are They Related?; and Optimal Enlisted Requisition Model. DTIC

N93-30575# Air Force Systems Command, Brooks AFB, TX. Armstrong Lab.
DETERMINANTS OF PERFORMANCE RATING ACCURACY: A FIELD STUDY Interim Report, Jan. 1990 - Dec. 1992
MARK S. TEACHOUT and TERRY L. DICKINSON Apr. 1993 93 p
(AD-A264726; AL-TP-1993-0010) Avail: CASI HC A05/MF A01

The purpose was to investigate the influence of rater and ratee

characteristics, performance constraints, and rating system acceptability on the accuracy of supervisory performance ratings in a field setting. Participants were 212 raters and 405 ratees across three jobs in the United States Air Force. An hypothesized structural model of rating accuracy was tested using LISREL 7 to determine the relationships among nine latent variables. Although the goodness-of-fit statistics for the model were considered marginal, results indicated that motivation to rate accurately, trust in the appraisal process, rating form acceptability, rater cognitive ability, rater experience, and ratee experience were related to rating accuracy. Interpretations and suggestions for future research were discussed. DTIC

N93-30657# Office of Technology Assessment, Washington, DC.
PROFILES OF MAJOR FEDERAL LITERACY PROGRAMS
N. KOBER Jul. 1992 79 p
(PB93-163863) Avail: CASI HC A05/MF A01

The bulk of Federal funding for adult literacy, as well as the most significant Federal policy guidance, comes from a group of programs that have the following characteristics: have adult literacy or basic skills education as their sole purpose or as one of a limited number of primary purposes; explicitly authorize literacy or basic skills education as a primary means of achieving a related purpose, such as job training or American citizenship; or through Departmental directive, have taken on significant new literacy missions, such as the Head Start family literacy programs. The programs constitute the core of the Federal role in adult education. Together they provide a starting point for understanding the nature, themes, and breadth of the Federal contribution to adult literacy education. NTIS

N93-32110*# Air Force Civil Engineering Center, Tyndall AFB, FL. Civil Engineering Support Agency.
AIR FORCE CONSTRUCTION AUTOMATION/ROBOTICS
A. D. NEASE and E. F. ALEXANDER *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) p 121-130 Feb. 1993
Avail: CASI HC A02/MF A04 44

The Air Force has several missions which generate unique requirements that are being met through the development of construction robotic technology. One especially important mission will be the conduct of Department of Defense (DOD) space activities. Space operations and other missions place construction/repair equipment operators in dangerous environments and potentially harmful situations. Additionally, force reductions require that human resources be leveraged to the maximum extent possible, and more stringent construction repair requirements push for increased automation. To solve these problems, the U.S. Air Force is undertaking a research and development effort at Tyndall AFB, FL, to develop robotic construction/repair equipment. This development effort involves the following technologies: teleoperation, telerobotics, construction operations (excavation, grading, leveling, tool change), robotic vehicle communications, vehicle navigation, mission/vehicle task control architecture, and associated computing environment. The ultimate goal is the fielding of a robotic repair capability operating at the level of supervised autonomy. This paper will discuss current and planned efforts in space construction/repair, explosive ordnance disposal, hazardous waste cleanup, and fire fighting. Author (revised)

N93-32122*# Air Force Systems Command, Kelly AFB, TX. Robotics and Automation Center of Excellence.
RACE PULLS FOR SHARED CONTROL
M. B. LEAHY, JR. and B. K. CASSIDAY *In* NASA. Lyndon B. Johnson Space Center, The Sixth Annual Workshop on Space Operations Applications and Research (SOAR 1992) p 205-211 Feb. 1993
Avail: CASI HC A02/MF A04

Maintaining and supporting an aircraft fleet, in a climate of reduced manpower and financial resources, dictates effective utilization of robotics and automation technologies. To help develop a winning robotics and automation program the Air Force Logistics Command created the Robotics and Automation Center of Excellence (RACE). RACE is a command wide focal point. Race is an organic source of expertise to assist the Air Logistic Center (ALC) product directorates in improving process productivity through the judicious insertion of robotics and automation technologies. RACE is a champion for pulling emerging technologies into the aircraft logistic centers. One of those technology pulls is shared control. Small batch sizes, feature uncertainty, and varying work load conspire to make classic industrial robotic solutions impractical. One can view ALC process problems in the context of space robotics without the time delay. The ALC's will benefit greatly from the implementation of a common architecture that supports a range of control actions from fully autonomous to teleoperated. Working with national laboratories and private industry, we hope to transition shared control technology to the depot floor. This paper provides an overview of the RACE internal initiatives and customer support, with particular emphasis on production processes that will benefit from shared control technology. Author (revised)

N93-32167 International Bank for Reconstruction and Development, Washington, DC.
INFORMATION SYSTEMS STRATEGIES FOR PUBLIC FINANCIAL MANAGEMENT World Bank Discussion Paper
H. M. DAVIES, A. HASHIM, and E. TALERO 1993 58 p
(PB93-186948; WORLD-BANK-DP-193) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

The paper develops a strategic framework for the network of systems required to support Public Financial Management (PFM) consisting of: (1) an information architecture; (2) a systems architecture; and (3) a technology architecture. To derive this framework, the paper uses a methodology that focuses on the business or functional processes within PFM rather than on the institutions that perform them. This ensures that the framework remains valid in spite of organizational changes, and that it can be used as an implementation roadmap over an extended period of time. The paper addresses questions such as: what are the scope, scale, and type of a particular area's system components; how do these elements interrelate; what are the major issues and options associated with the introduction of these systems; and where do the greatest problems and opportunities lie. The paper also discusses some factors that determine the choice of technology for the component modules of the PFM systems network and approaches to some implementation issues. NTIS

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MANAGEMENT OF PROCESS QUALITY

A92-14449
PRODUCIBILITY DEMONSTRATOR PROGRAM - TECHNOLOGICAL PREEMINENCE THROUGH CONCURRENT ENGINEERING
ALEX C. DUBLINSKI (Sikorsky Aircraft, Stratford, CT) AHS, Annual Forum, 47th, Phoenix, AZ, May 6-8, 1991, Paper. 6 p.

The design to costs targets for the next generation of composite aircraft require a significant reduction in fabrication costs. These types of aircraft bring with them additional complexity due to new technical requirements. To achieve these goals, Sikorsky Aircraft formed a multidisciplined concurrent enginering team (CET). The primary objective of the team was to successfully produce a series of low cost, high quality composite components with a repeatable process. The program utilizes a 2D CAD system which allows the transfer of information to all organizations directly involved with the design effort. This system also provides a common data base. This paper highlights the results of the CET, which are: molded integrated structures using cocure processing technology, elastomeric caul/preply tooling, flexible trim and drill fixtures, and thermoplastic structures. Author

A92-15567* Norton Co., Northboro, MA.
CERAMIC COMPONENT PROCESSING DEVELOPMENT FOR ADVANCED GAS-TURBINE ENGINES
B. J. MCENTIRE, R. R. HENGST, W. T. COLLINS, A. P. TAGLIALAVORE, R. L. YECKLEY, E. BRIGHT, and M. G. BINGHAM (Norton/TRW Ceramics, Northboro, MA) ASME, International Gas Turbine and Aeroengine Congress and Exposition, 36th, Orlando, FL, June 3-6, 1991. 9 p. Research supported by NASA, DOE, Norton Co., et al. refs
(ASME PAPER 91-GT-120)

A review of ceramic component advancements directed at developing manufacturing technologies for rotors, stators, vane-seat platforms and scrolls is presented. The first three components are being produced from HIPed Si3N4, while scrolls were prepared from a series of siliconized silicon-carbide materials. Developmental work has been conducted on all aspects of the fabrication process utilizing Taguchi experimental design methods. An assessment of material properties for various components from each process and material are made. R.E.P.

A92-15694
A COMPARISON OF FLUIDS USED TO SUPERABRASIVELY MACHINE A TITANIUM ALLOY
JAMES D. CAMPBELL (Pratt and Whitney Group, East Hartford, CT) ASME, International Gas Turbine and Aeroengine Congress and Exposition, 36th, Orlando, FL, June 3-6, 1991. 8 p. refs
(ASME PAPER 91-GT-321)

The paper compares the creep feed superabrasive machining of an alpha-beta structural titanium alloy, using a water-soluble and a straight oil grinding fluid, in terms of residual stress, specific energy, power flux, and microstructure. The statistical effect of process variables on these criteria was investigated using a Taguchi screening design of experiment. Grinding wheel peripheral velocity, abrasive size, and fluid type were the most important factors contributing to compressive residual stress. After the depth of cut, fluid type contributed the most variation to specific energy and power flux. Both fluids produced testpieces that were microstructurally sound, and were essentially stress free or had favorable compressive residual stress. Author

A92-15715
ADVANCED TURBINE TECHNOLOGY APPLICATIONS PROJECT (ATTAP) - OVERVIEW, AND CERAMIC COMPONENT TECHNOLOGY STATUS
PHILIP J. HALEY (General Motors Corp., Allison Gas Turbine Div., Indianapolis, IN) ASME, International Gas Turbine and Aeroengine Congress and Exposition, 36th, Orlando, FL, June 3-6, 1991. 7 p.
Research sponsored by DOE. refs
(ASME PAPER 91-GT-367)

The NASA-U.S. Department of Energy Advanced Turbine Technology Applications Project (ATTAP) emphasizes the development of cost-effective, near-net-shape, high volume/high yield manufacturing processes for automotive gas turbine structural ceramic components. Process physics modeling and Taguchi analyses have led to substantial progress. Damage tolerance and impact resistance have been substantially addressed through tailored component designs, tougher monolithic ceramics, and greater ceramic strengths. Ceramic-ceramic and ceramic-metal interfacing is being addressed through the minimization of component joint requirements. The extruded ceramic regenerator disk is a continuing goal. O.C.

A92-23825
DESIGNING FOR QUALITY - AN INTRODUCTION TO THE BEST OF TAGUCHI AND WESTERN METHODS OF STATISTICAL EXPERIMENTAL DESIGN
ROBERT H. LOCHNER and JOSEPH E. MATAR (Marquette University, Milwaukee, WI) White Plains, NY, Quality Resources, 1990, 249 p. refs
(ISBN 0-527-91633-1)
Copyright

The present work attempts to show engineers with little or no previous experimental design how to use statistically-designed experiments to improve products and processes, primarily according to quality-control principles developed by Genichi Taguchi. Attention is given to full-factorial and fractional factorial designs in two-level experiments, the evaluation of variability, and experimental design for factors at three and four levels. Also treated are Taguchi inner and outer arrays, variance-analysis in engineering design, computer software for experimental design, and the experimental improvement of processes. O.C.

A92-25289
ANALYSIS OF THE SHAPE OF THE MULTIDIMENSIONAL DOMAIN OF OPTIMIZED COMPOSITE PROPERTIES [ANALIZ FORMY MNOGOMERNOI OBLASTI SVOISTV OPTIMIZIRUEMOGO KOMPOZITA]
A. F. KREGERS and M. F. REKTIN'SH (AN Latvii, Institut Mekhaniki Polimerov, Riga, Latvia) *Mekhanika Kompozitnykh Materialov* (ISSN 0203-1272), Sept.-Oct. 1991, p. 876-884. In Russian. In RUSSIAN refs
Copyright

The problem of the multifactorial optimization of five composite properties (three elastic moduli and two thermal expansion coefficients) is solved for a layered composite with three reinforcement directions. Particular attention is given to a method for determining the coordinates of the end points defining the dimensions of the five-dimensional region and to a procedure for constructing projections of the five-dimensional region onto a specified plane, with identification of Pareto's optimality subregions. V.L.

A92-28875
COMPUTATIONAL FLUID DYNAMICS AND AIRCRAFT DESIGN
Aerospace Engineering (ISSN 0736-2536), vol. 12, March 1992, p. 24-29.
Copyright

An evaluation is made of the potential contributions of CFD tools to concurrent engineering design efforts associated with civil subsonic (and prospective supersonic) airliners. Attention is presently given to the use of Navier-Stokes codes handling up to 1 million grid points in 2-3 hrs of computation time in airfoil/wing-design applications; in selected areas of a given wing, it is possible to use high-resolution grids to resolve the finest details of flow. To date, turbulence modeling remains a major obstacle to the accomplishment of greater CFD accuracy. Attention is given to the aerodynamic performance of a high-lift flap system on landings and takeoffs. O.C.

A92-32538
THE ROLE OF SCALE EFFECTS AND QFD IN INTEGRATED DESIGN FOR COMPOSITES
VISTASP M. KARBHARI (Delaware, University, Newark), JOHN M. HENSHAW (Tulsa, University, OK), and DICK J. WILKINS (Delaware, University, Newark) IN: Composites; Proceedings of the 8th International Conference on Composite Materials (ICCM/8), Honolulu, HI, July 15-19, 1991. Section 1-11 1991 12 p refs

Motivation for the use of concurrent engineering in general and for composites in particular is developed. The concept of scale is briefly described and illustrated with examples of shape, microstructural, processing, and production volume scales. Scale is proposed as a way of relating traditional and difficult-to-relate aspects of design that must form the basis for an integrated engineering approach to composites. Quality Function Deployment (QFD) is briefly introduced and related to the authors' own concurrent engineering methodology, Total Quality Design (TQD). The five fundamental elements of TQD (definition, customers and customer wants, benchmarking, concepts, and go/no-go reviews) are introduced. Finally, the links between QFD and TQD are described in the areas of customer wants, benchmarking, and concepts. Author

A92-33234#
THE FUTURE OF DESIGN INTEGRATED COST MODELING
CLAUS J. MEISL (Rockwell International Corp., Rocketdyne Div., Canoga Park, CA) AIAA, Aerospace Design Conference, Irvine, CA, Feb. 3-6, 1992. 16 p. refs
(AIAA PAPER 92-1056) Copyright

Concurrent-engineering and design-to-life-cycle-cost practices make use of design function-integrated cost models. More recent models attempt to incorporate a modular/hierarchical structure suitable for the synthesis of design concepts having different degrees of component-definition fidelity, as well as the ability to do cost-optimization for design-to-cost applications and the inclusion of quantifiable uncertainties as to technical, programmatic, and cost parameters. These models may also encompass some form of 'knowledge engineering' to capture the expertise of experienced engineers. Attention is given to the generic architecture of a cost model with design analysis-embedded costing. O.C.

A92-33235*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
ELEMENTS OF DESIGNING FOR COST
EDWIN B. DEAN (NASA, Langley Research Center, Hampton, VA) and RESIT UNAL (Old Dominion University, Norfolk, VA) AIAA, Aerospace Design Conference, Irvine, CA, Feb. 3-6, 1992. 8 p. refs
(AIAA PAPER 92-1057)

During recent history in the United States, government systems development has been performance driven. As a result, systems within a class have experienced exponentially increasing cost over time in fixed year dollars. Moreover, little emphasis has been placed on reducing cost. This paper defines designing for cost and presents several tools which, if used in the engineering process, offer the promise of reducing cost. Although other potential tools exist for designing for cost, this paper focuses on rules of thumb, quality function deployment, Taguchi methods, concurrent engineering, and activity-based costing. Each of these tools has been demonstrated to reduce cost if used within the engineering process. Author

A92-33265*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
PRELIMINARY STRUCTURAL DESIGN OF A LUNAR TRANSFER VEHICLE AEROBRAKE
LANCE B. BUSH (NASA, Langley Research Center, Hampton, VA) and RESIT UNAL (Old Dominion University, Norfolk, VA) AIAA, Aerospace Design Conference, Irvine, CA, Feb. 3-6, 1992. 13 p. refs
(AIAA PAPER 92-1108) Copyright

An aerobrake for a lunar transfer vehicle was designed through the use of the Taguchi design method, structural finite element analyses, and structural sizing routines. A minimum weight aerobrake structural configuration was the objective of the study. Six design parameters were chosen to represent the aerobrake structural configuration. The design parameters included honeycomb core thickness, diameter-to-depth ratio, shape, material, number of concentric ring frames and number of radial frames. Each parameter had 3 levels. The optimum aerobrake configuration resulting from the study was approximately half the weight of the average of all the other experimental configurations. The parameters having the most significant impact on the aerobrake structural weight were identified. Author

A92-33269#
MULTIDISCIPLINARY DESIGN ENVIRONMENT DEVELOPMENT FOR AIR VEHICLE ENGINEERING
J. A. VOLK (Northrop Corp., Flight Loads and Dynamics Technology Div., Pico Rivera, CA) AIAA, Aerospace Design Conference, Irvine, CA, Feb. 3-6, 1992. 8 p. Research supported by Northrop Corp.
(AIAA PAPER 92-1113) Copyright

An account is given of a proprietary effort to develop and implement a highly integrated engineering analytic-systems environment, using the USAF's recently concluded ATF competition as a pilot program. The initial goal chosen for this engineering environment, designated the Rapid Multidisciplinary Computational Method, or 'RAMCOMP', was the significant reduction of design-cycle time for the ATF. Attention is given to the illustrative application of RAMCOMP to fighter maneuver-loads analysis, which entails strongly interdisciplinary interactions among design team members. O.C.

A92-33285*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
COMPUTATIONAL SIMULATION OF CONCURRENT ENGINEERING FOR AEROSPACE PROPULSION SYSTEMS
C. C. CHAMIS (NASA, Lewis Research Center, Cleveland, OH) and S. N. SINGHAL (Sverdrup Technology, Inc., Cleveland, OH) AIAA, Aerospace Design Conference, Irvine, CA, Feb. 3-6, 1992. 12 p. refs
(AIAA PAPER 92-1144) Copyright

Results are summarized of an investigation to assess the infrastructure available and the technology readiness in order to develop computational simulation methods/software for concurrent engineering. These results demonstrate that development of computational simulations methods for concurrent engineering is timely. Extensive infrastructure, in terms of multi-discipline simulation, component-specific simulation, system simulators, fabrication process simulation, and simulation of uncertainties - fundamental in developing such methods, is available. An approach is recommended which can be used to develop computational simulation methods for concurrent engineering for propulsion systems and systems in general. Benefits and facets needing early attention in the development are outlined. Author

A92-38324
QUALITY ASSURANCE AND TOLERANCE
GUENTER KIRSCHLING (Kassel, Universitaet, Federal Republic of Germany) Berlin and New York, Springer-Verlag, 1991, 343 p. Translation. refs
(ISBN 0-387-53258-7) Copyright

The book offers a comprehensive presentation of tolerance problems and their solution by statistical methods. The discussion covers the most important concepts of quality control, statistics, dimensions, and tolerances; probability distributions of quantitative characteristics; mathematical and graphical evaluation of dimensional series; and relationship between tolerances and production distributions. Attention is also given to tolerance calculation using square law, statistical tolerance calculation of individual values with trapezoid distribution or with triangular distribution; the tolerance model; assessment of completed batches and production batches; and process control. V.L.

A92-38639#
INTEGRATING SYSTEMS ENGINEERING WITH ENTERPRISE MANAGEMENT
MICHAEL WETZER (Andersen Consulting, Los Angeles, CA) AIAA, Space Programs and Technologies Conference, Huntsville, AL, Mar. 24-27, 1992. 10 p. refs
(AIAA PAPER 92-1543) Copyright

System engineering and enterprise management are evolving as competitive business tools for the mid-'90s and beyond. Fundamental interdependencies exist between these two concepts which must become active parts of implementation objectives to make either succeed. To utilize either independently has shown only marginal net improvements in the litmus tests of ultimate business performance: schedule, cost, and quality. Author

A92-43156
QUALITY MANAGEMENT OF LANDING GEAR WITH PULLING SUPPORT SYSTEM
M. NIKAI (Japan Air System, Tokyo) IN: Aircraft Symposium, 28th, Tokyo, Japan, Nov. 7-9, 1990, Proceedings 1990 4 p In JAPANESE

The maintenance of aircraft landing gear is discussed. Systems for the quality management are given and the pulling support system is emphasized. The quality inspection and landing gear overhaul operation is outlined. Y.P.Q.

A92-43246
STRINGER SUBSYSTEM AUTOMATION
KIYATAKA ABE and W. TANABE (Kawasaki Heavy Industries, Ltd., Kobe, Japan) IN: Aircraft Symposium, 28th, Tokyo, Japan, Nov. 7-9, 1990, Proceedings 1990 4 p In JAPANESE

A test facility for stringer subsystem automation is described. Test results are analyzed, including positioning accuracy and processing quality. Y.P.Q.

A92-44620
EFFECTS OF PROCESSING VARIABLES ON THE QUALITY OF CO-CURED SANDWICH PANELS
PIERRE JOUIN, DAVID POLLOCK, and ED RUDISILL (McDonnell Douglas Helicopter Co., Mesa, AZ) IN: Composite materials: Testing and design. Vol. 10; Proceedings of the 10th Conference, San Francisco, CA, Apr. 24, 25, 1990 1992 15 p refs
Copyright

This paper summarizes basic studies conducted to compare the effects of various processes and materials on the quality of co-cured honeycomb sandwich panels with carbon-epoxy facings. Manipulation of the vacuum-pressure-temperature schedules of those processes resulted in improved facing surface quality, compaction, and sealing. The mechanical properties of those panels also improved. Author

A92-45252
ADVANCED COMPOSITE MATERIAL QUALIFICATION-USER PRODUCER INTEGRATION
MARK A. WILHELM (Boeing Commercial Airplane Group, Seattle, WA) Society of Manufacturing Engineers, Composites in Manufacturing Conference, 10th, Anaheim, CA, Jan. 7-10, 1991. 9 p.
(SME PAPER EM91-101) Copyright

A close working relationship between the producer and the user applicable to the fabrication of advanced composite materials is critical to success. As the use of advanced composite materials becomes more widespread, the user/producer integration will become even more important to insure successful implementation of reduced cost fabrication processes that will result in lower-cost end-items. Comparing results generated during times of poor user/producer integration, with times of good integration, clearly demonstrates the benefits of the latter approach. Specific procedures used to develop the integration have evolved during the past decade to become an integral part of the process used to qualify materials to advanced composite material specifications. Author

A92-45440
INTEGRATED WIRING SYSTEM
V. E. SAUCEDO (Lockheed Advanced Development Co., Burbank, CA) IN: International Pacific Air and Space Technology Conference and Aircraft Symposium, 29th, Gifu, Japan, Oct. 7-11, 1991, Proceedings 1991 7 p
(SAE PAPER 912058) Copyright

The Lockheed Integrated Wiring System (IWS) is presented. This computer-based system features a single-source data base that is used for all design, documentation, fabrication, and testing of aircraft wiring. This single-source data base ensures that items are manufactured to match all engineering specifications. This application of concurrent engineering minimizes the transmittal or errors, reduces the time required for design, planning and mockup, ensures a coordinated effort among the affected divisions, and provides high-quality documentation. C.A.B.

A92-48379
STATISTICAL PROCESS CONTROL FOR TOTAL QUALITY
SYED W. ALI (Johns Hopkins University, Laurel, MD) *Johns Hopkins APL Technical Digest* (ISSN 0270-5214), vol. 13, no. 2, Apr.-June 1992, p. 317-325. refs
Copyright

The paper explains the techniques and applications of statistical process control (SPC). Examples of control charts used in the Poseidon program of the NASA ocean topography experiment (TOPEX) and a brief discussion of Taguchi methods are presented. It is noted that SPC involves everyone in process improvement by providing objective, workable data. It permits continuous improvement instead of merely aiming for all parts to be within a tolerance band. L.M.

A92-49576
HIGH-QUALITY METAL MATRIX COMPOSITE PRODUCED UNDER LOW PRESSURE
HAOWEI WANG, BAOLU SHANG, and YAOHE ZHOU (Northwestern Polytechnical University, Xian, People's Republic of China) *Northwestern Polytechnical University, Journal* (ISSN 1000-2758), vol. 10, no. 3, July 1992, p. 279-284. In Chinese. Jul. 1992 6 p In CHINESE refs

High pressure (100-1000 MPa) is replaced with low pressure (0.5-1.5 MPa) in the production of a high-quality metal matrix composite (MMC), with complete infiltration of the reinforcement. The main obstacles to making a high-quality MMC are poor wettability between metal and reinforcement, and chemical damage of the reinforcement. The present theoretical analysis indicates that high pressure is needed solely for an extremely minute part of the space between reinforcemnts. This space is filled by controlling the morphology of the nonmetal used in the thin layers of coating. High pressure is no longer needed, and both mechanical and chemical damage is averted. P.D.

A92-54494
COMPUTER CONTROLLED PROCESSING OF COMPOSITES UTILIZING DIELECTRIC SIGNATURE CURVES
L. B. KELLER and MARTY DOMINSKI (Ketema/Programmed Composites, Inc., Brea, CA) *SAMPE Journal* (ISSN 0091-1062), vol. 28, no. 5, Sept.-Oct. 1992, p. 25-27, 29-33. refs
(Contract DAAH01-89-C-0348)
Copyright

Three composite materials for aircraft applications are experimentally developed by using automated computer control of the autoclave fabrication process. The computer-control methodology is an expert system based on data regarding the correlation of dielectric information and physicochemical changes in polymer matrices during processing. Thermal and rheological analyses are conducted with thermocouples and dielectric sensors, and real-time data are sent to the computer to control the autoclave processing. Sample laminates including PEEK APC-2/AS-4, SC-1008 phenolic, and PMR-15 polyimide are studied for density, resin/void content, and fiber volume. Critical process events are identified which contribute to the production of high-quality composites, and the process-control technique is shown to reduce scrap and enhance uniformity in the samples. The study demonstrates the utility of dielectric signature curves as the basis for computer-controlled composite processing. C.C.S.

A92-57218
BRILLIANT EYES - DEVELOPING SMALL SPACE SYSTEMS IN A NEW ENVIRONMENT
JOHN R. LONDON, III (USAF, Center for Aerospace Doctrine, Maxwell AFB, AL), JACK R. WEISSMAN (Aerospace Corp., Los Angeles, CA), and R. C. MCNEIL (USAF, Material Command, Wright-Patterson AFB, OH) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 9 p.
(IAF PAPER 92-0820) Copyright

The system design and development process for the Brilliant Eyes (BE) satellite constellation are described focussing on the managerial strategy. Two primary management techniques - the cost-engineering model and total quality management - are the key control techniques for driving the design and development tactics. Spacecraft qualification and design quality are incorporated into the integrated product development, and the program also utilizes such concepts as technical risk management, schedule-risk mitigation, manufacturability/reproducibility considerations, and qualified manufacturing lines. The techniques employed are

described with examples to illustrate an efficient method for aerospace development and acquisition on a complex project. C.C.S.

A93-11980* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
COST-ESTIMATING RELATIONSHIPS FOR SPACE PROGRAMS
HUMBOLDT C. MANDELL, JR. (NASA, Johnson Space Center, Houston, TX) *In* Space economics Washington American Institute of Aeronautics and Astronautics 1992 p. 57-87. refs
Copyright

Cost-estimating relationships (CERs) are defined and discussed as they relate to the estimation of theoretical costs for space programs. The paper primarily addresses CERs based on analogous relationships between physical and performance parameters to estimate future costs. Analytical estimation principles are reviewed examining the sources of errors in cost models, and the use of CERs is shown to be affected by organizational culture. Two paradigms for cost estimation are set forth: (1) the Rand paradigm for single-culture single-system methods; and (2) the Price paradigms that incorporate a set of cultural variables. For space programs that are potentially subject to even small cultural changes, the Price paradigms are argued to be more effective. The derivation and use of accurate CERs is important for developing effective cost models to analyze the potential of a given space program. C.C.S.

A93-12748
TIME-TEMPERATURE EQUIVALENCE IN THERMOGRAVIMETRY FOR BMI COMPOSITES
I. M. SALIN, J. C. SEFERIS (Washington Univ., Seattle), C. L. LOECHELT, and R. ROTHSCHILDS (Boeing Commercial Airplane Group, Seattle, WA) SAMPE Quarterly (ISSN 0036-0821) vol. 24, no. 1 Oct. 1992 p. 54-63. Research supported by Boeing Commercial Airplane Group and Du Pont de Nemours & Co refs
Copyright

Bismaleimide (BMI) neat resin and composite degradation was analyzed with isothermal and dynamic TGA in air and nitrogen, adapting a descriptive time-temperature concept originally developed for the curing of thermosets. As in time-temperature superposition, only one parameter (the activation energy) was required in addition to reference data. Activation energies were determined from isothermal data at constant conversion and then used to predict both isothermal and dynamic data. The concept, defined as equivalent property time, successfully predicted weight loss at all experimental conditions used up to 6 percent and 15 percent weight loss for composite and neat resin, respectively. Consequently, this methodology has a potential to be a useful tool in designing aging experiments and assessing lifetime of composite systems. Author

A93-14199
RELIABILITY EVALUATION FOR A MULTISTATE DISPLAY AND CONTROL SYSTEM
JIAJUN SHAO and JIN LIU (Chengdu Aircraft Corp., Engineering Development Center, China) *In* ICAS, Congress, 18th, Beijing, China, Sept. 20-25, 1992, Proceedings. Vol. 1 Washington American Institute of Aeronautics and Astronautics, Inc. 1992 p. 354-360. refs
Copyright

A multilevel modular decomposition method is employed to analyze and evaluate the reliability of a multistate display and control system. The multistate reliability problem of a system with built-in-test (BIT) is solved using this method. It is pointed out that the miltistate reliability is corresponding to the concept of quality loss function or the deviation from an ideal or target value. The possibility to improve the multistate system reliability with robust design methodology is discussed. Author

A93-15802
THERMOPLASTICS-MOVING INTO SERIES PRODUCTION
ARNT R. OFFRINGA (Fokker Special Products, AB, Hoogeveen, Netherlands) *In* International SAMPE Symposium and Exhibition, 37th, Anaheim, CA, Mar. 9-12, 1992, Proceedings Covina, CA Society for the Advancement of Material and Process Engineering 1992 p. 1028-1039. refs
Copyright

Continuous fiber reinforced thermoplastic products are gradually moving from the development phase into series production. The relative simplicity and cost-effectiveness of a number of innovative manufacturing technologies provides the incentive for their application. Examples of technologies developed and in production are thermofolding, deep-drawing, press forming, transition molding and welding. These manufacturing methods are dependable and reproducible. The development of a product must be closely tuned to its final application. Therefore, close cooperation between the part manufacturer, the material supplier and the end-user is essential. Thermoplastics are presently applied in a number of civil aircraft programs in both structural and non-structural components. Examples are aircraft flap ribs, ice protection plates and wing panels. Author

A93-19371
ACHIEVING MANUFACTURING EXCELLENCE FOR GAS TURBINE COMPONENTS THROUGH FOCUSED IMPLEMENTATION OF TECHNOLOGY
CHESTER HAYNER (Pratt & Whitney Group, Manufacturing Engineering and Support Services, Southington, CT) Jun. 1992 7 p. ASME, International Gas Turbine and Aeroengine Congress and Exposition, 37th, Cologne, Germany, June 1-4, 1992
(ASME PAPER 92-GT-139)

This paper explains how focused implementation of a broad range of technologies was used as the key strategy resulting in the establishment of highly efficient, dedicated facility for manufacture of gas turbine disk, hub, and drum rotor components. The physical and operational constraints associated with the conversion of an existing operating facility, along with the rigid time constraints, required a carefully phased and integrated plan. Reviews and tradeoffs of each of the many available manufacturing technologies are discussed and those selected, such as flowline units, group technology, rule based design/manufacturing and product improvement teams are explained in the context of their implementation phase-in. Before and after performance results are provided and ongoing enhancements of this manufacturing system are covered. Author

A93-19446
FLEXIBLE MANUFACTURING OF AIRCRAFT ENGINE PARTS
OSSAMA M. HASSAN and DOUGLAS M. JENKINS (GE Aircraft Engines, Lynn, MA) Jun. 1992 10 p. ASME, International Gas Turbine and Aeroengine Congress and Exposition, 37th, Cologne, Germany, June 1-4, 1992 refs
(ASME PAPER 92-GT-229)

GE Aircraft Engines, a major supplier of jet engines for commercial and military aircraft, has developed a fully integrated manufacturing facility to produce aircraft engine components in flexible manufacturing cells. This paper discusses many aspects of the implementation including process technologies, material handling, software control system architecture, socio-technical systems and lessons learned. Emphasis is placed on the appropriate use of automation in a flexible manufacturing system. Author

A93-21747
DESIGNING DESIGN PROCESSES IN DECISION-BASED CONCURRENT ENGINEERING
BERT BRAS and FARROKH MISTREE (Houston Univ., TX) *In* Aerospace product/process design interface Warrendale, PA Society of Automotive Engineers, Inc. 1991 p. 15-36. SAE, Aerospace Technology Conference and Exposition, Long Beach, CA, Sept. 23-26, 1991 Research supported by Maritime Research Inst. Netherlands, BF Goodrich Co., NSF, et al refs
(SAE PAPER 912209) Copyright

The ability to represent design processes on a computer facilitates their analysis and debugging prior to implementation; debugging eliminates redundancies and inconsistencies, while identifying subprocesses that are sufficiently mutually independent to allow concurrent implementation. An account is presently given of ways in which design processes can be computer-modeled, with a view to the definition of concurrent-engineering processes. O.C.

A93-21748
THE DEVELOPMENT AND IMPLEMENTATION OF A COMPREHENSIVE CONCURRENT ENGINEERING METHOD - THEORY AND APPLICATION
S. DESA and JAMES M. SCHMITZ (Carnegie Mellon Univ., Pittsburgh, PA) *In* Aerospace product/process design interface Warrendale, PA Society of Automotive Engineers, Inc. 1991 p. 37-45. SAE, Aerospace Technology Conference and Exposition, Long Beach, CA, Sept. 23-26, 1991 refs
(SAE PAPER 912210) Copyright

It is proposed that a complete concurrent-engineering (CE) development method must have its basis in three fundamental concepts: the removal of guesswork, the establishment of explicit cause-effect links from design specifications to development costs and their results, and the establishment of a standard forum for communication between development-stage experts. The difficulties inherent in such an ideal CE system's implementation lead to the formulation of a 'virtual' CE method that extensively employs automated design evaluation and computer-generated design modifications to optimize development costs, times, and reliability. O.C.

A93-21943
DIMENSIONAL CONTROL OF POLYMER COMPOSITE LAMINATE
MING-YANG CHEN, SHIH-MING CHEN, LONG-ZENG ZENG, and JONG-PYNG CHEN (Industrial Technology Research Inst., Hsinchu, Taiwan) *MRL Bulletin of Research and Development* (ISSN 1010-2744) vol. 6, no. 1 May 1992 p. 23-27. Research supported by Ministry of Economic Affairs of Taiwan refs
Copyright

In order to manufacture high quality composites, the dimensional control of composite laminate is required. Composite laminate dimension is greatly affected by curing processing parameters such as applied pressure, heat-up rate, bleeder quantities, and temperature. This paper investigates the dimensional stability of a C/E composite laminate under autoclave curing conditions by using the economical and highly reproducible Taguchi Method. The optimum curing conditions for stabilizing the laminate thickness were obtained from dynamic characteristic analysis. An equation accurately predicting the laminate thickness was postulated after analyzing the experimental data with the statistical method. Author

A93-21948
AN INTELLIGENT KNOWLEDGE BASED APPROACH FOR THE AUTOMATED RADIOGRAPHIC INSPECTION OF CASTINGS
A. KEHOE and G. A. PARKER (Surrey Univ., Guildford, United Kingdom) NDT & E International (ISSN 0963-8695) vol. 25, no. 1 1992 p. 23-36. Research supported by Royal Ordnance, PLC refs
Copyright

An automated system for the radiographic inspection of castings is described which is based on both conventional image processing techniques and intelligent knowledge based techniques for the identification and evaluation of defects against quality assurance standards. An evaluation of the performance of the system against that of skilled inspectors demonstrates that the system is capable of meeting the requirements for an automated system for industrial radiographic inspection. The overall design of the system and elements of the system, including the knowledge representation scheme, inference mechanism, and control structure, are described. The discussion also covers examples of frame structures, frame taxonomies, data driven maintenance procedures, and rules for classification and evaluation. V.L.

A93-23018#
TOTAL QUALITY MANAGEMENT IN CURRICULUM DEVELOPMENT
ROBERT C. WINN and ROBERT S. GREEN (U.S. Air Force Academy, Colorado Springs, CO) Jan. 1993 6 p. AIAA, Aerospace Sciences Meeting and Exhibit, 31st, Reno, NV, Jan. 11-14, 1993 refs
(AIAA PAPER 93-0326)

The principles of Total Quality Management are briefly described focusing on the importance of identifying the customer and analyzing the processes. The 14 points of Dr. W. Edwards Deming, which form a framework for the implementation of the TQM are individually applied to the academic environment based on the experience gained at the Air Force Academy. It is noted that the key elements to a successfull TQM implementation include gain of the support in the chain of supervision, identification of customers, focus on the process, and Deming's 14 points as a guide and checklist during the implementation process. O.G.

A93-33152
HEURISTIC PLANNING IN FEATURE-BASED INSPECTION FOR COORDINATE MEASURING MACHINES
ROBERT B. DELVALLE (Case Western Reserve Univ., Cleveland; Wisdom Systems, Inc., Pepper Pike, OH), KAVOUS ROUMINA (Case Western Reserve Univ., Cleveland, OH), STEVE RUEGSEGGER (USAF, Materials Lab., Wright-Patterson AFB, OH), and FRANCIS MERAT (Case Western Reserve Univ., Cleveland, OH) *In* Applications of artificial intelligence 1993: Knowledge-based systems in aerospace and industry; Proceedings of the Meeting, Orlando, FL, Apr. 13-15, 1993 Bellingham, WA Society of Photo-Optical Instrumentation Engineers 1993 p. 341-355. Research supported by USAF refs
Copyright

This system is a practical application of intelligent reasoning about the planning and sequencing of inspection tasks performed by a coordinate measuring machine (CMM). This research is part of an Air Force supported effort to develop a feature-based concurrent engineering system using an object-oriented development platform. Manipulation of design, manufacturing, and inspection features (in this system) is unique in that features are transformed into domain specific objects rather than degraded into elementary geometry. The object-oriented platform provides a means for transformation through built-in qualities such as inheritance, tree-search, and a cohesive part/sub-part organization. Inspection features represent not only geometry, but references to a world coordinate system, proper probe approach, and preferred evaluation method. Reasoning through inspection rules forms a single data object which can then be transformed into CMM executable code. Author

A93-36025
BLADE TWIST-DESIGN OF EXPERIMENT
P. N. FLETCHER (Bell Helicopter Textron, Inc., Fort Worth, TX) Jun. 1992 14 p. AHS, Annual Forum, 48th, Washington, June 3-5, 1992, Paper

A Model 406 composite main rotor blade for the OH58D has, by design, a relatively low torsional stiffness when compared to a V-22, 214ST, or 222 blade. An unacceptable blade twist rejection was being experienced during blade manufacture. After initiating SPC on blade components and conducting cure cycle tests, it was determined that there was a direct correlation between cure cycle and blade twist in a blade with this degree of torsional stiffness. This case study, a design of experiment, is designed to optimize the cure cycle, and discuss the events leading up to and execution of the Taguchi-style (L8) design of experiment using a 48-blade population. The paper also contains a discussion of noise factors that were monitored during the experiment and the improved results achieved. Author

A93-37911
ACCURATE MEASUREMENT OF THE Q FACTOR OF AN OPEN RESONATOR IN THE W-BAND FREQUENCY RANGE
R. K. MONGIA and R. K. ARORA (Florida Agricultural and Mechanical Univ.; Florida State Univ., Tallahassee) *Review of Scientific Instruments* (ISSN 0034-6748) vol. 63, no. 8 Aug. 1992 p. 3877-3880. refs

It is important to be able to measure accurately the Q factor of an open resonator to compute loss tangent of low-loss dielectric materials. In this paper, we report the results of the heterodyne detection technique used to measure the Q factor of an open resonator in the W-band frequency range. A more general algorithm is used for determining the Q factor. This algorithm offers some advantages over the commonly used 'half-power frequencies' method of measurement of the Q factor. The effect of SNR on the accuracy of measurement of the Q factor is experimentally studied. It is shown that with the set up used, it is possible to measure the Q factor to an accuracy of better than 1 percent. Author (revised)

A93-37989
MMCS BY PLASMA SPRAYING
EDOARDO PROVERBIO, TEODORO VALENTE, FABIO CARASSITI, and RANIERI CIGNA (Roma I, Univ., Rome, Italy) *In* Advanced structural inorganic composites Amsterdam and New York Elsevier 1991 p. 717-726. refs

The present evaluation of the development status of plasma-spraying techniques for the formation of metal-matrix composite unidirectional prepreg tapes notes that these methods allow substantial decreases in the product cost/quality ratio by eliminating processing stages and allowing widespread use of automation. Plasma spraying is also noted to prevent matrix oxidation and minimize interfacial reactions (through minimization of reaction times), as well as to favor the use of continuous fibers. AIAA

A93-44565 National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
EFFECTS OF PROCESS VARIABLES ON THE PROPERTIES OF YBA2CU3O(7-X) CERAMICS FORMED BY INVESTMENT CASTING
M. W. HOOKER, T. D. TAYLOR, H. D. LEIGH (Clemson Univ., SC), S. A. WISE, J. D. BUCKLEY, P. VASQUEZ, G. M. BUCK, and L. P. HICKS (NASA, Langley Research Center, Hampton, VA) *IEEE Transactions on Applied Superconductivity* (ISSN 1051-8223) vol. 3, no. 1, pt. 3 March 1993 p. 1154-1156. 1992 Applied Superconductivity Conference, Chicago, IL, Aug. 23-28, 1992, Proceedings. Pt. 2. A93-44558 18-33 refs (Contract NGT-50548)

An investment casting process has been developed to produce net-shape, superconducting ceramics. In this work, a factorial experiment was performed to determine the critical process parameters for producing cast YBa2Cu3O7 ceramics with optimum properties. An analysis of variance procedure indicated that the key variables in casting superconductive ceramics are the particle size distribution and sintering temperature. Additionally, the interactions between the sintering temperature and the other process parameters (e.g., particle size distribution and the use of silver dopants) were also found to influence the density, porosity, and critical current density of the fired ceramics. Author

A93-44638
A SUPERCONDUCTIVE INTEGRATED CIRCUIT FOUNDRY
L. A. ABELSON, S. L. THOMASSON, J. M. MURDUCK, R. ELMADJIAN, G. AKERLING, R. KONO, and H. W. CHAN (TRW Space & Technology Group, Redondo Beach, CA) *IEEE Transactions on Applied Superconductivity* (ISSN 1051-8223) vol. 3, no. 1, pt. 4 March 1993 p. 2043-2049. 1992 Applied Superconductivity Conference, Chicago, IL, Aug. 23-28, 1992, Proceedings. Pt. 3. A93-44612 18-33 refs

A foundry has been established for production of superconductive integrated circuits, modeled after semiconductor application-specific integrated circuit (IC) production. The foundry supports and improves standardized Nb-based IC processing, and develops advanced processes such as a novel NbN-based process. The authors discuss the operation of the foundry, standardized process technologies, design rules, process flows, in-line product tracking, statistical process control, and automated parametric testing. The advantages of fine-line lithography and a class 10/100 environment are presented. Internal and external customer support with standard layout and circuit design tools enables reliable, quick turnaround production of a wide range of circuits. Finally, the authors present examples of concurrent device and process development towards improved, denser circuits, while maintaining a disciplined foundry environment. Author

A93-46463* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
A REFERENCE ARCHITECTURE FOR THE COMPONENT FACTORY
VICTOR R. BASILI, GIANLUIGI CALDIERA (Maryland Univ., College Park), and GIOVANNI CANTONE (Napoli, Univ., Naples, Italy) *ACM Transactions on Software Engineering and Methodology* (ISSN 1049-331X) vol. 1, no. 1 Jan. 1992 p. 53-80. refs
(Contract NSG-5123; N00014-87-K-0037; CNR-89,00052,69)

Software reuse can be achieved through an organization that focuses on utilization of life cycle products from previous developments. The component factory is both an example of the more general concepts of experience and domain factory and an organizational unit worth being considered independently. The critical features of such an organization are flexibility and continuous improvement. In order to achieve these features we can represent the architecture of the factory at different levels of abstraction and define a reference architecture from which specific architectures can be derived by instantiation. A reference architecture is an implementation and organization independent representation of the component factory and its environment. The paper outlines this reference architecture, discusses the instantiation process, and presents some examples of specific architectures by comparing them in the framework of the reference model.

A93-49632* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
THE MARSHALL AUTOMATED WELD SYSTEM (MAWS)
CAROLYN K. RUSSELL, KIRBY G. LAWLESS, and A. C. NUNES (NASA, Marshall Space Flight Center, Huntsville, AL) *In* TABES 93 - Annual Technical and Business Exhibition and Symposium, 9th, Huntsville, AL, May 11, 12, 1993, Submitted Papers Huntsville, AL Huntsville Association of Technical Societies 1993 7 p. refs
(TABES PAPER 93-602) Copyright Avail: Issuing Activity (National Technical Information Service (NTIS))

A fully automated welding system, which can operate totally independent of human intervention, is currently unavailable in the welding industry. Development of the Marshall Automated Weld System (MAWS) has been undertaken to fill this void. The system will enable application of statistical process control practices to assure weld quality prior to post weld nondestructive testing. The Variable Polarity Plasma Arc (VPPA) welding process has been baselined for MAWS because it has eliminated process related defects in the welding of the Space Shuttle External Tank. The few remaining weld defects occurring on the tank can be associated with human error. The system integrates multiple sensors (providing real time information on weld bead geometry, weld joint location, wirefeed entry, and inert gas quality) with a weld model (describing weld geometry in relation to critical parameters) and computer-controlled VPPA weld equipment. This system is designed to provide real-time, closed-loop control of the weld as it is being made.

A93-50352
THE WELL MADE ENGINE
JIM KEIR (Rolls-Royce, PLC, Aerospace Group, Derby, United Kingdom) *Aerospace* (UK) (ISSN 0305-0831) vol. 20, no. 6 June 1993 p. 32-35.

An account is given of high-value-adden manufacturing processes and quality management practices developed by a major turbine engine manufacturer, such as the concurrency of product design and manufacturing process development. The production facilities thus evolved are composed of 'cells' where similar components are grouped together, allowing a concentration of relevant worker and supervisor skills. AIAA

A93-50950
ADVANCED GENERATING TECHNOLOGIES - MOTIVATION AND SELECTION PROCESS IN ELECTRIC UTILITIES
MURTY P. BHAVARAJU (Public Service Electric and Gas Co., Newark, NJ) IEEE, Proceedings (ISSN 0018-9219) vol. 81, no. 3 March 1993 p. 480-485. refs
Copyright

Electric utilities are constantly seeking advanced methods for generating electricity to meet the future demand. The primary motivation for the development of advanced technologies is to generate electricity with minimum damage to the environment and with resources that are abundant. The utility planner evaluates the role of these technologies in the future system considering both quantifiable and nonquantifiable benefits and risks involved.

N92-10043*# National Academy of Sciences - National Research Council, Washington, DC. Commission on Engineering and Technical Systems.
THE SPACE SHUTTLE ADVANCED SOLID ROCKET MOTOR: QUALITY CONTROL AND TESTING
1991 65 p
(Contract NASW-4003)
(NASA-CR-188800; NAS1.26:188800) Avail: CASI HCA04/MFA01

The Congressional committees that authorize the activities of NASA requested that the National Research Council (NRC) review the testing and quality assurance programs for the Advanced Solid Rocket Motor (ASRM) program. The proposed ASRM design incorporates numerous features that are significant departures from the Redesigned Solid Rocket Motor (RSRM). The NRC review concentrated mainly on these features. Primary among these are the steel case material, welding rather than pinning of case factory joints, a bolted field joint designed to close upon firing the rocket, continuous mixing and casting of the solid propellant in place of the current batch processes, use of asbestos-free insulation, and a lightweight nozzle. The committee's assessment of these and other features of the ASRM are presented in terms of their potential impact on flight safety. Author

N92-10223# Sandia National Labs., Albuquerque, NM.
A GENERIC GUIDE FOR THE PREPARATION OF A QUALITY ASSURANCE/QUALITY CONTROL MANUAL FOR THE DESIGN, PRODUCTION, AND INSTALLATION OF PHOTOVOLTAIC CONCENTRATOR SYSTEMS
V. S. MURTY Jul. 1991 42 p Prepared in cooperation with Texas Southern Univ., Houston
(Contract DE-AC04-76DP-00789)
(DE91-017716; SAND-91-7010) Avail: CASI HC A03/MF A01

The United States National Photovoltaic (PV) program considers the production of energy using PV concentrator systems a viable renewable energy technology. To this end it has launched the National Photovoltaic Concentrator Initiative. One of the main objectives of the initiative is to achieve an energy price goal of $0.06/kwh by the year 2000. These cost goals involve calculations that assume the systems are operating with the minimum of maintenance for periods of twenty to thirty years. This rigid reliability requirement necessitates, the implementation of a strict Quality Assurance/Quality Control plan in all phases of design, development, manufacturing, testing, installation and operation. This document is intended as a guide for any company involved in design and manufacture of PV concentrator modules and systems. The contents of this document incorporate the collective input of representatives of the PV industry and the Sandia Photovoltaic Technology Research Division. DOE

N92-14608# KDT Industries, Inc., Austin, TX.
UNIFIED LIFE CYCLE ENGINEERING (ULCE) DESIGN SYSTEM Final Report, Feb. - Aug. 1990
PATRICK R. FLANAGAN Aug. 1991 77 p
(Contract F33615-89-C-5733)
(AD-A241039; WL-TR-91-8045) Avail: CASI HC A05/MF A01

This report describes Phase 1 of a project to develop a computer program to improve the efficiency of the engineering design process. The program will integrate Feature Based Modeling with Concurrent Engineering to facilitate the development of life cycle analysis models. The purpose of the program is to reduce data management and computer program interface coding requirements on engineering designers. The proposed program combined an Object Oriented Database, Expert System, Computer Aided Design (CAD) system, and computer model integration tool to create friendly, graphically oriented user interfaces that allow multiple representations of design data. This program also allows designers to develop interfaces between the design database and computer analysis models without writing computer code. The project resulted in four primary products: (1) a methodology and architecture; (2) a limited proof of concept computer model; (3) a feature based life cycle model of a microwave switch; and (4) a Phase 2 plan. DTIC

N92-16579*# Air Force Logistics Command, Wright-Patterson AFB, OH. Acquisition Logistics Div.
APPLICATION OF MACHINE LEARNING AND EXPERT SYSTEMS TO STATISTICAL PROCESS CONTROL (SPC) CHART INTERPRETATION
MARK SHEWHART *In* NASA. Johnson Space Center, Second CLIPS Conference Proceedings, Volume 1 p 123-138 Sep. 1991
Avail: CASI HC A03/MF A03

Statistical Process Control (SPC) charts are one of several tools used in quality control. Other tools include flow charts, histograms, cause and effect diagrams, check sheets, Pareto diagrams, graphs, and scatter diagrams. A control chart is simply a graph which indicates process variation over time. The purpose of drawing a control chart is to detect any changes in the process signalled by abnormal points or patterns on the graph. The Artificial Intelligence Support Center (AISC) of the Acquisition Logistics Division has developed a hybrid machine learning expert system prototype which automates the process of constructing and interpreting control charts. Author

N92-19005# Rolls-Royce Ltd., Derby (England).
INTRODUCTION: NEEDS AND APPROACHES TO RELIABILITY AND QUALITY ASSURANCE IN DESIGN AND MANUFACTURE
A. C. PICKARD *In* AGARD, AGARD/SMP Review: Damage Tolerance for Engine Structures. 4: Reliability and Quality Assurance 4 p Dec. 1991 Previously announced as N91-10297
Copyright Avail: CASI HC A01/MF A01

In the damage tolerance approach for improving the integrity of aircraft engines, reliability and quality assurance issues are discussed. The implications of the following aspects on the damage tolerance concept are studied: component material specifications and standards; controls on manufacturing processes and procedures; and design systems and quality assurance. The subjects reviewed in the workshop on reliability and quality assurance are given. Author

N92-19007# Fiat Aviazione S.p.A., Turin (Italy).
QUALITY ASSURANCE AND DESIGN SYSTEMS
L. CARONI and E. CAMPO *In* AGARD, AGARD/SMP Review: Damage Tolerance for Engine Structures. 4: Reliability and Quality Assurance 9 p Dec. 1991
Copyright Avail: CASI HC A02/MF A01

Inside the company quality system as outlined by NATO AQAP-1, a major role is given to engineering quality. This is the branch which is responsible for assurance that a design and development program is set, codes of design practice are established and maintained, and that drawings and specifications include all practical experience gained by the

company. The engineering quality manual and the design manual are the reference for such activities. The engineering quality manual, in fact, sets the methodology to be used in the project development. The design manual, on the other hand, documents the technical data and information to support material choice, structural analysis, and life prediction. An example is given to show the type of content of the design manual within the subject of damage tolerance criteria of rotating critical parts. Author

N92-19466# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Systems and Logistics.

A GUIDE FOR THE CONSIDERATION OF COMPOSITE MATERIAL IMPACTS ON AIRFRAME COSTS M.S. Thesis

JEFFREY L. ISOM Sep. 1991 122 p

(AD-A243928; AFIT/GCA/LSQ/91S-3) Avail: CASI HC A06/MF A02

This study provides a guide to cost analysts who must consider the impact of composite materials on airframe costs. A literature review was conducted to determine the availability of cost models which incorporate the effect of composites on cost. A number of models are available, but no individual model was found that is applicable for every situation. In order to provide a baseline upon which analysts can compare model results as well as provide guidance in selecting cost drivers, a Delphi survey was conducted. Questionnaire results indicate that composite weight (as a percentage of total weight), composite part complexity, percentage of composites in load-bearing role, composite part size, fabrication technique, and percentage of composites in a low observable role are all potentially significant cost drivers. Delphi results also indicate that engineering and quality assurance labor hours are quite sensitive to composite weight, while manufacturing and tooling hours are more sensitive to composite part complexity. Finally, the Delphi results indicate that, although there are some differences in composite labor hour impacts across aircraft type, there are no discernable patterns to the differences. DTIC

N92-20710# Naval Ocean Systems Center, San Diego, CA.

MICROCIM COMPUTER INTEGRATED MANUFACTURING IN THE HYBRID MICROELECTRONICS INDUSTRY

T. J. SAMPITE Dec. 1991 12 p

(AD-A244875) Avail: CASI HC A03/MF A01

The MicroCIM program is managed by the Manufacturing Technology Branch at NOSC under sponsorship of the Director, Navy MANTECH Program, Office of the Assistant Secretary of the Navy for Research, Development, and Acquisition. Funding is provided from the Navy Industrial Preparedness budget which has the purpose of assisting American industry to be economically competitive with foreign suppliers and therefore sufficiently capable of meeting the needs of the United States Navy during any emergent situation. The intent is to develop new or improved processes, methods, techniques, or equipment to enhance industrial base capability. While this has focused on cost benefits, quality is also seen as an important value. MicroCIM is an outgrowth of the Integrated Facility for Automated Hybrid Microcircuit manufacturing (IFAHMM). The purpose of IFAHMM was to develop a test facility to evaluate state-of-the-art technology for the manufacture of hybrid microcircuits. This technology could be used to enhance production capability and, as a result, produce parts at a lower cost to the DoD. DTIC

N92-21265*# Florida International Univ., Miami, FL. Dept. of Industrial Engineering.

USE OF TAGUCHI DESIGN OF EXPERIMENTS TO DETERMINE ALPLS ASCENT DELTA-5 SENSITIVITIES AND TOTAL MASS SENSITIVITIES TO RELEASE CONDITIONS AND VEHICLE PARAMETERS Final Report

HECTOR RAMON CARRASCO *In* Texas A and M Univ., NASA/ASEE Summer Faculty Fellowship Program, 1991, Volume 1 12 p Dec. 1991

Avail: CASI HC A03/MF A03

The objective of this study is to evaluate the use of Taguchi's Design of Experiment Methods to improve the effectiveness of this and future parametric studies. Taguchi Methods will be applied in addition to the typical approach to provide a mechanism for comparing the results and the cost or effort necessary to complete the studies. It is anticipated that results of this study should include an improved systematic analysis process, an increase in information obtained at a lower cost, and a more robust, cost effective vehicle design. Author

N92-21268*# Houston Univ., TX. Dept. of Industrial Engineering.

AN EXPLORATORY EXERCISE IN TAGUCHI ANALYSIS OF DESIGN PARAMETERS: APPLICATION TO A SHUTTLE-TO-SPACE STATION AUTOMATED APPROACH CONTROL SYSTEM Final Report

DON E. DEAL *In* Texas A and M Univ., NASA/ASEE Summer Faculty Fellowship Program, 1991, Volume 1 10 p Dec. 1991

Avail: CASI HC A02/MF A03

The chief goals of the summer project have been twofold - first, for my host group and myself to learn as much of the working details of Taguchi analysis as possible in the time allotted, and, secondly, to apply the methodology to a design problem with the intention of establishing a preliminary set of near-optimal (in the sense of producing a desired response) design parameter values from among a large number of candidate factor combinations. The selected problem is concerned with determining design factor settings for an automated approach program which is to have the capability of guiding the Shuttle into the docking port of the Space Station under controlled conditions so as to meet and/or optimize certain target criteria. The candidate design parameters under study were glide path (i.e., approach) angle, path intercept and approach gains, and minimum impulse bit mode (a parameter which defines how Shuttle jets shall be fired). Several performance criteria were of concern: terminal relative velocity at the instant the two spacecraft are mated; docking offset; number of Shuttle jet firings in certain specified directions (of interest due to possible plume impingement on the Station's solar arrays), and total RCS (a measure of the energy expended in performing the approach/docking maneuver). In the material discussed here, we have focused on single performance criteria - total RCS. An analysis of the possibility of employing a multiobjective function composed of a weighted sum of the various individual criteria has been undertaken, but is, at this writing, incomplete. Results from the Taguchi statistical analysis indicate that only three of the original four posited factors are significant in affecting RCS response. A comparison of model simulation output (via Monte Carlo) with predictions based on estimated factor effects inferred through the Taguchi experiment array data suggested acceptable or close agreement between the two except at the predicted optimum point, where a difference outside a rule-of-thumb bound was observed. We have concluded that there is most likely an interaction effect not provided for in the original orthogonal array selected as the basis for our experimental design. However, we feel that the data indicates that this interaction is a mild one and that inclusion of its effect will not alter the location of the optimum. Author

N92-21383# Delaware Univ., Newark, DE. Center for Composite Materials.

CONCURRENT ENGINEERING FOR COMPOSITES Final Report

DICK J. WILKINS, VISTASP M. KARBHARI, and JOHN M. HENSHAW Oct. 1991 184 p

(Contract DAAL03-91-G-0004)

(AD-A244714; ARO-28409.1-MS) Avail: CASI HC A09/MF A02

The Total Quality Design (TQD) approach serves as a facilitation tool for the coupled decision making that is necessary for composites. The approach serves as a means of enabling the concurrent engineering of composites through the use of a composites design methodology, as well as the Composites Manufacturing and Design Guide (CMDG). This serves as a decision support system, enabling the design team to not only obtain pertinent information in the shortest possible time, but also serves

through its discrimination stacks as a means of rejecting concepts that are not feasible with the customers needs and wants. This serves to reduce conflict. Actual case studies are described, and the methodology is further coupled with the TAGUCHI method, to enable efficient quality control in the RTM process. The methodology is structured so as to enable the design team to conquer barriers of communication, and work in an efficient manner for the successful realization of the design cycle. The approach and tools present a concurrent engineering approach to the application of the latest decision making management techniques to the product realization process for composites. DTIC

N92-23681# Materials Research Lab., Inc., Glenwood, IL.
DEVELOPMENT OF A CRACK ARREST FRACTURE TOUGHNESS MEASUREMENT PROCEDURE FOR QUALITY ASSURANCE OF PLATES AND WELDS USED FOR HYDROCARBON STORAGE TANKS Final Report, Oct. 1986 - Sep. 1991
E. J. RIPLING and P. B. CROSLEY Sep. 1991 79 p
(Contract GRI-5086-254-1363)
(PB92-141753; MRL-7043; GRI-91/0227) Avail: CASI HC A05/MF A01

A test method was developed for measuring the full thickness crack arrest fracture toughness of steel plates. The method is unique in that it was developed to measure a fracture mechanics parameter for quality control. This was done by designing the test specimen to measure a preselected toughness specimen to measure a preselected toughness value. The method is patterned after an ASTM Standard: E 1221. Full thickness cracks, unlike the cracking described in E 1221, frequently form by tunneling, which means that toughness does not have a single value, but is a function of crack length. The feature is accounted for in the method. Full thickness toughness values are also generally higher than the values measured by ASTM E 1221 so that a plasticity correction is required. Both methods use a static analysis, however, i.e. both methods assume that time dependent affects are negligible. Three plates of nickel steels having different thicknesses and toughnesses were used for developing the test method. Also, tests were made on one carbon-manganese-silicon steel, and a hydrogen charged thick plate. Author

N92-24035# Oak Ridge Y-12 Plant, TN.
THE USE OF STEP IN AN INTEGRATED MANUFACTURING ENVIRONMENT
W. D. CAIN 1992 10 p Presented at the CAD and Engineering Workstations 1992, Anaheim, CA, 9-12 Mar. 1992
(Contract DE-AC05-84OS-21400)
(DE92-008417; Y/EN-4562; CONF-920392-1) Avail: CASI HC A02/MF A01

The ability to exchange and share product data between and within enterprises is essential for implementing the concepts of concurrent engineering. An international standard, the Standard for the Exchange of Product Model Data (STEP), is currently being developed within the International Organization for Standardization (ISO) to provide a comprehensive and reliable product data exchange/sharing mechanism for industry. The purpose of STEP is to prescribe a neutral mechanism capable of completely representing product data throughout the life cycle of a product. Application Protocols (APs) which define the context for the use of product data and specify the use of STEP to satisfy an industrial need are being developed and have become an integral part of STEP. This paper discusses the work being done to develop a suite of interoperable APs for STEP for the exchange and sharing of product and process information in an integrated design and manufacturing environment. DOE

N92-24993*# National Inst. of Standards and Technology, Gaithersburg, MD.
INTELLIGENT PROCESSING EQUIPMENT DEVELOPMENTS WITHIN THE NAVY'S MANUFACTURING TECHNOLOGY CENTERS OF EXCELLENCE
PHILIP NANZETTA *In* NASA, Washington, The Federal Conference on Intelligent Processing Equipment p 68-73 Apr. 1992
Avail: CASI HC A02/MF A03

The U.S. Navy has had an active Manufacturing Technology (MANTECH) Program aimed at developing advanced production processes and equipment since the late-1960's. During the past decade, however, the resources of the MANTECH program were concentrated in Centers of Excellence. Today, the Navy sponsors four manufacturing technology Centers of Excellence: the Automated Manufacturing Research Facility (AMRF); the Electronics Manufacturing Productivity Facility (EMPF); the National Center for Excellence in Metalworking Technology (NCEMT); and the Center of Excellence for Composites Manufacturing Technology (CECMT). This paper briefly describes each of the centers and summarizes typical Intelligent Equipment Processing (IEP) projects that were undertaken. Author

N92-25544# CALS/CE, Washington, DC. Industry Steering Group.
FIRST PRINCIPLES OF CONCURRENT ENGINEERING: A COMPETITIVE STRATEGY FOR ELECTRONIC PRODUCT DEVELOPMENT. CALS/CONCURRENT ENGINEERING TASK GROUP-ELECTRONIC SYSTEMS
L. LINTON, D. HALL, K. HUTCHISON, D. HOFFMAN, and S. EVANCZUK 30 Sep. 1991 181 p
(PB92-102524; CALS-TR-005) Avail: CASI HC A09/MF A02

The U.S. electronics industry is in trouble. Progressively more electronic components and critical technologies are available only from foreign sources. The problems of maintaining a sufficient level of military readiness and a competitive commercial electronics industry to support a healthy economy are directly linked. The majority of problems are directly related to inherent insufficiencies in the way the products are engineered and the processes that manufacture, test, and support them. Outlined here are the principles of current engineering for electronics development. The competitive strategy is part of the Computer-aided Acquisition and Logistic Support (CALS) system. Author

N92-26275# Institute for Defense Analyses, Alexandria, VA.
ADVANCED MATERIALS ASPECTS OF CONCURRENT ENGINEERING Final Report, Aug. - Oct. 1991
GEORGE MAYER Oct. 1991 29 p
(Contract MDA903-89-C-0003)
(AD-A245437; AD-E501463; IDA-D-1033; IDA/HQ-91-40225) Avail: CASI HC A03/MF A01

Unique opportunities are offered for new devices and systems through the use of advanced materials, such as composites, ceramics, and intermetallics. Concurrent engineering approaches to the use of these materials are key to assuring successful applications. Generic steps in concurrent engineering with special reference to advanced materials are reviewed. Examples are provided of intelligent processing and net-shape processing, which provide routes to more reproducible materials. It is anticipated that a wide range of DARPA applications will be affected by the approaches described here, including the metal-matrix composites model factory, composite hulls and chassis for lightweight ground vehicles, and the polymer composite submarine hull. DTIC

N92-27827# Analytix Corp., Houston, TX.
INNOVATIVE LIFE CYCLE MANAGEMENT SYSTEMS FOR COMPOSITES, PHASE 1 Final Report, 1 Sep. - 7 Dec. 1991
FRANCIS D. GUTOWSKI Dec. 1991 82 p
(Contract DAAL04-91-C-0013)
(AD-A246018; AMTL-FR-12.91-PHASE-1; MTL-TR-91-49-PHASE-1) Avail: CASI HC A05/MF A01

The production of advanced composite structures proceeds through a sequence of stages (design, processing, quality control, etc.), each linked to preceding and following functions by material and data flows in the form of inputs, outputs and constraining factors. The integrity of a composite structure depends on a variety of reactive materials with limited

shelf lives, complex production and test equipment, and exacting processes and procedures. In this environment, accurate, systematic and complete documentation of material identified is mandatory. Significant technical challenges arise in the design and implementation of an intelligent, interactive quality management system for advanced composites which is cost-effective, user-friendly, and well-adapted to both R and D-intensive and large-scale, production-oriented composites fabrication environments. Rapid prototyping was used to test the feasibility of developing an integrated, user-friendly, knowledge-based life cycle management system (LCMS) to provide comprehensive material traceability and quality management support in R and D and production environments. DTIC

N92-28172# Naval Postgraduate School, Monterey, CA.
STATISTICAL PROCESS CONTROL TECHNIQUES FOR THE TELECOMMUNICATIONS SYSTEMS MANAGER M.S. Thesis
JOSEPH W. BEADLES, III and LEE W. SCHONENBERG Mar. 1992 108 p
(AD-A249122) Avail: CASI HC A06/MF A02

The purpose of this thesis is to provide personnel, who are undergoing Total Quality Leadership (TQL) implementation at their telecommunications-related commands, an understanding of Statistical Process Controls (SPCs) and their potential application to telecommunication issues. Basic SPC tools common to all total quality programs are discussed. Advanced SPC methods including Analysis of Means (ANOM), Analysis of Variance (ANOVA) Weibull analysis and Taguchi methods are also presented. Selected SPC training programs of both the U.S. Navy and the commercial telecommunication industry are examined. A case study of a telecommunication-related issue is provided to demonstrate an integrated approach to the use of SPCs. DTIC

N92-28880# California State Univ., Chico, CA. Coll. of Communication.
INTEGRATING THE AFFECTIVE DOMAIN INTO THE INSTRUCTIONAL DESIGN PROCESS Interim Report, Jun. - Aug. 1991
ROBERT G. MAIN Mar. 1992 27 p
(Contract F49620-90-C-0076)
(AD-A249287; AL-TP-1992-0004) Avail: CASI HC A03/MF A01

This study develops a model of instructional design that incorporates the affective domain as an integral component. The model combines Keller's ARCS model of motivation for learning with the five phased military instructional design model. The proposed model provides a framework for organizing instructional principles, strategies and techniques concerning the affective domain and furnishes a theoretical base to aid in formulating research hypotheses and collecting empirical data. Attention to the affective domain is particularly important for technology based instruction that removes teacher/student interaction from the lesson delivery. This model should be helpful because it provides for the systematic consideration of the affective domain in every aspect of the instructional design process. The study concludes with recommendations for additional research needed to operationalize the model for use by instructional designers. DTIC

N92-29417*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
IMPROVING DESIGNER PRODUCTIVITY
GARY C. HILL Feb. 1992 13 p
(Contract RTOP 505-69-50)
(NASA-TM-103929; A-92081; NAS 1.15:103929) Copyright Avail: CASI HC A03/MF A01

Designer and design team productivity improves with skill, experience, and the tools available. The design process involves numerous trials and errors, analyses, refinements, and addition of details. Computerized tools have greatly speeded the analysis, and now new theories and methods, emerging under the label Artificial Intelligence (AI), are being used to automate skill and experience. These tools improve designer productivity by capturing experience, emulating recognized skillful designers, and making the essence of complex programs easier to grasp. This paper outlines the aircraft design process in today's technology and business climate, presenting some of the challenges ahead and some of the promising AI methods for meeting these challenges. Author

N92-31120# Superconducting Super Collider Lab., Dallas, TX.
A STATISTICAL RATIONALE FOR ESTABLISHING PROCESS QUALITY CONTROL LIMITS USING FIXED SAMPLE SIZE, FOR CRITICAL CURRENT VERIFICATION OF SSC SUPERCONDUCTING WIRE
D. A. POLLOCK, G. BROWN, D. W. CAPONE, II, D. CHRISTOPHERSON, J. M. SEUNTJENS, and J. WOLTZ Mar. 1992 8 p Presented at the International Industrial Symposium on the Super Collider, New Orleans, LA, 4-6 Mar. 1992 Submitted for publication
(Contract DE-AC35-89ER-40486)
(DE92-014844; SSCL-PREPRINT-52; CONF-920331-50) Avail: CASI HC A02/MF A01

The purpose of this paper is to demonstrate a statistical method for verifying superconducting wire process stability as represented by I(sub c). The paper does not propose changing the I(sub c) testing frequency for wire during Phase 1 of the present Vendor Qualification Program. The actual statistical limits demonstrated for one supplier's data are not expected to be suitable for all suppliers. However, the method used to develop the limits and the potential for improved process through their use, may be applied equally. Implementing the demonstrated method implies that the current practice of testing all pieces of wire from each billet, for the purpose of detecting manufacturing process errors (i.e. missing a heat-treatment cycle for a part of the billet, etc.) can be replaced by other less costly process control measures. As used in this paper, process control limits for critical current are quantitative indicators of the source manufacturing process uniformity. The limits serve as alarms indicating the need for manufacturing process investigation. DOE

N92-33608# Department of the Navy, Washington, DC.
NAVY PRIMARY AND SECONDARY BATTERIES: DESIGN AND MANUFACTURING GUIDELINES
Sep. 1991 171 p
(PB92-183516; NAVSO-P-3676) Avail: CASI HC A08/MF A02

The best practices for the specification, design, and manufacture of primary and secondary batteries most commonly used in military applications are provided. The scope was limited to lead-acid batteries (excluding submarine batteries), nickel-cadmium batteries, dry cell, thermal cells, and lithium cells (primaries only). Silver-Zinc batteries, secondary and primary, were purposely excluded since they represent a small portion of the military procurement and require a special treatment of their manufacture and quality assurance best practices. Author

N92-34182# RAND Corp., Santa Monica, CA.
ADVANCED AIRFRAME STRUCTURAL MATERIALS: A PRIMER AND COST ESTIMATING METHODOLOGY
SUSAN A. RESETAR, J. C. ROGERS, and RONALD W. HESS 1991 117 p
(Contract F49620-91-C-0003)
(AD-A253371; RAND/R-4016-AF) Avail: CASI HC A06/MF A02

This report identifies, describes, and quantifies the cost effects of structural materials that are likely to be incorporated into aircraft becoming operational in the 1990s (aluminum, aluminum-lithium, steel, titanium, graphite/epoxy, graphite/bismaleimide, and graphite/thermoplastic). The first half of this report is a primer for advanced aircraft structural materials emphasizing polymer matrix composites. The second half of the report contains both cost data and a cost estimating methodology sensitive to material mix. For each material type separate cost factors are presented for two time frames, the late 1980s and the mid-1990s, and for the following cost elements: nonrecurring engineering, nonrecurring tooling, recurring engineering, recurring tooling, manufacturing labor, manufacturing mate-

rial, and quality assurance. These factors are based on data obtained from Boeing Airplane Company, General Dynamics Corporation, Grumman Aerospace Corporation, Lockheed Aerospace Systems Corporation-California Division and Georgia Division, LTV Aerospace and Defense Aircraft Group, McDonnell Douglas Corporation, Northrop Aircraft Division, and Rockwell International Group. DTIC

N93-12494# EG and G Energy Measurements, Inc., Idaho Falls, ID.
A TAGUCHI EXPERIMENTAL DESIGN STUDY OF TWIN-WIRE ELECTRIC ARC SPRAYED ALUMINUM COATINGS
T. J. STEEPER (Westinghouse Savannah River Co., Aiken, SC.), D. J. VARACALLE, JR. (Westinghouse Savannah River Co., Aiken, SC.), G. C. WILSON (Westinghouse Savannah River Co., Aiken, SC.), R. W. JOHNSON, G. IRONS, W. R. KRATOCHVIL (Hobart-Tafa Corp., Concord, NH.), and W. L. II RIGGS 1992 7 p Presented at the 1992 International Thermal Spray Conference, Orlando, FL, 1-5 Jun. 1992
(Contract DE-AC07-76ID-01570)
(DE92-018022; EGG-M-91298; CONF-9206135-4) Avail: CASI HC A02/MF A01

An experimental study was conducted on the twin-wire electric arc spraying of aluminum coatings. This aluminum wire system is being used to fabricate heater tubes that emulate nuclear fuel tubes for use in thermal-hydraulic experiments. Experiments were conducted using a Taguchi fractional-factorial design parametric study. Operating parameters were varied around the typical process parameters in a systematic design of experiments in order to display the range of processing conditions and their effect on the resultant coating. The coatings were characterized by hardness tests, optical metallography, and image analysis. The paper discusses coating qualities with respect to hardness, roughness, deposition efficiency, and microstructure. The study attempts to correlate the features of the coatings with the changes in operating parameters. A numerical model of the process is presented including gas, droplet, and coating dynamics. DOE

N93-12555# Georgia Inst. of Tech., Atlanta, GA.
APPLICATION OF CONCURRENT ENGINEERING METHODS TO THE DESIGN OF AN AUTONOMOUS AERIAL ROBOT M.S. Thesis
STEPHEN A. INGALLS Dec. 1991 162 p
(AD-A254968) Avail: CASI HC A08/MF A02

This paper documents the year-long efforts of a multidisciplinary design team to design, build, and support an autonomous aerial robotics system. The system was developed to participate in the Association for Unmanned Vehicle System's (AUVS) First International Aerial Robotics Competition which was held in Atlanta, Georgia on the Georgia Tech campus on July 29th, 1991. As development time and budget were extremely limited, the team elected to attempt the design using concurrent engineering design methods. These methods were validated in an IDA study by Winner 1 in the late- 1980's to be particularly adept at handling the difficulties to design presented by these limitations. DTIC

N93-13036# Westinghouse Savannah River Co., Aiken, SC.
STATISTICAL PROCESS MANAGEMENT: AN ESSENTIAL ELEMENT OF QUALITY IMPROVEMENT
M. R. BUCKNER 1992 8 p Presented at the 1992 Westinghouse Electronic Systems Group Statistics Symposium, Baltimore, MD, 7 Aug. 1992
(Contract DE-AC09-89SR-18035)
(DE92-019934; WSRC-MS-92-249; CONF-9208123-1) Avail: CASI HC A02/MF A01

Successful quality improvement requires a balanced program involving the three elements that control quality: organization, people and technology. The focus of the SPC/SPM User's Group is to advance the technology component of Total Quality by networking within the Group and by providing an outreach within Westinghouse to foster the appropriate use of statistic techniques to achieve Total Quality. SPM encompasses the disciplines by which a process is measured against its intrinsic design capability, in the face of measurement noise and other obscuring variability. SPM tools facilitate decisions about the process that generated the data. SPM deals typically with manufacturing processes, but with some flexibility of definition and technique it accommodates many administrative processes as well. The techniques of SPM are those of Statistical Process Control, Statistical Quality Control, Measurement Control, and Experimental Design. In addition, techniques such as job and task analysis, and concurrent engineering are important elements of systematic planning and analysis that are needed early in the design process to ensure success. The SPC/SPM User's Group is endeavoring to achieve its objectives by sharing successes that have occurred within the member's own Westinghouse department as well as within other US and foreign industry. In addition, failures are reviewed to establish lessons learned in order to improve future applications. In broader terms, the Group is interested in making SPM the accepted way of doing business within Westinghouse. DOE

N93-16796*# Old Dominion Univ., Norfolk, VA.
MULTIDISCIPLINARY DESIGN OPTIMIZATION USING RESPONSE SURFACE ANALYSIS
RESIT UNAL *In* Hampton Univ., NASA/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program 1992 p 189-190 Sep. 1992
Avail: CASI HC A01/MF A03

Aerospace conceptual vehicle design is a complex process which involves multidisciplinary studies of configuration and technology options considering many parameters at many values. NASA Langley's Vehicle Analysis Branch (VAB) has detailed computerized analysis capabilities in most of the key disciplines required by advanced vehicle design. Given a configuration, the capability exists to quickly determine its performance and lifecycle cost. The next step in vehicle design is to determine the best settings of design parameters that optimize the performance characteristics. Typical approach to design optimization is experience based, trial and error variation of many parameters one at a time where possible combinations usually number in the thousands. However, this approach can either lead to a very long and expensive design process or to a premature termination of the design process due to budget and/or schedule pressures. Furthermore, one variable at a time approach can not account for the interactions that occur among parts of systems and among disciplines. As a result, vehicle design may be far from optimal. Advanced multidisciplinary design optimization (MDO) methods are needed to direct the search in an efficient and intelligent manner in order to drastically reduce the number of candidate designs to be evaluated. The payoffs in terms of enhanced performance and reduced cost are significant. A literature review yields two such advanced MDO methods used in aerospace design optimization; Taguchi methods and response surface methods. Taguchi methods provide a systematic and efficient method for design optimization for performance and cost. However, response surface method (RSM) leads to a better, more accurate exploration of the parameter space and to estimated optimum conditions with a small expenditure on experimental data. These two methods are described. Author

N93-19446# Westinghouse Electric Corp., Baltimore, MD.
DARPA INITIATIVE IN CONCURRENT ENGINEERING (DICE). PHASE 4: ELECTRONICS PILOT PROJECT Final Technical Report, 30 Sep. 1991 - 15 Oct. 1992
MICHAEL LUCAS, UBAID QUDSI, PATTI BRENCE, WILLIAM GARBER, and ROBERT MICHAELS 30 Nov. 1992 118 p
(Contract MDA972-91-C-0039; ARPA ORDER 8290)
(AD-A258927) Avail: CASI HC A06/MF A02

This report describes the performance of a pilot project using DICE technology for the design of an electronics module. The project objectives were to assess the capability of the DICE technology to enable computer-based concurrent engineering and to provide recommendations for improvement. Four DICE software tools were used to design a high performance signal processor module. These tools consisted of the Electronic Design Notebook, the Project Coordination Board, Meeting on

the Net, and the Communications Manager. The primary conclusion drawn from the project was that the DICE technology has a large potential to improve the product development process in terms of decreased product development cost, reduced cycle time, and improved product quality. The specific implementations of the four DICE tools evaluated in this pilot project, however, provided only a small portion of this potential. The numerous recommendations developed during the course of the project will, if incorporated into the DICE technology, help the technology reach its full potential. DTIC

N93-22718# Oak Ridge National Lab., TN.
STRENGTH OPTIMIZATION THROUGH POWDER MODIFICATION
A. E. PASTO, F. AVELLA (GTE Labs., Inc., Waltham, MA.), S. NATANSOHN (GTE Labs., Inc., Waltham, MA.), and W. J. ROURKE (Duracell, Inc., Needham, MA.) 1992 9 p Presented at the 16th Material Research Society International Symposium on the Scientific Basis for Nuclear Waste Management Fall Meeting, Boston, MA, 30 Nov. - 5 Dec. 1992
(Contract DE-AC05-84OR-21400)
(DE93-005109; CONF-921101-16) Avail: CASI HC A02/MF A01

Effect of oxygen content of silicon nitride powders on properties of resulting ceramics was studied by physically and chemically treating the powder to modify its surface oxygen content. These powders were hot-pressed into dense ceramics. Strength and oxidation resistance of these ceramics were measured and correlated with the powder and ceramics compositions as well as the resulting intergranular phases. Results showed that the phases developed in yttria-containing silicon nitride ceramics varied with slight changes in the initial powder oxygen content, as predicted, and that strength could be correlated to initial oxygen concentration. Best results were obtained when the oxygen content was increased by thermal oxidation. A Taguchi Methods experimental study designed to optimize the thermal treatment resulted in silicon nitride ceramics with strength improvements of 22 and 37 percent at ambient temperature and 1370 C, respectively, as compared to untreated pow ders. Oxidation resistance was also improved. DOE

N93-23025# Allied-Signal Aerospace Co., Kansas City, MO.
STATISTICAL PROCESS CONTROL PROGRAM AT A CERAMICS VENDOR FACILITY
G. M. ENKE Dec. 1992 35 p
(Contract DE-AC04-76DP-00613)
(DE93-006043; KCP-613-4866) Avail: CASI HC A03/MF A01

Development of a statistical process control (SPC) program at a ceramics vendor location was deemed necessary to improve product quality, reduce manufacturing flowtime, and reduce quality costs borne by Allied-Signal Inc., Kansas City Division (KCD), and the vendor. Because of the lack of available KCD manpower and the required time schedule for the project, it was necessary for the SPC program to be implemented by an external contractor. Approximately a year after the program had been installed, the original baseline was reviewed so that the success of the project could be determined. DOE

N93-23445# Department of Defense, Washington, DC.
PROCESS MANAGEMENT: THE QUALITY WAY TO IMPROVEMENT
C. D. HECKER Oct. 1992 69 p
(PB93-154532) Avail: CASI HC A04/MF A01

The book is presented as a reference guide for Process Management. It focuses on the fundamental premise that no process, product or service is perfect, and everything can be improved. NTIS

N93-23666# Raytheon Co., Tewksbury, MA. Missile Systems Lab.
SOFTWARE DESIGN SPECIFICATION FOR THE MANUFACTURING OPTIMIZATION (MO) SYSTEM
LINDA J. LAPOINTE, THOMAS J. LALIBERTY, and ROBERT V. BRYANT Dec. 1992 171 p
(Contract MDA903-92-C-0020; ARPA ORDER 8363)
(AD-A259707) Avail: CASI HC A08/MF A02

DICE has developed a concurrent engineering model that replicates the human tiger team concept. The basic tenet of the human tiger team is to have the various specialists contributing to the project co-located. In today's environment of complex product designs and geographically dispersed specialists, DIC envisioned a virtual tiger team working on a unified product model accessible by computer networks. Such an environment must enable specialists from each functional area to work on the design concurrently and share development ideas. DTIC

N93-24430# Wright State Univ., Dayton, OH.
MULTIOBJECTIVE OPTIMIZATION OF AEROSPACE STRUCTURES Final Report, 1 Jan. 1990 - 31 Dec. 1991
RAMANA V. GRANDHI and GEETHA BHARATRAM Jul. 1992 130 p
(Contract F33615-88-C-3204)
(AD-A260433; WL-TR-92-3052) Avail: CASI HC A07/MF A02

This report presents the multiobjective optimization methodology suitable to the preliminary design of large scale aircraft structures. The algorithm is based on generalized compound scaling techniques to reach the intersection of multiple functions. Multiobjective functions are treated similar to the behavior constraints by generating pseudo-targets on objectives. This algorithm is very efficient due to the fact that it does not solve many single objective optimization problems in reaching the Pareto set. The Pareto set gives several optimum solutions, and the designer has to use additional decision criteria in selecting the best design. In this work, a reliability index based concept is used as the decision criterion. System reliability of the Pareto designs is calculated-due to the random nature of material properties, fabrication tolerances, and service loads, where the random parameters influencing the design appear through their mean and covariance values. DTIC

N93-25820# Spire Corp., Bedford, MA.
MOCVD PROCESS TECHNOLOGY FOR AFFORDABLE, HIGH-YIELD, HIGH-PERFORMANCE MESFET STRUCTURES. PHASE 3: MIMIC Final Report
26 Jan. 1993 51 p
(Contract N00019-89-C-0152)
(AD-A261178; FR-10119) Avail: CASI HC A04/MF A01

Under the MIMIC Program, Spire has pursued improvements in the manufacturing of low cost, high quality gallium arsenide MOCVD wafers for advanced MIMIC FET applications. As a demonstration of such improvements, Spire was tasked to supply MOCVD wafers for comparison to MBE wafers in the fabrication of millimeter and microwave integrated circuits. In this, the final technical report for Spire's two-year MIMIC contract, we report the results of our work. The main objectives of Spire's MIMIC Phase 3 Program, as outlined in the Statement of Work, were as follows: Optimize the MOCVD growth conditions for the best possible electrical and morphological gallium arsenide. Optimization should include substrate and source qualification as well as determination of the optimum reactor growth conditions; Perform all work on 75 millimeter diameter wafers, using a reactor capable of at least three wafers per run; and Evaluate epitaxial layers using electrical, optical, and morphological tests to obtain thickness, carrier concentration, and mobility data across wafers. DTIC

N93-25876# Environmental Protection Agency, Cincinnati, OH.
QUALITY CONTROL: VARIABILITY IN PROTOCOLS
G. Y. SIMES Sep. 1991 33 p
(PB93-157790; EPA/600/9-91/034) Avail: CASI HC A03/MF A01

The document Variability in Protocols (VIP) was initially designed as a quick reference for personnel performing QA audits, but it also has found its place in serving as a reference source for laboratory managers as well as personnel reviewing or developing QA Project Plans. Variability in Protocols contains tabular summaries of the quality control differences and similarities for some of the most frequently used analytical methods for water, soils, and other environmental samples. The document has been prepared in an attempt to bring together the separate methods that became a product of the major environmental statutes. Noticeable differences between methods are evidenced in method detection limits, calibration methods, blanks, spikes, and several other parameters in-

cluded in the summary. The tabular format provides quick and easy access to important, needed information. VIP can provide guidance when preparing Quality Assurance Project Plans. Managers, field sampling team members, auditors, and laboratory personnel alike will find the document helpful in determining the most suitable method of chemical analysis for their various purposes. NTIS

N93-26434# Army Materials Technology Lab., Watertown, MA.
NDT STANDARDS FROM THE PERSPECTIVE OF THE DEPARTMENT OF DEFENSE
BERNARD STRAUSS Sep. 1992 15 p Submitted for publication
(MTL-TR-92-68) Avail: CASI HC A03/MF A01

The interaction of the DoD non-Government Society (NGS) bodies in the area of nondestructive testing (NDT) are illustrated. The adoption process for NGS is outlined including the criteria for adoption, what adoption means, and the advantages of DoD/NGS interaction. The tasks of the DoD's Standardization Program Plan for NDT are described along with DoD's efforts on a Joint Army, Navy, Air Force (JANNAF) NDE Subcommittee and on an international standardization group (America, Britain, Canada, and Australia) called the Quadripartite Working Group on Proofing, Inspection, and Quality Assurance. Author (revised)

N93-26529# Little (Arthur D.), Inc., Cambridge, MA.
IMPROVED SELECTIVE CATALYTIC NOX CONTROL TECHNOLOGY FOR COMPRESSOR STATION RECIPROCATING ENGINES Final Report, Sep. 1991 - Sep. 1992
C. E. BENSON, K. R. BENEDEK, and P. J. LOFTUS Sep. 1992 89 p
See also PB86-110186
(Contract GRI-5091-254-2235)
(PB93-158566; GRI-92/0364) Avail: CASI HC A05/MF A01

The objective of the program was to identify and assess improvements to Selective Catalytic Reduction (SCR) exhaust gas NO(x) control processes for stationary reciprocating engines at pipeline compressor stations. Based on commercial application experience in Europe and the U.S., it is evident that SCR systems have been successfully applied to control NO(x) emissions from natural gas fueled stationary engines. Nevertheless, cost, maintenance, and automation related aspects of most commercial SCR systems currently render the technology an unattractive NO(x) control option for pipeline compressor station engines. Desirable and feasible improvements to SCR technology were defined through interaction with technology consumers (pipeline companies) and technology suppliers (SCR manufacturers), followed by independent analyses. The key technologies recommended for advancement include: a non-extractive, continuous emissions monitoring system, integration and automation of optimized engine/SCR systems, engine NOx emission mapping and feed-forward control of the SCR process, and qualification and use of commercially available low phosphorus lubricating oils. NTIS

N93-28624*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
SOFT COMPUTING IN DESIGN AND MANUFACTURING OF ADVANCED MATERIALS
GEORGE Y BAAKLINI, ALEX VARY, and KRZYSZTOF J. CIOS (Toledo Univ., OH.) Apr. 1993 8 p Presented at the ASME Conference, Cincinnati, OH, 24-27 May 1993: sponsored by IGTI and ASME
(Contract RTOP 510-01-50)
(NASA-TM-106032; E-7597; NAS 1.15:106032) Avail: CASI HC A02/MF A01

The potential of fuzzy sets and neural networks, often referred to as soft computing, for aiding in all aspects of manufacturing of advanced materials like ceramics is addressed. In design and manufacturing of advanced materials, it is desirable to find which of the many processing variables contribute most to the desired properties of the material. There is also interest in real time quality control of parameters that govern material properties during processing stages. The concepts of fuzzy sets and neural networks are briefly introduced and it is shown how they can be used in the design and manufacturing processes. These two computational methods are alternatives to other methods such as the Taguchi method. The two methods are demonstrated by using data collected at NASA Lewis Research Center. Future research directions are also discussed. Author (revised)

N93-29513# Microelectronics and Computer Technology Corp., Austin, TX.
AN MCM/CHIP CONCURRENT ENGINEERING VALIDATION Final Quarterly Report, Jul. - Sep. 1992
HECTOR MORENO and SHUANE STARK 31 Dec. 1992 32 p
(Contract MDA972-92-C-0022; ARPA ORDER 8363)
(AD-A262959; HVE-042-93) Avail: CASI HC A03/MF A01

We report on the MOST software system, which implements a concurrent physical design environment for Multi-Chip Modules. The system integrates the work of design teams distributed across a network and using different CAD systems. At present the following systems have been integrated: Cadence's Edge 2.1, Cadence's Allegro 6.1, AutoDesk's AutoCad 12.0, and Harris' Finesse. Software links were established allowing data from those systems to be shared through a ROSE (Rensselaer Object Storage Environment) database management developed under the sponsorship of the DICE program. The code was written in C++ and uses various methods to feed the information in and obtain it out of the design systems: IGES for Allegro, SKILL for Edge and dfile for Finesse, while the AutoCad link is a direct one. The DDR2 (Digital Drop Receiver, version 2) multi-chip module from Harris was entered into the system and routed utilizing a redundant route scheme. The exercise used a concurrent approach, the data defining parts and placement entered through Finesse, the parts modified in Edge, the route done in Allegro and the final merge and verification performed with the Edge tool. DTIC

N93-29562*# Lappeenranta Univ. of Technology (Finland). Dept. of Chemical Technology.
FUZZY SIMULATION IN CONCURRENT ENGINEERING
A. KRASLAWSKI and L. NYSTROM *In* NASA. Johnson Space Center, North American Fuzzy Logic Processing Society (NAFIPS 1992), Volume 2 p 408-417 Dec. 1992
Avail: CASI HC A02/MF A03

Concurrent engineering is becoming a very important practice in manufacturing. A problem in concurrent engineering is the uncertainty associated with the values of the input variables and operating conditions. The problem discussed in this paper concerns the simulation of processes where the raw materials and the operational parameters possess fuzzy characteristics. The processing of fuzzy input information is performed by the vertex method and the commercial simulation packages POLYMATH and GEMS. The examples are presented to illustrate the usefulness of the method in the simulation of chemical engineering processes. Author (revised)

N93-30865*# Boeing Commercial Airplane Co., Seattle, WA.
PROCESS AND ASSEMBLY PLANS FOR LOW COST COMMERCIAL FUSELAGE STRUCTURE
KURTIS WILLDEN, STEPHEN METSCHAN, and VAL STARKEY *In* NASA. Langley Research Center, First NASA Advanced Composites Technology Conference, Part 2 p 831-842 Jan. 1991
Avail: CASI HC A03/MF A06

Cost and weight reduction for a composite structure is a result of selecting design concepts that can be built using efficient low cost manufacturing and assembly processes. Since design and manufacturing are inherently cost dependent, concurrent engineering in the form of a Design-Build Team (DBT) is essential for low cost designs. Detailed cost analysis from DBT designs and hardware verification must be performed to identify the cost drivers and relationships between design and manufacturing processes. Results from the global evaluation are

used to quantitatively rank design, identify cost centers for higher ranking design concepts, define and prioritize a list of technical/economic issues and barriers, and identify parameters that control concept response. These results are then used for final design optimization. Author

N93-30954*# Purdue Univ., West Lafayette, IN. Mechanical Engineering Technology Dept.
TOOL GRINDING AND SPARK TESTING
EDWARD L. WIDENER *In* NASA. Langley Research Center, National Educators' Workshop. Update 92: Standard Experiments in Engineering Materials Science and Technology p 121-126 Jun. 1993
Avail: CASI HC A01/MF A04

The objectives were the following: (1) to revive the neglected art of metal-sparking; (2) to promote quality-assurance in the workplace; (3) to avoid spark-ignited explosions of dusts or volatiles; (4) to facilitate the salvage of scrap metals; and (5) to summarize important references. Derived from text

N93-31192# McDonnell-Douglas Electronics Co., Saint Louis, MO.
USE OF TITANIUM CASTINGS WITHOUT A CASTING FACTOR Final Report, 26 Sep. 1989 - 30 Sep. 1992
DIANNE CHONG 30 Sep. 1992 131 p
(Contract AF PROJ. 2418)
(AD-A264414; WL-TR-92-4090) Avail: CASI HC A07/MF A02

The 'Use of Titanium Castings Without a Casting Factor' program was conducted to establish 'A' and 'B' allowables for Ti-6Al-4V. Taguchi methods were used to develop a more restrictive chemistry and annealing condition to provide parts with less variability in properties. 'A' and 'B' design allowables that were determined for full scale Ti-6Al-4V missile fins and step plates produced using these new parameters showed very low variability, the standard deviations of these data were less than 2 ksi. The 'A' basis allowables are F(sub tu) = 125 ksi and F(sub ty) = 120 ksi. A nondestructive inspection technique was developed to correlate measurement of microstructural features to mechanical properties. This was found to be of limited value because of the narrow property band that was established. A new AMS specification that included the new allowables, the microstructural inspection criteria, and the more refined chemistry and post-casting treatments was established for investment cast Ti-6Al-4V. Limited fracture mechanics evaluation was also performed on the cast fins. DTIC

06
SUPPLIER QUALITY

A92-10202
FABRICATION AND COMPRESSION TESTING OF LAYER WAVINESS IN THERMOPLASTIC COMPOSITE LAMINATES
D. O'H. ADAMS and M. W. HYER (Virginia Polytechnic Institute and State University, Blacksburg) IN: International SAMPE Symposium and Exhibition, 36th, San Diego, CA, Apr. 15-18, 1991, Proceedings. Book 1 1991 15 p refs
(Contract N00014-90-J-1688) (TABES PAPER 93-602) Copyright

A three-step fabrication method is presented for intentionally fabricating isolated layer waves into otherwise wave-free thermoplastic composite laminates. Results of quality assurance testing verify that at this three-step method does not produce significant fiber damage or interface degradation. Compressive strengths from carbon/polysulfone specimens with various wave geometries as well as control specimens without waves are presented. Layer waviness is shown to produce strength reductions of up to 36 percent, although the wavy layer accounts for only 20 percent of the load-carrying capacity of the laminate. Two parameters, the wave length divided by the wave amplitude and the maximum angle of fiber rotation, are shown to characterize the severity of layer waviness. Author

A92-17270
SPACE/PERFORMANCE QUALIFICATION OF THE TAPE AUTOMATED BONDED (TAB) DEVICES
OMKARNATH K. GUPTA and JAMES J. KNIGHT (Amber Engineering, Inc., Goleta, CA) IN: Materials, devices, techniques, and applications for Z-plane focal plane array technology II; Proceedings of the Meeting, San Diego, CA, July 12, 13, 1990 8 p refs
Copyright

Quality assurance, wafer lot production, device testing, postprobe processing, and qualification and quality screening of tape automated bonded devices are discussed. These devices are qualifed for space applications and ready to assemble directly into production modules. C.D.

A92-38509#
TITAN IV - AN INTEGRATED SPACECRAFT/BOOSTER VIEW
SAMUEL W. ALBRECHT (USAF, Titan IV System Program Office, El Segundo, CA) AIAA, Space Programs and Technologies Conference, Huntsville, AL, Mar. 24-27, 1992. 8 p. refs
(AIAA PAPER 92-1325)

The Titan IV launch vehicle is briefly described focusing on the integration process which starts with spacecraft environmental and mechanical interface requirements definition and progresses through physical mating of the spacecraft and launch vehicle, launch countdown, launch, and orbit insertion. An approach to payload integration is presented where teamwork between the government and contractor organizations provides the framework necessary for the efficient incorporation of mission unique requirements. O.G.

A92-38638#
SYSTEMS ENGINEERING - THE LAST ENGINEERING DISCIPLINE TO BE AUTOMATED
MACK ALFORD (Ascent Logic Corp., San Jose, CA) AIAA, Space Programs and Technologies Conference, Huntsville, AL, Mar. 24-27, 1992 9p refs
(AIAA PAPER 92-1541) Copyright

This paper discusses the need and required characteristics for automation of Systems Engineering. The goals and requirements for automating Systems Engineering are discussed. Several classes of issues are identified: support for the unique methods and concepts used by systems engineers; support of concurrent engineering; the need for strengthening the systems engineering notations to eliminate current ambiguities; and the need for smooth transition of systems requirements to downstream tools. The expected benefits are explored, including increased productivity of the systems engineer's day to day activities (e.g., easier traceability and document production, easier capture of design decisions), increased rpoductivity due to increased quality, and shorter calender time to get to a design. Author

A92-43152
INSPECTING THE DAMAGE OF A COMPOSITE MATERIAL STRUCTURE FOR QUALITY ASSURANCE
M. UCHIYAMA (Kawasaki Heavy Industries, Ltd., Kobe, Japan) IN: Aircraft Symposium, 28th, Tokyo, Japan, Nov. 7-9, 1990, Proceedings 1990 4 p In JAPANESE

The types of damage of aircraft composite materials are classified. Nondestructive test methods including X-ray detection and ultrasonic detection are discussed. Y.P.Q.

A92-46475
ELECTRICAL, ELECTRONIC, AND ELECTRO-MECHANICAL PARTS FOR SPACE FLIGHT USE - A REVIEW
GERARD F. KIERNAN (Kiernan Engineering, Riverdale, MD) IN: Annual AIAA/Utah State University Conference on Small Satellites, 5th, Logan, Aug. 26-29, 1991, Proceedings 1991 4 p

Some military and NASA specifications for electrical, electronic, and

electromechanical parts define reliability goals, under subtitles such as established reliability or high reliability. Specifications with no reference to reliability will often have multiple levels of product or quality assurance, one of which is designated for space flight use. Documents used to calculate system reliability make calculations based on catastrophic failure of the part, whereas specifications use a parametric shift as the definition of failure. For most spacecraft circuits, parametric drift is the more prevalent problem. Parts often have aging characteristics that the designer must consider. It is shown how specification requirements can be combined with applications guidelines, such as the derating tables given in various NASA and military documents, to choose appropriate parts for space flight projects. A.F.S.

A92-47418
ECONOMICS OF AUTOMOTIVE COMPOSITE APPLICATIONS
JAMES M. MARGOLIS (Margolis Marketing & Research Co., New York) IN: Composites in manufacturing - Case studies 1991 15 p
Copyright

Several cost analyses are presented to demonstrate that composites can compete in the automotive industry with proper automation and product integration. Several composite manufacturing methods are reviewed from the automotive perspective, including layup, filament winding, pultrusion, resin-transfer molding, reaction injection molding, and sheet-molding compound compression molding. It is noted that automotive design and manufacturing methods must change from the traditional metal-oriented methods to take full advantage of composite materials. Design for assembly/design for manufacturing, CAD/CAM, automated finite element analysis, quality assurance methods, and automation are required for the successful use of composites in the automotive industry. V.L.

A92-52300
777 SHAPING UP
GUY NORRIS and GRAHAM WARWICK *Flight International* (ISSN 0015-3710), vol. 142, no. 4325, July 1, 1992, p. 27, 28, 30-32. 1 Jul. 1992 5 p
Copyright

An overview is presented of the assembly of the 777 transport with parts from more than a dozen countries, over 40 major suppliers, subcontractors, and hundreds of smaller suppliers as product definition takes place. Attention is given to the systems integration laboratory that will house a dedicated 777 flight-control test rig now being built, complete with control surfaces, full electronics, electrical power system and some parts of the hydraulics. Consideration is given to the powerplants, computer design system, the advanced air conditioning system, avionics and landing gear wheels, brakes and tires. R.E.P.

A92-56252
ELECTRONICS/AVIONICS INTEGRITY - DEFINITION, MEASUREMENT AND IMPROVEMENT
W. KOLARIK, J. RASTY, M. CHEN, and Y. KIM (Texas Tech University, Lubbock) IN: Annual Reliability and Maintainability Symposium, Las Vegas, NV, Jan. 21-23, 1992, Proceedings 1992 8 p refs
Copyright

The authors report on the results obtained from an extensive, threefold research project: (1) to search the open quality and reliability literature for documented information relative to electronics/avionics integrity; (2) to interpret and evaluate the literature as to significant concepts, strategies, and tools appropriate for use in electronics/avionics product and process integrity efforts; and (3) to develop a list of critical findings and recommendations that will lead to significant progress in product integrity definition, measurement, modeling, and improvements. The research consisted of examining a broad range of trade journals, scientific journals, and technical reports, as well as face-to-face discussions with reliability professionals. Ten significant recommendations have been supported by the research work. I.E.

A93-25467 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA.
SAR CALIBRATION - AN OVERVIEW
ANTHONY FREEMAN (JPL, Pasadena, CA) *IEEE Transactions on Geoscience and Remote Sensing* (ISSN 0196-2892) vol. 30, no. 6 Nov. 1992 p. 1107-1121. Research supported by NASA refs
Copyright

Remote sensing with synthetic aperture radars (SAR's) is a rapidly developing field. Calibration of these sensors is required for the establishment of relationships between radar backscatter and geographical parameters. A review of recent progress in SAR calibration is presented. The quantities measured by SAR are defined and mathematical formulations of the three basic types of SAR images are developed. The establishment of scientific requirements for calibration and the difficulties involved are discussed. Image quality assessment is reviewed and the problems of radiometric calibration of SAR images using the radar equation and internal and external approaches are considered. Polarimetric radar calibration and the development of the necessary algorithms are described. Interferometric phase calibration and its associated problems are reviewed and future challenges in SAR calibration are discussed. A.O.

A93-26616
COLD TESTS OF OPEN COAXIAL RESONATORS IN THE RANGE 9-17 GHZ
P. J. CASTRO, J. J. BARROSO, and R. A. CORREA (INPE, Sao Jose dos Campos, Brazil) *International Journal of Infrared and Millimeter Waves* (ISSN 0195-9271) vol. 14, no. 2 Feb. 1993 p. 383-395. refs
Copyright

A study of selective properties of coaxial open cylindrical resonators have been conducted experimentally and compared with theory. The resonator consists of an inner circular cylinder symmetrically located inside an outer weakly irregular open waveguide. Several fundamental TE modes were identified over the range 9 to 17 GHz through measurements of the resonant frequencies and the associated loaded quality factors. It has been verified that the structure and the number of resonant modes are both strongly dependent on the diameter of the coaxial insert. Such an electrodynamical system proves to be useful in guided wave applications requiring, for example, filters, frequency-tunable resonators and devices for analyzing the modal composition of a signal. Author

A93-27244 National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
DESIGN ASPECTS AND COMPARISON BETWEEN HIGH TC SUPERCONDUCTING COPLANAR WAVEGUIDE AND MICROSTRIP LINE
K. S. KONG (Texas Univ., Austin), K. B. BHASIN (NASA, Lewis Research Center, Cleveland, OH), and T. ITOH (California Univ., Los Angeles) *In* Superconductivity applications for infrared and microwave devices II; Proceedings of the Meeting, Orlando, FL, Apr. 4, 5, 1991 Bellingham, WA Society of Photo-Optical Instrumentation Engineers 1991 p. 57-65. Previously announced in STAR as N91-27445 refs (Contract RTOP 506-59-4C; NCC3-192; N00014-89-J-1006)
Copyright

The high T sub c superconducting microstrip line and coplanar waveguide are compared in terms of the loss characteristics and the design aspects. The quality factor Q values for each structure are compared in respect to the same characteristic impedance with the comparable dimensions of the center conductor of the coplanar waveguide and the strip of the microstrip line. Also, the advantages and disadvantages for each structure are discussed in respect to passive microwave circuit applications. Author

A93-33945#
RELIABILITY ANALYSIS AND QUALITY ASSURANCE OF ROCKET MOTOR CASE CONSIDERING PROOF TESTING
J. N. YANG (California Univ., Irvine), H. Y. CHEN, C. M. CHANG, and H. K. SHEE (Chung Shan Inst. of Science and Technology, Longtan, Taiwan) *In* AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dy-

namics, and Materials Conference, 34th and AIAA/ASME Adaptive Structures Forum, La Jolla, CA, Apr. 19-22, 1993, Technical Papers. Pt. 2 Washington American Institute of Aeronautics and Astronautics 1993 p. 724-733. refs
(AIAA PAPER 93-1382) Copyright

The effect of proof testing on structural reliability in service is examined with particular attention given to practical applications of the reliability theory to the quality assurance of rocket motor cases. Multiple failure modes under consideration include fracture failure, plastic yielding collapse and their interactions. The fracture toughness, yield stress, flaw length, flaw geometry, service loads, and geometric dimensions are considered as statistical variables. It is concluded that proof testing is most effective when the statistical variability of the surface mode is small or the statistical dispersion of the overall strength of the structure is large. AIAA

A93-38675* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
LUMPED ELEMENTS CHARACTERIZE Q IN DIELECTRIC RESONATORS
CHASE P. HEARN (NASA, Langley Research Center, Hampton, VA) Microwaves & RF (ISSN 0745-2993) vol. 32, no. 4 April 1993 p. 89-92. refs
Copyright

It has been earlier observed (Podcameni et al., 1981) that, as the coupling factor between a microstrip-coupled dielectric resonator and the line becomes much larger than unity, the unloaded quality factor (Q) of the resonator decreases. In this paper it is shown that this effect can be explained using lumped-element models of the coupling line, when the dielectric resonator is either overcoupled or undercoupled to the line. AIAA

A93-39071
OPTIMIZATION OF CUTTING REGIMES IN FLEXIBLE PRODUCTION SYSTEMS BASED ON QUALITY PARAMETERS [OPTIMIZATSIIA REZHIMOV REZANIIA V USLOVIIAKH GIBKIKH PROIZVODSTVENNYKH SISTEM PO PARAMETRAM KACHESTVA]
T. N. LITVINOVA (Rybinskii Aviatsionnyi Tekhnologicheskii Inst., Rybinsk, Russia) *In* Quality of the surface layer and operating properties of aircraft engine components Yaroslavl, Russia Rybinskii Aviatsionnyi Tekhnologicheskii Institut 1990 p. 62-66. In RUSSIAN refs
Copyright

The use of cutting regimes as a control factor in flexible production systems is examined. The downtime of machine tool modules resulting from failures leads to a reduction in productivity. These losses can be compensated by using high-speed cutting regimes on alternative machine tools, i.e., by activating emergency regimes for the period of fault repair. The problem of calculating the emergency regimes is formulated and solved as a three-dimensional optimization problem without constraints. AIAA

A93-39100
A STUDY OF THE QUALITY OF MATERIALS AND COMPARATIVE TESTING OF BLADES PRODUCED BY HIGH-SPEED RAM EXTRUSION [ISSLEDOVANIE KACHESTVA MATERIALOV I SRAVNITEL'NYE ISPYTANIIA LOPATOK, POLUCHENNYKH VYSOKOSKOROSTNOI SHTAMPOVKOI]
I. L. SHITAREV and IU. N. KRASNOV *In* High-efficiency machining methods for aviation materials Samara, Russia Kuibyshevskii Aviatsionnyi Institut 1991 p. 112-116. In RUSSIAN
Copyright

The chemical composition, micro- and macrostructures, and mechanical properties of EI961Sh blades produced by high-speed ram extrusion were investigated in order to evaluate the quality of the blade material. It is found that the reliability and durability of the extruded blades exceed those of blades produced by die forging. AIAA

A93-39273
BREAKAWAY FRICTIONS OF DYNAMIC O-RINGS IN MECHANICAL SEALS
TOM LAI and PETER KAY (John Crane, Inc., Morton Grove, IL) Lubrication Engineering (ISSN 0024-7154) vol. 49, no. 5 May 1993 p. 349-355; Discussion, p. 355; Authors' Closure, ASME and STLE, Tribology Conference, San Diego, CA, Oct. 19-21, 1992 Research supported by John Crane, Inc refs
Copyright

Breakaway friction of a dynamic O-ring affects the mechanical seal's response to large axial shaft movement and face wear. However, little data exist to help designers. Therefore, a test rig was developed to measure breakaway friction. The research quantitatively shows the effects of lubrication with silicone grease and a change of surface finish. By using the Taguchi statistical experimental design method, the significance of test parameters was evaluated with a minimum number of tests. It was found that fluid pressure, dwell time, and O-ring percentage squeeze affect O-ring breakaway friction more than the O-ring cross sectional diameter and axial sliding speed within the range of values tested. The authors showed that breakaway friction increased linearly with pressure. However, O-rings made of different materials had significantly different increase rates, even if they had nominally the same durometer hardness. Breakaway friction also increased with logarithm of dwell time. Again, the increase rate depended strongly on the specific O-ring material tested. These observations led the authors to believe that the typical approach of generalizing data based on generic polymer type and durometer was inappropriate. Author (revised)

A93-40777
MATERIALS DEVELOPMENT FOR LIGHT DESIGN - A SUPPLIERS VIEW
JEFF W. EDINGTON (Alcan International, Ltd., Montreal, Canada) *In* Mechanical behaviour of materials - VI; Proceedings of the 6th International Conference, Kyoto, Japan, July 29-Aug. 2, 1991. Vol. 1 Oxford and Elmsford, NY Pergamon Press 1992 p. 3-16. refs
Copyright

The paper discusses two major points of consideration for the material suppliers, regarding material technology development for lightweight structures. The first is represented by the example of the development of Al-Li alloys for airframes, a classical case where the key step is the alloy development. The second is represented by the example of the technology development for aluminum-structured automobile bodies, a more complex situation where the alloy development is a minor issue. The major issues are the manufacturing and cost problems and problems of vehicle performance, which must be solved by collaboration between the materials supplier and the automobile manufacturer. AIAA

A93-47746
THE US ARMY ATMOSPHERIC PROFILER RESEARCH FACILITY - DESCRIPTION AND CAPABILITIES
JOHN R. HINES, FRANK D. EATON, WILLIAM HATCH, and SCOTT MCLAUGHLIN (U.S. Army, Atmospheric Sciences Lab., White Sands Missile Range, NM) *In* IGARSS '92; Proceedings of the 12th Annual International Geoscience and Remote Sensing Symposium, Houston, TX, May 26-29, 1992. Vol. 1 New York Institute of Electrical and Electronics Engineers, Inc. 1992 p. 734-737. refs
Copyright

The atmospheric profiler research facility (APRF) is designed to remotely monitor three primary atmospheric parameters: wind speed and direction, refractive index structure parameter (Cn2), and virtual temperature. The APRF includes a suite of high performance (temporal and spatial resolution) phased-array, multiple reflector, and multiple aperture type atmospheric profilers. The data derived from the facility components are massaged to provide an integrated profile of each of the parameters of interest. Quality assurance algorithms are implemented to ?edit' the resultant quantities. Facility-derived projects support research applications including R&TD test bed analyses, imaging and propagation system

design and test, and test range environmental forecasting improvement. The facility design and capabilities are fully described. I.E.

A93-48814
REAL TIME DIAGNOSTICS OF BEAM QUALITY IN C.W. AND PULSED LASER SYSTEMS
ANTONELLO CUTOLO and LUIGI ZENI (Napoli Univ., Naples, Italy) *In* Lasers '91; Proceedings of the 14th International Conference on Lasers and Applications, San Diego, CA, Dec. 9-13, 1991 McLean, VA STS Press 1992 p. 859-878. Research supported by CNR and MURST refs
Copyright

A real-time analyzer (RTA) apparatus capable of operating from the CW to the femtosec emission regimes has been developed to monitor the fluctuations of the M-squared factor, the waist and far-field divergences, and (in the case of pulsed lasers), the pulse length and peak power. It is shown that, with only minor modifications, the RTA can be used to monitor transient mode-mixing effects by measuring the fluctuations of M-squared. AIAA

A93-51293
ULTRAHIGH Q PENDULUM SUSPENSIONS FOR GRAVITATIONAL WAVE DETECTORS
D. G. BLAIR, L. JU, and M. NOTCUTT (Western Australia Univ., Nedlands, Australia) *Review of Scientific Instruments* (ISSN 0034-6748) vol. 64, no. 7 July 1993 p. 1899-1904. Research supported by Australian Research Council refs
Copyright

Pendulum suspensions for laser interferometer gravitational wave detectors need to have an extremely high Q factor to minimize Brownian motion noise. In this paper we analyze the limits to the Q factor of the compound pendulum. We show that the observed acoustic loss of niobium can allow pendulum Q factors of 10 exp 10 to be achieved. This should enable a 3 km terrestrial laser interferometer detector to achieve strain sensitivity of 10 exp -22/sq rt Hz at frequencies as low as 10 Hz. At cryogenic temperatures, Q factors up to 10 exp 12 should be achievable. Author (revised)

A93-52171
GAS TURBINE STARTER (JET FUEL STARTER) SPECIFICATION SAE
Aerospace Standard SAE AS 1606 Sept. 15, 1992 55 p. refs
(SAE AS 1606) Copyright

The requirements concerning the 'to be specified' (TBS) jet fuel starter for the gas turbine engine used in the TBS aircraft are listed in a form that they may serve as an aid in the preparation of a gas turbine starter specification. Applicable documents are presented, including military documents (specifications and standards) and other publications, and definitions and symbols; requirements, including operational, environmental, and design requirements; quality assurance provisions, including specifications concerning classification of tests, test conditions, acceptance tests, individual tests, and preproduction testing; and preparation for delivery, including directions for preservation and packaging, packing, marking, and packing list. AIAA

A93-53641
PERFORMANCE ANALYSIS, QUALITY FUNCTION DEPLOYMENT AND STRUCTURED METHODS
M. W. MAIER (Alabama Univ., Huntsville) *In* 1993 IEEE Aerospace Applications Conference, 14th, Steamboat Springs, CO, Jan. 31-Feb. 5, 1993, Digest New York Institute of Electrical and Electronics Engineers, Inc. 1993 p. 187-195. refs
Copyright

Quality function deployment, (QFD), an approach to synthesizing several elements of system modeling and design into a single unit, is presented. Behavioral, physical, and performance modeling are usually considered as separate aspects of system design without explicit linkages. Structured methodologies have developed linkages between behavioral and physical models before, but have not considered the integration of performance models. QFD integrates performance models with traditional structured models. In this method, performance requirements such as cost, weight, and detection range are partitioned into matrices. Partitioning is done by developing a performance model, preferably quantitative, for each requirement. The parameters of the model become the engineering objectives in a QFD analysis and the models are embedded in a spreadsheet version of the traditional QFD matrices. The performance model and its parameters are used to derive part of the functional model by recognizing that a given performance model implies some structure to the functionality of the system.

N92-13286# Reinhart and Associates, Inc., Austin, TX.
A RADIOGRAPHIC LAYER COUNTER FOR COMPOSITES Final Technical Report, Jun. 1987 - Feb. 1988
RONALD E. LARSEN Jun. 1991 51 p
(Contract DAAK60-87-C-0039)
(AD-A240794; NATICK-TR-91/032) Avail: CASI HC A04/MF A01

The Army helmet is a composite of layers of resin-bonded Kevlar. Inadvertent omission of layers or undetected shifting of layers during molding processes can reduce the effective number of fibers in some helmet areas and impair their strength properties. A nondestructive method of 100 percent testing of the helmets, more effective than random sampling by ballistic testing, is needed. This six-month study evaluated the feasibility of using relatively low-energy radioisotopes to gauge the uniformity of Kelvar helmets. The potential for constructing a portable detection unit was also assessed. A laboratory radiometric test system was used to evaluate resin-bonded Kevlar samples, as well as actual Army helmets from current suppliers. It was found that the radiometric test system has the capacity to reflect the general condition of fabricated Kevlar helmets. DTIC

N92-13865*# Old Dominion Univ., Norfolk, VA. Dept. of Engineering Management.
SPACECRAFT DESIGN OPTIMIZATION USING TAGUCHI ANALYSIS
RESIT UNAL *In its* NASA/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1991 p 227-228 Sep. 1991
Avail: CASI HC A01/MF A03

The quality engineering methods of Dr. Genichi Taguchi, employing design of experiments, are important statistical tools for designing high quality systems at reduced cost. The Taguchi method was utilized to study several simultaneous parameter level variations of a lunar aerobrake structure to arrive at the lightest weight configuration. Finite element analysis was used to analyze the unique experimental aerobrake configurations selected by Taguchi method. Important design parameters affecting weight and global buckling were identified and the lowest weight design configuration was selected. Author

N92-17873*# National Aeronautics and Space Administration, Washington, DC.
HUBBLE SPACE TELESCOPE: SRM/QA OBSERVATIONS AND LESSONS LEARNED
GEORGE A. RODNEY 1990 27 p
(NASA-TM-105505; NAS 1.15:105505) Avail: CASI HC A03/MF A01

The Hubble Space Telescope (HST) Optical Systems Board of Investigation was established on July 2, 1990 to review, analyze, and evaluate the facts and circumstances regarding the manufacture, development, and testing of the HST Optical Telescope Assembly (OTA). Specifically, the board was tasked to ascertain what caused the spherical aberration and how it escaped notice until on-orbit operation. The error that caused the on-orbit spherical aberration in the primary mirror was traced to the assembly process of the Reflective Null Corrector, one of the three Null Correctors developed as special test equipment (STE) to measure and test the primary mirror. Therefore, the safety, reliability, maintainabil-

ity, and quality assurance (SRM&QA) investigation covers the events and the overall product assurance environment during the manufacturing phase of the primary mirror and Null Correctors (from 1978 through 1981). The SRM&QA issues that were identified during the HST investigation are summarized. The crucial product assurance requirements (including nonconformance processing) for the HST are examined. The history of Quality Assurance (QA) practices at Perkin-Elmer (P-E) for the period under investigation are reviewed. The importance of the information management function is discussed relative to data retention/control issues. Metrology and other critical technical issues also are discussed. The SRM&QA lessons learned from the investigation are presented along with specific recommendations. Appendix A provides the MSFC SRM&QA report. Appendix B provides supplemental reference materials. Appendix C presents the findings of the independent optical consultants, Optical Research Associates (ORA). Appendix D provides further details of the fault-tree analysis portion of the investigation process. Author

N92-21777# National Inst. of Standards and Technology, Gaithersburg, MD. Office of Standards Code and Information.
CRITERIA FOR THE OPERATION OF FEDERALLY-OWNED SECONDARY CALIBRATION LABORATORIES (IONIZING RADIATION) Final Report
E. H. EISENHOWER Aug. 1991 66 p
(PB92-112481; NIST/SP-812) Avail: CASI HC A04/MF A01

Given here are standards of performance for laboratories that calibrate instrumentation used to measure ionizing radiation. Such standards are useful for the development of a secondary level of calibration laboratories that can provide a high-quality link between the National Institute of Standards and Technology and those who make routine measurements at the field level. The standards may also be used as criteria on which a decision is based regarding accreditation of a particular laboratory. They were developed by representatives of federally-owned laboratories that perform calibrations of the type addressed by the document. General criteria that must be satisfied by all laboratories seeking accreditation are noted, as well as requirements relating to management and staff, physical aspects of the laboratory, calibration facilities and equipment, operational procedures, accuracy and quality assurance, and records and reports. Criteria are established for calibration of survey instruments, irradiation of personnel dosimeters, calibration of sources, calibration of instruments for diagnostic levels, and calibration of reference-class instruments. The types of radiation covered include gamma rays, x rays, beta particles, neutrons, and alpha particles. The proficiency tests administered by NIST to secondary laboratories as a prerequisite for their accreditation are described. Author

N92-26828# General Accounting Office, Washington, DC.
KENNEDY SPACE CENTER: DECISION ON PHOTOGRAPHIC REQUIREMENTS APPEARS JUSTIFIED
Apr. 1992 10 p
(GAO/NSIAD-92-192; B-248197) Avail: CASI HC A02/MF A01

NASA's decision to transfer some photography work from the photographic support contractor to the shuttle processing, payload ground operations, and base operations contractors was an attempt to hold the three contractors more fully accountable for accomplishment of their respective missions. Most of the photographic work in question is performed as a minor part of the duties of quality assurance personnel with simple-to-use cameras. According to NASA's Inspector General, the photography costs are less than would be incurred if the photographs were taken by the photographic support contractor. Engineers who use the photographs are generally satisfied with their quality, and in cases where NASA believes that professional quality photographs are needed, it can have the photographic support contractor take them. Author

N92-30133*# Saab-Scania, Linkoping (Sweden). Aircraft Div.
A MANUFACTURER'S APPROACH TO ENSURE LONG TERM STRUCTURAL INTEGRITY
HANS ANSELL, BILLY FREDRIKSSON, and INGVAR HOLM *In* NASA. Langley Research Center, The 1991 International Conference on Aging Aircraft and Structural Airworthiness p 379-405 Jul. 1992
Avail: CASI HC A03/MF A04

The main features of the design concepts for the Saab 340 and Saab 2000 aircraft are described with respect to structural integrity and high reliability. Also described is the approach taken at Saab Aircraft to ensure structural integrity and high reliability. The concepts of global and local loads and sequences, and the fatigue and damage tolerance sizing and their verification are discussed. Also described is quality assurance in the production and structural maintenance program. Structural repair and feedback from operators are also covered. Author

N92-31972# Andrulis Research Corp., Salt Lake City, UT.
DEVELOPMENT OF METHODOLOGY AND TECHNOLOGY FOR IDENTIFYING AND QUANTIFYING EMISSION PRODUCTS FROM OPEN BURNING AND OPEN DETONATION THERMAL TREATMENT METHODS. FIELD TEST SERIES A, B, AND C. VOLUME 2, PART A: QUALITY ASSURANCE AND QUALITY CONTROL Final Report, Dec. 1988 - Jan. 1992
MACDONALD JOHNSON Jan. 1992 138 p
(Contract DAAD09-87-D-0008)
(AD-A250736) Avail: CASI HC A07/MF A02

The report describes the quality assurance/quality control program conducted during 1990 field testing which supported the OB/OD Thermal Treatment Methods Study. The QA/QC program encompassed sample collection, preparation, storage, extraction, analytical instrument operation, data reduction, statistical data analyses and interpretation. Samples included atmosphere collected in evacuated stainless steel canisters, soil, and Teflon coated-glass-fiber media. The supercritical fluid chromatograph and gas chromatograph with mass spectrometers were the principal laboratory analytical instruments used during these field tests. Real-time instruments detected and quantified CO, CO2, NO, NO2, and NOx. Near-real-time analyses were accomplished by use of a Teflon bag in which samples of the plume were collected for analyses during testing operations. Sample-tracking was conducted using a system which permitted precise identification of individual specimens from collection through analyses or archiving. Analysis of atmosphere and soil samples spiked by the U.S. Environment Protection Agency (EPA) reflected a degree of accuracy well within acceptable limits. DTIC

N92-31973# Andrulis Research Corp., Salt Lake City, UT.
DEVELOPMENT OF METHODOLOGY AND TECHNOLOGY FOR IDENTIFYING AND QUANTIFYING EMISSION PRODUCTS FROM OPEN BURNING AND OPEN DETONATION THERMAL TREATMENT METHODS. FIELD TEST SERIES A, B, AND C. VOLUME 2, PART B: QUALITY ASSURANCE AND QUALITY CONTROL. APPENDICES Final Report, Dec. 1988 - Jan. 1992
MACDONALD JOHNSON Jan. 1992 367 p
(Contract DAAD09-87-D-0008)
(AD-A250737) Avail: CASI HC A16/MF A03

The report describes the quality assurance/quality control program conducted during 1990 field testing which supported the OB/OD Thermal Treatment Methods Study. The QA/QC program encompassed sample collection, preparation, storage, extraction, analytical instrument operation, data reduction, statistical data analyses and interpretation. Samples *included atmosphere collected in evacuated stainless steel canisters*, soil, and Teflon coated-glass-fiber media. The supercritical fluid chromatograph and gas chromatograph with mass spectrometers were the principal laboratory analytical instruments used during these field tests. Real-time instruments detected and quantified CO, CO2, NO, NO2, and NOx. Near-real-time analyses were accomplished by use of a Teflon bag in which samples of the plume were collected for analyses during testing operations. Sample-tracking was conducted using a system which permitted precise identification of individual specimens from collection through analyses or archiving. Analysis of atmosphere and soil samples spiked by

the U.S. Environmental Protection Agency (EPA) reflected a degree of accuracy well within acceptable limits. DTIC

N92-32650# Andrulis Research Corp., Salt Lake City, UT.
DEVELOPMENT OF METHODOLOGY AND TECHNOLOGY FOR IDENTIFYING AND QUANTIFYING EMISSION PRODUCTS FROM OPEN BURNING AND OPEN DETONATION THERMAL TREATMENT METHODS. BANGBOX TEST SERIES. VOLUME 3: QUALITY ASSURANCE AND QUALITY CONTROL Final Report, Dec. 1988 - Jan. 1992
MACDONALD JOHNSON Jan. 1992 306 p
(Contract DAAD09-87-D-0008)
(AD-A251099) Avail: CASI HC A14/MF A03

The 1989 BangBox test validated technologies and methodologies proposed for identifying and quantifying emissions resulting from the open burning (OB) of propellants and open detonation (OD) of explosives. This test also provided the first credible data on combustion products resulting from OB/OD treatment procedures. The vigorous quality assurance/quality control (QA/QC) program established well before the first trial was continued through the reporting phase. Major elements of the OA/QC program were a quality assurance program plan (QAPP), letters of instruction (LOI) covering all technical aspects of the testing program, a sample identification and tracking system, test monitoring by the scientific support contractor, visits to the test site and assay laboratories by an independent QA contractor, assays by different laboratories using different instruments (gas chromatograph/mass spectrometer and supercritical fluid chromatograph/mass spectrometer), equipment audits by the U.S. Environmental Protection Agency's Atmospheric Research and Exposure Assessment Laboratory (AREAL), assay of samples spiked by the AREAL, and cooperative assistance from the U.S. Army Toxic and Hazardous Material Agency, and the U.S. Army Environmental Hygiene Agency. DTIC

N92-33061# National Inst. of Standards and Technology, Boulder, CO. Electromagnetic Fields Div.
CALIBRATION SERVICE FOR LOW-LOSS, THREE-TERMINAL CAPACITANCE STANDARDS AT 100 KHZ AND 1 MHZ
GEORGE M. FREE and RAY N. JONES Feb. 1992 34 p
(PB92-189554; NIST/TN-1348; B91-0099) Avail: CASI HC A03/MF A01; SOD HC

The three-terminal capacitance calibration service at 100 kHz and 1 MHz at the National Institute of Standards and Technology, Boulder Laboratories, is described. The document discusses the purpose of the service, contact points for initiating the service, what capacitors are appropriate for calibration, the measurement methods used, the instrumentation used for the measurement, and an analysis of the errors in the measurement. It also lists the calibration uncertainties for the stated frequencies and capacitances. Finally, the document discusses the quality assurance programs used at NIST to insure the integrity of the calibration. Author

N93-26447# Federal Aviation Administration, Oklahoma City, OK. Civil Aeromedical Inst.
CONVERSION OF THE CTA, INC., EN ROUTE OPERATIONS CONCEPTS DATABASE INTO A FORMAL SENTENCE OUTLINE JOB TASK TAXONOMY Final Report
MARK D. RODGERS and GENA K. DRECHSLER Jan. 1993 77 p
(AD-A261410; DOT/FAA/AM-93/1) Avail: CASI HC A05/MF A01

FAA Air Traffic Control Operations Concepts Volume VI: ARTCC-Host En Route Controllers (1990) developed by CTA, Inc., a technical description of the duties of an En Route air traffic control specialist (ATCS), formatted in User Interface Language, was restructured into a hierarchical formal sentence outline. To ensure that none of the meaning associated with a task or task element was lost during the conversion, the revised document was reviewed by subject matter experts (SME's) consisting of five groups of six En Route controllers and a quality assurance subject matter expert. SME's looked for words, phrases, or acronyms not commonly used by En Route controllers, and illogical sequencing of duties described in the document. Appropriate suggestions for change were implemented into the document before the next review. Five-hundred seventy-five changes were made to the document, with only two of these changes made during the final review, confirming that an improved document resulted from the research. The restructured document is intended to assist in the identification of tasks not performed or performed incorrectly during the commission of an operational error. However, an easily understood, detailed description of duties performed by an En Route ATCS has potential not only for use by researchers interested in En Route ATCS tasks, but also by quality assurance investigation teams and training personnel. DTIC

N93-27099# Cortest Columbus Technologies, OH.
ALTERNATING CURRENT (AC) IMPEDANCE TESTING OF COATED TRAYCANS Final Report, Jul. 1991 - Jan. 1993
KURT LAWSON and JOHN BEAVERS Jan. 1993 32 p
(Contract DAAK60-90-C-1301; DA PROJ. 728-01219)
(AD-A261256; NATICK-TR-93-019) Avail: CASI HC A03/MF A01

The overall objective of the program was to evaluate the relative resistance of several candidate coatings prior to retorting to a solution containing NaCl and citric acid (simulating saline, acidic food product) at ambient temperature. An additional objective of the program was to perform an initial assessment of the applicability of the AC impedance technique as a quality assurance technique for traycan coatings. The performance of the coatings was evaluated by means of an Electrochemical Impedance Spectroscopy (EIS) technique, also referred to as AC impedance. The EIS technique was found to be a sensitive technique for measuring coating degradation on the traycans. Of the coatings analyzed, the VMC coating, in general was found to be the best performer, followed closely by DMS and VMS. The control coating was found to be the poorest coating, of the coatings analyzed. DTIC

N93-31830 National Inst. of Standards and Technology, Gaithersburg, MD. Standard Reference Materials Program.
STANDARD REFERENCE MATERIALS: HANDBOOK FOR SRM USERS Special Publication
J. K. TAYLOR and N. M. TRAHEY Feb. 1993 122 p Supersedes PB86-110897 Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(PB93-183796; NIST-SP-260-100) Avail: Issuing Activity (National Technical Information Service (NTIS))

The handbook was prepared to provide guidance for the use of Standard Reference Materials (SRMs) to provide an accuracy base for chemical measurements. The general concepts of precision and accuracy, and their realization by quality assurance of the measurement process, are discussed. General characteristics of SRMs are described and guidance given on their selection for specific applications. Ways to effectively use SRMs are recommended, including the utilization of control charts to evaluate and monitor measurement accuracy. Appendices provide statistical guidance on the evaluation of measurement uncertainty. NTIS

07
ASSESSING RESULTS

A92-14351
ROTORCRAFT MANEUVERABILITY AND AGILITY SURVIVABILITY SENSITIVITY ANALYSIS (RMASSA)
SCOTT R. SWINSICK and SHARON L. DRUMMOND (McDonnell Douglas Helicopter Co., Mesa, AZ) IN: AHS, Annual Forum, 47th, Phoenix, AZ, May 6-8, 1991, Proceedings. Vol. 1 1991 7 p refs

Using a fractional-factorial study matrix, combinations of baseline and improved levels of helicopter maneuverability and agility (M&A) have been used to investigate different aircraft configurations in air-to-air, air-to-ground, and AirLand Engagement Simulation combat models. The M&A performance parameters most critical to survivability have been identified. Using Taguchi methods a study matrix that studied the critical performance parameters across three levels was developed; the matrix represented derivative helicopter designs which reflected improved M&A qualities. O.C.

A92-38787
THE US GOVERNMENT CIVIL SPACE PROGRAMME
T. F. ROGERS (Sophron Foundation, McLean, VA) *Space Policy* (ISSN 0265-9646), vol. 8, no. 2, May 1992, p. 103-108. refs
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This paper examines the U.S. national space program within the context of historical change and the present global political and economic climate. Specific issues addressed include the erosion of public support for the program due to the end of the Cold War, the lack of economic return, and the program's inherent costs. Specific suggestions are listed for changing the philosophy and content of the space program to make it compatible with current circumstances. It is proposed that the U.S. space program adopt as its goal 'leadership in the use of space' by emphasizing R&D programs that directly affect the lives of the general public. Human planetary exploration and settlement are considered low-priority activities since they cannot directly stimulate the U.S. economy. C.C.S.

A92-51880
GUN LAUNCH TO SPACE - INTERNATIONAL POLICY AND LEGAL CONSIDERATIONS
MICHAEL POTTER IN: Colloquium on the Law of Outer Space, 34th, Montreal, Canada, Oct. 5-11, 1991, Proceedings 1992 8 p refs
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The state of space gun technology is surveyed, including civilian, military, and commercial applications. The motivation to pursue this kind of technology in space projects is briefly discussed. Space law issues involved in space gun technology are addressed. C.D.

A93-11456
EVALUATION OF SILICON NITRIDE AS AN ADVANCED RADOME MATERIAL
R. K. FRAZER (Johns Hopkins Univ., Laurel, MD) *Johns Hopkins APL Technical Digest* (ISSN 0270-5214) vol. 13, no. 3 July-Sept. 1992 p. 393-399. refs
Copyright

Various forms of silicon nitride (Si_3N_4) are investigated to determine their suitability as radome materials for hypersonic radar-guided missiles. A database of thermal transport and mechanical properties was generated by the developers of these materials and by other independent laboratories. Standard surface-finish techniques and a uniform sample size and shape for use by all suppliers was developed so that direct comparisons could be made. The results of tests on mechanical strength and particle-impact damage are presented along with an explanation of the methods for obtaining reliable strength and toughness values essential for radome design. Author

A93-24295#
AN ASSESSMENT OF COMBAT SURVIVABILITY ENHANCEMENTS BY TAGUCHI METHODS
MARK A. BRYNESTAD and CONRAD F. NEWBERRY (U.S. Naval Postgraduate School, Monterey, CA) Aug. 1992 14 p. AIAA, Aircraft Design Systems Meeting, Hilton Head Island, SC, Aug. 24-26, 1992 refs (AIAA PAPER 92-4204)

A Taguchi-methodology assessment of the effects of several aircraft survivability-enhancement features on both the desired survivability and takeoff gross weight of a generic close air support-type aircraft has been implemented in a computer model. The enhancement features in question are engine separation, engine protection, control system backups, and the number of single-point 'kill sites'. The Taguchi techniques yield a quantitative evaluation of these measures, as well as the value of a fractional factorial experiment. O.C.

A93-29114* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
TELEROBOTIC SYSTEM PERFORMANCE MEASUREMENT - MOTIVATION AND METHODS
GEORGE V. KONDRASKE and GEORGE J. KHOURY (Texas Univ., Arlington) *In* Cooperative intelligent robotics in space III; Proceedings of the Meeting, Boston, MA, Nov. 16-18, 1992 Bellingham, WA Society of Photo-Optical Instrumentation Engineers 1992 p. 161-172. Research supported by NASA and Texas Advanced Technology Grant Program refs
Copyright

A systems performance-based strategy for modeling and conducting experiments relevant to the design and performance characterization of telerobotic systems is described. A developmental testbed consisting of a distributed telerobotics network and initial efforts to implement the strategy described is presented. Consideration is given to the general systems performance theory (GSPT) to tackle human performance problems as a basis for: measurement of overall telerobotic system (TRS) performance; task decomposition; development of a generic TRS model; and the characterization of performance of subsystems comprising the generic model. GSPT employs a resource construct to model performance and resource economic principles to govern the interface of systems to tasks. It provides a comprehensive modeling/measurement strategy applicable to complex systems including both human and artificial components. Application is presented within the framework of a distributed telerobotics network as a testbed. Insight into the design of test protocols which elicit application-independent data is described. P.D.

A93-37479
QUANTITATIVE MEASUREMENT OF THERMAL PARAMETERS OVER LARGE AREAS USING PULSE VIDEO THERMOGRAPHY
CHRIS HOBBS, DAMIAN KENWAY-JACKSON, and JIM MILNE (Harwell Lab., Didcot, United Kingdom) *In* Thermosense XIII; Proceedings of the Meeting, Orlando, FL, Apr. 3-5, 1991 Bellingham, WA Society of Photo-Optical Instrumentation Engineers 1991 p. 264-277. Research supported by ESA refs
Copyright

Illustrative examples are presented of the quantitative results obtainable from pulse-video thermography (PVT) for a variety of fields, emphasizing the character of the pictorial representations which is anticipated to be most useful for quality-assurance management. The ability to obtain sequential frame-grabbed thermal images has greatly improved PVT data, opening the way for digital processing of thermal-transient images, as well as the determination of thermal diffusivity and effusivity over large areas. AIAA

A93-41439* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
THE ANALYTICAL CONTROL PROGRAM FOR THE NASA SPACE STATION FREEDOM ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM (ECLSS) WATER RECOVERY TEST
JAMES D. TATARA and SILVIA MINTON (ION Electronics, Huntsville, AL) Jul. 1992 14 p. SAE, International Conference on Environmental Systems, 22nd, Seattle, WA, July 13-16, 1992 Research supported by NASA refs
(SAE PAPER 921269) Copyright

NASA-Marshall has striven to maximize quality assurance and quality control measures in the course of Water Recovery Test (WRT) development for the Space Station Freedom ECLSS. The WRT was subjected to an independent analytical control program that is governed by the Analytical Control Test Plan and the Microbiological Methods for

Water Recovery Testing Plan. Attention is given to analysis results for volatiles, sodium, and conductivity. AIAA

A93-49691#
DETAIL DESIGN OF THE SURFACE TENSION PROPELLANT MANAGEMENT DEVICE FOR THE INTELSAT VII COMMUNICATION SATELLITE
PHILIP L. GIACALONE (Synergy Technologies, Salinas, CA) Jun. 1993 16 p. AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 29th, Monterey, CA, June 28-30, 1993 refs
(AIAA PAPER 93-1802) Copyright

The design of the Intelsat VII surface tension propellant management device (PMD) (an all-welded assembly consisting of about 100 individual components) was developed using a modular design approach that allowed the complex PMD assembly to be divided into smaller modules. The modular approach reduces manufacturing-related technical and schedule risks and allows many components and assemblies to be processed in parallel, while also facilitating the incorporation of quality assurance tests at all critical PMD subassembly levels. The baseline PMD assembly is made from titanium and stainless steel materials. In order to obtain a 100 percent titanium PMD, a new, state-of-the-art fine mesh titanium screen material was developed, tested, and qualified for use as an alternaltive to the stainless steel screen material. The Ti based screen material demonstrated a high level of bubble point performance. It was integrated into a PMD assembly and was successfully qualification tested at the tank assembly level. AIAA

A93-50144*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
THE DEVELOPMENT OF HYDROGEN SENSOR TECHNOLOGY FOR AEROSPACE APPLICATIONS
GARY W. HUNTER, PHILIP G. NEUDECK, G. D. JEFFERSON, G. C. MADZSAR (NASA, Lewis Research Center, Cleveland, OH), C. C. LIU, and Q. H. WU (Case Western Reserve Univ., Cleveland, OH) Jun. 1993 11 p. AIAA; SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 29th, Monterey, CA, June 28-30, 1993 refs
(AIAA PAPER 93-2375) Copyright

The motivation and present status of each of the major components of the NASA Lewis Research Center hydrogen sensor program. The testing facility used to test the sensors and the proposed expansion of this facility are discussed. The Schottky diode prototype sensors, the use of SiC as a semiconductor for a hydrogen sensor, and the present characterization of PdCr are addressed. Future directions for the program are examined. It is concluded that results thus far are encouraging and that further development work is necessary. AIAA

A93-50766* National Aeronautics and Space Administration, Washington, DC.
THE ROLE OF SIMULATION IN THE DESIGN OF A NEURAL NETWORK CHIP
UTPAL DESAI, THADDEUS A. ROPPEL, and MARY L. PADGETT (Auburn Univ., AL) *In* WNN 92; Proceedings of the 3rd Workshop on Neural Networks: Academic/Industrial/NASA/Defense, Auburn Univ., AL, Feb. 10-12, 1992 and South Shore Harbour, TX, Nov. 4-6, 1992 San Diego, CA/Bellingham, WA Society for Computer Simulation/Society of Photo-Optical Instrumentation Engineers 1993 p. 401-408. Research supported by Center for Commercial Development of Space Power and Advanced Electronics and Alabama Microelectronics Science and Technology Center refs
(Contract NAGW-1192)
Copyright

An iterative, simulation-based design procedure for a neural network chip is introduced. For this design procedure, the goal is to produce a chip layout for a neural network in which the weights are determined by transistor gate width-to-length ratios. In a given iteration, the current layout is simulated using the circuit simulator SPICE, and layout adjustments are made based on conventional gradient-decent methods. After the iteration converges, the chip is fabricated. Monte Carlo analysis is used to predict the effect of statistical fabrication process variations on the overall performance of the neural network chip.

N92-24247*# Old Dominion Univ., Norfolk, VA. *Engineering Mechanics*
PRELIMINARY STRUCTURAL DESIGN OF A LUNAR TRANSFER VEHICLE AEROBRAKE M.S. Thesis
LANCE B. BUSH (National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.) Feb. 1992 64 p
(NASA-TM-107828; NAS 1.15:107828) Avail: CASI HC A04/MF A01

An aerobrake concept for a Lunar transfer vehicle was weight optimized through the use of the Taguchi design method, structural finite element analyses and structural sizing routines. Six design parameters were chosen to represent the aerobrake structural configuration. The design parameters included honeycomb core thickness, diameter to depth ratio, shape, material, number of concentric ring frames, and number of radial frames. Each parameter was assigned three levels. The minimum weight aerobrake configuration resulting from the study was approx. half the weight of the average of all twenty seven experimental configurations. The parameters having the most significant impact on the aerobrake structural weight were identified. Author

N92-27397*# Research Inst. for Computing and Information Systems, Houston, TX.
NASA TECHNOLOGY TRANSFER NETWORK COMMUNICATIONS AND INFORMATION SYSTEM: TUNS USER SURVEY
24 Feb. 1992 24 p Prepared in cooperation with Applied Expertise, Inc., Arlington, VA
(Contract NCC9-16; RICIS PROJ. RB-04)
(NASA-CR-190385; NAS 1.26:190385) Avail: CASI HC A03/MF A01

Applied Expertise surveyed the users of the deployed Technology Utilization Network System (TUNS) and surveyed prospective new users in order to gather background information for developing the Concept Document of the system that will upgrade and replace TUNS. Survey participants broadly agree that automated mechanisms for acquiring, managing, and disseminating new technology and spinoff benefits information can and should play an important role in meeting NASA technology utilization goals. However, TUNS does not meet this need for most users. The survey describes a number of systematic improvements that will make it easier to use the technology transfer mechanism, and thus expedite the collection and dissemination of technology information. The survey identified 26 suggestions for enhancing the technology transfer system and related processes. H.A.

N92-27928# General Accounting Office, Washington, DC. National Security and International Affairs Div.
SPACE STATION: CONTRACT OVERSIGHT AND PERFORMANCE PROVISIONS FOR MAJOR WORK PACKAGES. BRIEFING REPORT TO THE CHAIRMAN, SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT, COMMITTEE ON SCIENCE, SPACE AND TECHNOLOGY, HOUSE OF REPRESENTATIVES
Apr. 1992 11 p PO Box 6015 Gaithersburg, MD 20877
(GAO/NSIAD-92-171BR; B-247885) HC first copy free, additional copies $2.00

Selected aspects of NASA's management of the three work package contracts for Space Station Freedom are reviewed. Specifically reviewed is how NASA centers managing each of the contracts responded to Federal Acquisition Regulation (FAR) requirements for post award contract administration and quality assurance planning conferences and for quality assurance plan development, review, and approval. In addition, identified are the award fee provisions related to the performance of contractors' products. The results of the preliminary work were presented in a briefing on November 1991. This report updates and provides additional details on the information contained in that briefing. H.A.

N92-30127*# Federal Aviation Administration, Washington, DC.
REVISION OF CERTIFICATION STANDARDS FOR AVIATION MAINTENANCE PERSONNEL
LESLIE K. VIPOND *In* NASA. Langley Research Center, The 1991 International Conference on Aging Aircraft and Structural Airworthiness p 315-319 Jul. 1992
Avail: CASI HC A01/MF A04

Part 65, Subparts D and E, of the Federal Aviation Regulations (FAR) identify the certification requirements for aviation mechanics and aviation repairmen. The training, experience, privileges, ratings, recordkeeping, and currency requirements for aviation maintenance personnel are also addressed by those parts of the FAR. The recent emergence of the aging fleet problem and the introduction of new technologies, aircraft, engines, and aeronautical products has caused certain portions of these rules to become obsolete. Further, international political arrangements, such as bilateral airworthiness and maintenance agreements, International Civil Aviation Organization (ICAO) standards, certain international agreements for maintenance personnel training, and mechanic certificate reciprocity, have all impacted on the current regulatory policy. Author

N93-10447# Carnegie-Mellon Univ., Pittsburgh, PA. Software Engineering Inst.
INTRODUCTION TO SOFTWARE PROCESS IMPROVEMENT Final Report
WATTS S. HUMPHREY Jun. 1992 37 p
(Contract F19628-90-C-0003)
(AD-A253326; CMU/SEI-92-TR-7; ESD-92-TR-007) Avail: CASI HC A03/MF A01

While software now pervades most facets of modern life, its historical problems have not been solved. This report explains why some of these problems have been so difficult for organizations to address and the actions required to address them. It describes the Software Engineering Institute's (SEI) software process maturity model, how this model can be used to guide software organizations in process improvement, and some guidelines organizations have found helpful in their improvement efforts. This report concludes with a discussion of the most common process improvements traps and pitfalls, and the steps to take to avoid them. DTIC

N93-10598# GEC-Marconi Electronics Ltd., Chelmsford (England).
ACQUISITION 1: STOCK ACQUISITION PROCESSES IN DEFENCE AND AEROSPACE DOCUMENTATION CENTRES
CHRIS BIGGER *In* AGARD, Seminar on Basic Documentation Practices 9 p Aug. 1992
Copyright Avail: CASI HC A02/MF A02

The acquisition of stock for any library is of course an essential activity, without stock there is no library and no service can be provided. It is sometimes difficult to find or create general rules because every library is different with different budgets, users, user needs, and organizational aims. Some general guidelines will be of some help but most decisions rest with the library after weighing all the evidence. Unless you are running a national library or a very large system it will not be possible to buy or acquire all that is published. Even if it could be acquired there may not be the space to store all stock. You are then forced to be selective due to the limits imposed by your organization. When stock has been selected it must be purchased at reasonable prices and at suitable speed. The acquisition of library stock is covered, and selection and acquisition processes are included, starting with the need for selection policies and moving on to establishing user needs, stock types, evaluation methods, purchase methods, and stock suppliers. Author

N93-11470# Federal Coordinating Council for Science, Engineering and Technology, Washington, DC. Committee on Industry and Technology.
ADVANCED MATERIALS AND PROCESSING: THE FEDERAL PROGRAM IN MATERIALS SCIENCE AND TECHNOLOGY. A REPORT BY THE FCCSET COMMITTEE ON INDUSTRY AND TECHNOLOGY TO SUPPLEMENT THE PRESIDENT'S FISCAL YEAR 1993 BUDGET
1992 69 p
(PB92-199108) Avail: CASI HC A04/MF A01

The goal of the advanced materials and processing program (AMPP) is to improve the manufacture and performance of materials to enhance the nation's quality of life, security, industrial productivity, and economic growth. The AMPP will focus special attention on the interfaces between universities, government laboratories and industry and on the process of technology transfer from basic research to application. Continuing input from all parties will be sought and collaboration will be fostered through mechanisms such as consortia and cooperative research and development agreements. The President's Fiscal Year (FY) 1993 budget includes $1821.4 million for materials Research & Development (R&D) representing an increase of 10 percent over the FY 1992 base. Special emphasis is placed on synthesis and processing, those areas critical to the development of new materials, and to the improvement of reliability, cost, and quality of all materials. The budget also increases emphasis on those programs which are aimed at bridging the gap between the innovation of new materials and their application. NTIS

N93-12663# Universal Energy Systems, Inc., Dayton, OH.
USAF 1990 RESEARCH INITIATION PROGRAM, VOLUME 2 Annual Report, 1 Jan. - 31 Dec. 1991
ROD DARRAH 25 Jun. 1992 432 p
(Contract F49620-88-C-0053)
(AD-A254654; AFOSR-92-0708TR-VOL-2) Avail: CASI HC A19/MF A04

This program is for follow-on research efforts for the participants in the Summer Faculty Research Program. Funding is provided to establish RIP awards to about half the number of participants in the SFRP. Participants in the 1990 SFRP competed for funding under the 1990 RIP. Evaluation of the proposals were made by the contractor. Evaluation criteria consisted of the following: (1) technical excellence of the proposal; (2) continuation of the SFRP effort; and (3) cost sharing by the university. The list of proposals selected for award was forwarded to AFOSR for approval of funding and for research efforts to be completed by 31 Dec. 1991. The following summarizes the events for the evaluation of proposals and award of funding under the RIP. RIP proposals were submitted to the contractor by 1 Nov. 1991. The proposals were limited to $20,000 plus cost sharing by the universities. The universities were encouraged to cost share, since this is an effort to establish a long term effort between the Air Force and the university. Proposals were evaluated on the criteria listed above and the final award approval was given by AFOSR after consultation with the Air Force Laboratories. Subcontracts were negotiated with the Universities. There were a total of 92 RIP awards made under the 1990 program. DTIC

N93-12664# Universal Energy Systems, Inc., Dayton, OH.
USAF 1990 RESEARCH INITIATION PROGRAM, VOLUME 4 Annual Report, 1 Jan. - 31 Dec. 1991
ROD DARRAH 25 Jun. 1992 795 p
(Contract F49620-88-C-0053)
(AD-A254655; AFOSR-92-0710TR-VOL-4) Avail: CASI HC A99/MF A06

This program is for follow-on research efforts for the participants in the Summer Faculty Research Program. Funding is provided to establish RIP awards to about half the number of participants in the SFRP. Participants in the 1990 SFRP competed for funding under the 1990 RIP. Evaluation of the proposals were made by the contractor. Evaluation criteria consisted of the following: (1) technical excellence of the proposal; (2) continuation of the SFRP effort; and (3) cost sharing by the university. The list of proposals selected for award was forwarded to AFOSR for

approval of funding and for research efforts to be completed by 31 Dec. 1991. The following summarizes the events for the evaluation of proposals and award of funding under the RIP. RIP proposals were submitted to the contractor by 1 Nov. 1991. The proposals were limited to $20,000 plus cost sharing by the universities. The universities were encouraged to cost share, since this is an effort to establish a long term effort between the Air Force and the university. Proposals were evaluated on the criteria listed above, and the final award approval was given by AFOSR after consultation with the Air Force Laboratories. Subcontracts were negotiated with the Universities. There were a total of 92 RIP awards made under the 1990 program. DTIC

N93-12665# Universal Energy Systems, Inc., Dayton, OH.
USAF 1990 RESEARCH INITIATION PROGRAM, VOLUME 1 Annual Report, 1 Jan. - 31 Dec. 1991
ROD DARRAH 25 Jun. 1992 811 p
(Contract F49620-88-C-0053)
(AD-A254656; AFOSR-92-0707TR-VOL-1) Avail: CASI HC A99/MF A06

This program is for follow-on research efforts for the participants in the Summer Faculty Research Program. Funding is provided to establish RIP awards to about half the number of participants in the SFRP. Participants in the 1990 SFRP competed for funding under the 1990 RIP. Evaluation of the proposals were made by the contractor. Evaluation criteria consisted of the following: (1) technical excellence of the proposal; (2) continuation of the SFRP effort; and (3) cost sharing by the university. The list of proposals selected for award was forwarded to AFOSR for approval of funding and for research efforts to be completed by 31 Dec. 1991. The following summarizes the events for the evaluation of proposals and award of funding under the RIP. RIP proposals were submitted to the contractor by 1 Nov. 1991. The proposals were limited to $20,000 plus cost sharing by the universities. The universities were encouraged to cost share, since this is an effort to establish a long term effort between the Air Force and the university. Proposals were evaluated on the criteria listed above and the final award approval was given by AFOSR after consultation with the Air Force Laboratories. Subcontracts were negotiated with the Universities. There were a total of 92 RIP awards made under the 1990 program. DTIC

N93-12692*# Alabama Univ., Huntsville, AL. Lab. for Inline Process Analyses.
REAL-TIME QUALITY ASSURANCE TESTING USING PHOTONIC TECHNIQUES: APPLICATION TO IODINE WATER SYSTEM Final Report, Aug. 1989 - Aug. 1990
W. F. ARENDALE, RICHARD HATCHER, YADILETT GARLINGTON, JACK HARWELL, and TRACEY EVERETT Jul. 1990 62 p
(Contract NAS8-36955)
(NASA-CR-184413; NAS 1.26:184413; JRC-90-28) Avail: CASI HC A04/MF A01

A feasibility study of the use of inspection systems incorporating photonic sensors and multivariate analyses to provide an instrumentation system that in real-time assures quality and that the system in control has been conducted. A system is in control when the near future of the product quality is predictable. Off-line chemical analyses can be used for a chemical process when slow kinetics allows time to take a sample to the laboratory and the system provides a recovery mechanism that returns the system to statistical control without intervention of the operator. The objective for this study has been the implementation of do-it-right-the-first-time and just-in-time philosophies. The Environment Control and Life Support Systems (ECLSS) water reclamation system that adds iodine for biocidal control is an ideal candidate for the study and implementation of do-it-right-the-first-time technologies. Author

N93-16950# National Space Council, Washington, DC.
REPORT TO THE PRESIDENT ON THE US SPACE PROGRAM Final Report
Jan. 1993 85 p Original contains color illustrations (ISBN-0-16-041608-6)
Avail: CASI HC A05/MF A01; SOD HC

This presidential report covers the following topics: space leadership, space transportation, national security, Mission to Planet Earth, Mission from Planet Earth, international space activity, space commerce and trade, planning for the future, chronology of Bush Administration Space Policy Activities, the executive order establishing the National Space Council, and National Space Policy Directives. Author

N93-17218# Space Policy Advisory Board, Washington, DC.
A POST COLD WAR ASSESSMENT OF US SPACE POLICY
Dec. 1992 77 p Original contains color illustrations Avail: CASI HC A05/MF A01

The V.P. of the US, Dan Quayle, asked his Space Policy Advisory Board to conduct a review of current national space policy. He charged them with making policy recommendations that would: increase the efficiency of federal government space activities to enable the best space program possible for the funds available; maintain US leadership and competitiveness for the 21st century; and sustain an industrial base capable of supporting future national security, civil, and commercial space requirements. The group has completed this review and found that space systems and missions remain important elements of government activity. Specifically, some findings are: current space activities are not appropriate for post Cold War era; economic competitiveness of the space related industrial sector promotes civil and national security interest; and enhanced international cooperation presents an opportunity for the US which should be pursued. The group recommends that the US: change the way space activities are organized and managed; reduce and eliminate security constraints associated with national security; revitalize a more productive cooperation between the government and the space industry; and take the initiative in shaping a common international agenda in selected areas of civil and national security space activity to address global problems and to maintain US influence. E.R.

N93-17261*# Brown Univ., Providence, RI.
THE QUICKEST, LOWEST-COST LUNAR RESOURCE ASSESSMENT PROGRAM: INTEGRATED HIGH-TECH EARTH-BASED ASTRONOMY Abstract Only
CARLE M. PIETERS *In* Lunar and Planetary Inst., Joint Workshop on New Technologies for Lunar Resource Assessment p 42-44 1992
Avail: CASI HC A01/MF A01

Science and technology applications for the Moon have not fully kept pace with technical advancements in sensor development and analytical information extraction capabilities. Appropriate unanswered questions for the Moon abound, but until recently there has been little motivation to link sophisticated technical capabilities with specific measurement and analysis projects. Over the last decade enormous technical progress has been made in the development of (1) CCD photometric array detectors; (2) visible to near-infrared imaging spectrometers; (3) infrared spectroscopy; (4) high-resolution dual-polarization radar imaging at 3.5, 12, and 70 cm; and equally important (5) data analysis and information extraction techniques using compact powerful computers. Parts of each of these have been tested separately, but there has been no programmatic effort to develop and optimize instruments to meet lunar science and resource assessment needs (e.g., specific wavelength range, resolution, etc.) nor to coordinate activities so that the symbiotic relation between different kinds of data can be fully realized. No single type of remotely acquired data completely characterizes the lunar environment, but there has been little opportunity for integration of diverse advanced sensor data for the Moon. Two examples of technology concepts for lunar measurements are given. Using VIS/near-IR spectroscopy, the mineral composition of surface material can be derived from visible and near-infrared radiation reflected from the surface. The surface and subsurface scattering properties of the Moon can be analyzed using radar backscattering imaging. Author

N93-18169*# National Aeronautics and Space Administration, Washington, DC.
STRATEGIC FACTORS IN THE DEVELOPMENT OF THE NATIONAL TECHNOLOGY TRANSFER NETWORK
JONATHAN F. ROOT and BARBARA A. STONE 1993 9 p *Proposed* for presentation at the Thirtieth Space Congress, Cocoa Beach, FL, 27-30 Apr. 1993
(NASA-TM-108594; NAS 1.15:108594) Avail: CASI HC A02/MF A01

Broad consensus among industry and government leaders has developed over the last decade on the importance of applying the U.S. leadership in research and development (R&D) to strengthen competitiveness in the global marketplace, and thus enhance national prosperity. This consensus has emerged against the backdrop of increasing economic competition, and the dramatic reduction of military threats to national security with the end of the Cold War. This paper reviews the key factors and considerations that shaped - and continue to influence - the development of the Regional Technoloty Transfer Centers (RTTC) and the National Technology Transfer Center (NTTC). Also, the future role of the national network in support of emerging technology policy initiatives will be explored. I.I.C.

N93-18533# *Pacific Northwest Lab., Richland, WA.*
TECH TRANSFER OUTREACH
S. LIEBETRAU, ed. 1992 45 p Presented at the First Technology/ Communications Conference: Tech Transfer Outreach, Richland, WA, 19-21 May 1992
(Contract DE-AC06-76RL-01830)
(DE93-001553; PNL-SA-21348; CONF-9205241) Avail: CASI HC A03/ MF A01

This document provides an informal summary of the conference workshop sessions. 'Tech Transfer Outreach' was originally designed as an opportunity for national laboratory communications and technology transfer staff to become better acquainted and to discuss matters of mutual interest. When DOE field office personnel asked if they could attend, and then when one of our keynote speakers became a participant in the discussions, the actual event grew in importance. The conference participants—the laboratories and DOE representatives from across the nation—worked to brainstorm ideas. Their objective: identify ways to cooperate for effective (and cost-effective) technology transfer outreach. Thus, this proceedings is truly a product of ten national laboratories and DOE, working together. It candidly presents the discussion of issues and the ideas generated by each working group. The issues and recommendations are a consensus of their views. DOE

08
CUSTOMER FOCUS AND SATISFACTION

A92-14413
A HOLISTIC APPROACH TO SUPPORT
ROBERT M. DEVIN (McDonnell Douglas Helicopter Co., Mesa, AZ) IN: AHS, Annual Forum, 47th, Phoenix, AZ, May 6-8, 1991, Proceedings. Vol. 2 1991 5 p
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The paper presents holistic approach to support that views product support, customer support, and infrastructure support as separate requirements. A successful holistic approach to support is described as occurring when: (1) it is the object of the support effort that drives strategy rather than adherence to established support concepts; (2) the object's true support needs are anticipated and made paramount in the design philosophy; (3) these concepts are incorporated in the design through a true concurrent engineering process that has matured into concurrent product definition; (4) it is structured by combining the best mix of methodologies selected from both military and commercial logistics support; and (5) applied with the concept of the customer as a partner in the industry of applying helicopter technology. Author

A92-38218
NEW PROCESSES IN COMMERCIAL AIRPLANE DESIGN
M. R. JOHNSON and STEVEN G. LYNN (Boeing Commercial Airplane Group, Seattle, WA) IN: International Aerospace Symposium 90, *Nagoya, Japan, Nov. 26, 27, 1990, Proceedings* 1990 8 p

An evaluation is made of the procedures that extensive reliance on CAD-CAM will institute in the design of the B 767-X airliner. Among the staff members affected will be engineering designers and analysts, manufacturing planners, tool designers, numerically-controlled machine tool programmers, and customer service personnel. Computers will be used not only to design all components of the aircraft, but to integrate them in simulated assemblies and ensure proper fits and interfaces. Much error and rework associated with assembly and parts interference will in this way be precluded. O.C.

A92-48572
SQA - A CUSTOMER SERVICE APPROACH
JOHN E. LOWE and BRUCE JENSEN (Litton Computer Services, Mountain View, CA) IN: NAECON 91; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1991. Vol. 3 1991 6 p
Copyright

For a beginning SQA (software quality assurance) professional or for someone unfamiliar with SQA, the authors discuss the SQA program goals, objectives, and benefits. They also provide information to convince management of the need and importance of an effective SQA program. A proven and effective SQA program is described. It is pointed out that the SQA professional will find that this program is easily implemented with positive results almost immediately. I.E.

A93-35922
CONFIGURATION MANAGEMENT IMPACTS ON CUSTOMER SUPPORT AND SATISFACTION
ROLLIE JONES, JR. and WENDELL W. SHIVERS (McDonnell Douglas Helicopter Co., Mesa, AZ) *In* AHS, Annual Forum, 48th, Washington, June 3-5, 1992, Proceedings. Vol. 1 Alexandria, VA American Helicopter Society 1992 p. 283-304. refs
Copyright

An integrated configuration management process and its impact on cost effective sustainment of customer support and customer satisfaction are addressed. It is shown that the impact of support considerations on change alternatives and implementation options is significant both quantitatively in financial performance and qualitatively in the confidence levels and attitudes of customers. This function must be accepted as a coequal in configuration management. It is concluded that understanding, acceptance, and integration of customer support interests and expertise throughout the configuration management process is a critical factor to both customer satisfaction and enterprise survival. AIAA

A93-43326
VISIM
S. MARA (Cray Systems, Bristol, United Kingdom) *British Interplanetary Society, Journal* (ISSN 0007-094X) vol. 46, no. 6 June 1993 p. 203-208.
Copyright

Over the last decade, the increasing power of the microprocessor has led to a move away from powerful mainframe computers towards desktop-bound workstations. These workstations allow a single user great flexibility in the presentation of information including graphical displays. Spacecraft simulations experts have traditionally relied on alpha-numerical displays to present their information. However, recent simulations for ESA have used workstations from Digital with their flexible X-Windows interface. Cray Systems as the leading supplier of operational training simulators to the European space industry are always looking at the best ways to exploit the power of the latest computers to present the customer with the most user-friendly way of working. This has led over the last year to the development of VISIM - a visualisation tool for spacecraft simulations. Author

A93-55752
GUIDING TECHNOLOGY DEVELOPMENT AND TRANSITION INTO PRODUCTS RESPONSIVE TO END-USER NEEDS
ERIC A. YOUNG (GE Aircraft Engines, Evandale, OH) *IEEE Aerospace and Electronic Systems Magazine* (ISSN 0885-8985) vol. 8, no. 8 Aug. 1993 p. 10-14. IEEE, NAECON '93 - National Aerospace and Electronics Conference, Dayton, OH, May 24-28, 1993 refs
Copyright

It is argued that a systems engineering process that develops an understanding of end-user needs and economically develops a product system which includes the right technology advances to satisfy these needs is the best way to ensure success in the market of end-user needs. This customer pulled approach to new and improved products also pulls the necessary technology developments with it and integrates their timing and resource requirements into those of the end product planning. With appropriate concurrent, cross-functional teams working both the planning and the execution, this approach benefits from the wisdom and leadership of the end-user focused team to deliver the desired program results on schedule. This frees top leadership to focus on longer range visions for the product line and technologies.

N92-10711*# Research Inst. for Advanced Computer Science, Moffett Field, CA.
WORLDNET
PETER J. DENNING 5 Jul. 1989 15 p Submitted for publication
(Contract NCC2-387)
(NASA-CR-188845; NAS 1.26:188845; RIACS-TR-89-26) Avail: CASI HC A03/MF A01

The expanding use of powerful workstations coupled to ubiquitous networks is transforming scientific and engineering research and the the ways organizations around the world do business. By the year 2000, few enterprises will be able to succeed without mastery of this technology, which will be embodied in an information infrastructure based on a worldwide network. A recurring theme in all the discussions of what might be possible within the emerging Worldnet is people and machines working together in new ways across distance and time. A review is presented of the basic concepts on which the architecture of Worldnet must be built: coordination of action, authentication, privacy, and naming. Worldnet must provide additional functions to support the ongoing processes of suppliers and consumers: help services, aids for designing and producing subsystems, spinning off new machines, and resistance to attack. This discussion begins to reveal the constituent elements of a theory for Worldnet, a theory focused on what people will do with computers rather than on what computers do. Author

N92-18590# Boeing Commercial Airplane Co., Seattle, WA.
STRUCTURAL AIRWORTHINESS OF AGING BOEING JET TRANSPORTS
JACK F. MCGUIRE and ULF G. GORANSON *In* AGARD, Fatigue Management 10 p Dec. 1991
Copyright Avail: CASI HC A02/MF A03

Boeing is dedicated to design and manufacture safe commercial jet transports. The successful accomplishment of this responsibility over the last three decades has contributed significantly to a position of industry leadership and reflects the top priority given to safety. This paper illustrates that the structural integrity assurance of commercial airplane structures is a serious and disciplined process. High standards must be maintained to ensure the safety of aging airplanes until economics dictate their retirement. Standard Boeing practices to ensure continuing structural integrity include providing structural maintenance programs, continuous communication through customer support services, and recommendations for maintenance actions through service letters, structural item interim advisories, and service bulletins. To help identify potential problems associated with the aging jet transport fleet, Boeing has implemented additional activities: (1) supplemental structural inspection programs that require airlines to regularly inspect structurally significant items on selected older airplanes and report defects to Boeing for prompt fleet action; (2) teardown of older airframes to help identify corrosion and other structural service defects; (3) fatigue testing of older airframes to determine structural behavior in the presence of service-induced problems such as corrosion and repairs; and (4) an engineering assessment of the condition of a representative sample of older Boeing airplanes to observe effectiveness of corrosion prevention features and acquire additional data that might improve maintenance recommendations to the operators. Aging fleet concerns have also resulted in joint industry, airlines, and airworthiness authority actions. These initiatives have provided timely preventive structural maintenance recommendations and permit continued safe operation of aging jet transports until their retirement from service. Author

N92-25139*# Nichols Research Corp., Huntsville, AL.
SPIRAL MODEL PILOT PROJECT INFORMATION MODEL
28 Oct. 1991 65 p
(Contract NAS8-37680)
(NASA-CR-184310; NAS 1.26:184310) Avail: CASI HC A04/MF A01

The objective was an evaluation of the Spiral Model (SM) development approach to allow NASA Marshall to develop an experience base of that software management methodology. A discussion is presented of the Information Model (IM) that was used as part of the SM methodology. A key concept of the SM is the establishment of an IM to be used by management to track the progress of a project. The IM is the set of metrics that is to be measured and reported throughout the life of the project. These metrics measure both the product and the process to ensure the quality of the final delivery item and to ensure the project met programmatic guidelines. The beauty of the SM, along with the IM, is the ability to measure not only the correctness of the specification and implementation of the requirements but to also obtain a measure of customer satisfaction. Author

N92-27572*# Research Inst. for Computing and Information Systems, Houston, TX.
DETERMINING RULES FOR CLOSING CUSTOMER SERVICE CENTERS: A PUBLIC UTILITY COMPANY'S FUZZY DECISION
ANDRE DEKORVIN and MARGARET F. SHIPLEY (Houston Univ., Clear Lake, TX.) Feb. 1992 30 p
(Contract NCC9-16; RICIS PROJ. SR-01)
(NASA-CR-190390; NAS 1.26:190390) Avail: CASI HC A03/MF A01

In the present work, we consider the general problem of knowledge acquisition under uncertainty. A commonly used method is to learn by examples. We observe how the expert solves specific cases and from this infer some rules by which the decision was made. Unique to this work is the fuzzy set representation of the conditions or attributes upon which the decision make may base his fuzzy set decision. From our examples, we infer certain and possible rules containing fuzzy terms. It should be stressed that the procedure determines how closely the expert follows the conditions under consideration in making his decision. We offer two examples pertaining to the possible decision to close a customer service center of a public utility company. In the first example, the decision maker does not follow too closely the conditions. In the second example, the conditions are much more relevant to the decision of the expert. Author

N92-27981# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Systems and Logistics.
A STUDY OF THE AIR FORCE'S EXCEPTION MANAGEMENT PROCESS: ITS EFFECT ON CUSTOMER SERVICE AND ORDER PROCESSING M.S. Thesis
DAVID W. JONES Sep. 1991 75 p
(AD-A246627; AFIT/GLM/LSM/91S-34) Avail: CASI HC A04/MF A01

The purpose of this study was two-fold; the first goal was to determine what the SBSS order processing is, and secondly to determine the effect the current method of ECC management has on the SBSS order processing cycle and the level of customer service rendered by base supply. The research revealed that exception management is a crucial component of a successful order processing function. Further, it was established that the level of customer satisfaction experienced is greatly

dependent upon good order processing. Research further indicated flaws in the current method of ECC management and recommended further actions to correct the current method of ECC management. The success of the SBSS order processing function is highly dependent upon a sound system of managing ECC images; however, the order processing functions do not need to be directly involved in the management of the ECCs. Rather, they require the ECC management function to merely keep their mainframe up-to-date with valid ECC information. This study is the first of its kind which links non-customer serving functions of Base Supply to the satisfaction level experienced by supply customers. DTIC

N93-11215# National Inst. of Standards and Technology, Gaithersburg, MD.
MANAGING DATA: FROM VISION TO REALITY
J. J. NEWTON, M. L. MELLEY, and H. HIGGINS May 1992 165 p Presented at the 4th Proceedings of the Annual DAMA Symposium, Gaithersburg, MD, 14-15 May 1991 Sponsored in part by Data Administration Management Association, Washington, DC
(PB92-191212; NISTIR-4843) Avail: CASI HC A08/MF A02

The following topics are covered: achieving the data management reality; the road map for CASI implementation; the impact of implementing a new information architecture; data planning; data modeling: the data administrator perspective vs. the traditional application development point of view; data management and information proficiency: a vision for the future; information reengineering; managing information across multiple CASE tools; the atomic database: building the perfect beast; data management and customer satisfaction; data administration, the IBM repository, and CASE technology at Depository Trust Company; status and application of standards for data administration; future vision; and an essential prerequisite for a data management program. NTIS

N93-12273# Institute for Defense Analyses, Alexandria, VA.
RESEARCH AND DEVELOPMENT STRATEGIES FOR HUMAN CENTERED AND GROUP SUPPORT TECHNOLOGIES
KAREN J. RICHTER, D. S. BARNETT, and EARL A. ALLUISI May 1992 226 p
(Contract MDA903-89-C-0003)
(AD-A254366; IDA-P-2630; IDA/HQ-92-41177; AD-E501558) Avail: CASI HC A11/MF A03

The Armstrong Laboratory's Acquisition Logistics Research and Development Activity at Wright Patterson Air Force Base, Ohio, is actively investigating both human centered technology and group support technology. In order to ensure the development of these technologies with a focus on customer needs and the use of relevant technological developments, the laboratory has been involved in a strategic planning process for future R and D activities. This paper reports the results of research performed by an Institute for Defense Analyses study team whose immediate goal was to help refine and sharpen the focus of the Acquisition Logistics R and D Activity's strategy for human centered technology and group support technology by providing information about, and analysis of, potential customers, relevant technological developments, and probable alternative strategies. DTIC

N93-12868# Air Force Inst. of Tech., Wright-Patterson AFB, OH.
AN ANALYSIS OF THE FIELD SERVICE FUNCTION OF SELECTED ELECTRONICS FIRMS Ph.D. Thesis
DENNIS LEE HULL 1992 400 p
(AD-A255003; AFIT/CI/CIA-92-009D) Avail: CASI HC A17/MF A04

For the purposes of this study, field service was defined as the function concerned with the servicing and maintaining, by the manufacturer or supplier, of products (usually owned by customers) used away from the manufacturer's or supplier's site. Field service is an important component of the service sector and of customer service. Field service availability and quality of this service are increasingly being used by customers as a means of product selection. Many companies have recognized this trend and have identified field service as a competitive edge. A review of the field service literature and discussions with field service consultants and professionals indicated a lack of field service research—more specifically, a systems analysis of the area was lacking. The purpose of this research was to examine, utilizing a systems perspective, the field service practices of leading electronics firms in order to develop field service management propositions (empirical generalizations) and a prescriptive model of best practice. The electronics industry was selected due to the critical relation of service-based competition to company profitability. DTIC

N93-16779*# Wichita State Univ., KS. Dept. of Industrial Engineering.
FUZZY SET APPROACH TO QUALITY FUNCTION DEPLOYMENT: AN INVESTIGATION Abstract Only Final Report
ABU S. M. MASUD *In* Hampton Univ., NASA/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program 1992 p 142 Sep. 1992
Avail: CASI HC A01/MF A03

The final report of the 1992 NASA/ASEE Summer Faculty Fellowship at the Space Exploration Initiative Office (SEIO) in Langley Research Center is presented. Quality Function Deployment (QFD) is a process, focused on facilitating the integration of the customer's voice in the design and development of a product or service. Various input, in the form of judgements and evaluations, are required during the QFD analyses. All the input variables in these analyses are treated as numeric variables. The purpose of the research was to investigate how QFD analyses can be performed when some or all of the input variables are treated as linguistic variables with values expressed as fuzzy numbers. The reason for this consideration is that human judgement, perception, and cognition are often ambiguous and are better represented as fuzzy numbers. Two approaches for using fuzzy sets in QFD have been proposed. In both cases, all the input variables are considered as linguistic variables with values indicated as linguistic expressions. These expressions are then converted to fuzzy numbers. The difference between the two approaches is due to how the QFD computations are performed with these fuzzy numbers. In Approach 1, the fuzzy numbers are first converted to their equivalent crisp scores and then the QFD computations are performed using these crisp scores. As a result, the output of this approach are crisp numbers, similar to those in traditional QFD. In Approach 2, all the QFD computations are performed with the fuzzy numbers and the output are fuzzy numbers also. Both the approaches have been explained with the help of illustrative examples of QFD application. Approach 2 has also been applied in a QFD application exercise in SEIO, involving a 'mini moon rover' design. The mini moon rover is a proposed tele-operated vehicle that will traverse and perform various tasks, including autonomous operations, on the moon surface. The output of the moon rover application exercise is a ranking of the rover functions so that a subset of these functions can be targeted for design improvement. The illustrative examples and the mini rover application exercise confirm that the proposed approaches for using fuzzy sets in QFD are viable. However, further research is needed to study the various issues involved and to verify/validate the methods proposed. Author

N93-19029 Missouri Univ., Rolla, MO.
AIRCRAFT LANDING GEAR SHIMMY Ph.D. Thesis
JEFFREY ALLEN BAUMANN 1992 133 p
Avail: Univ. Microfilms Order No. DA9239687

In the landing gear of taxiing aircraft, shimmy is a condition of self-excited oscillation driven by the interaction between the tires and the ground. In extreme cases, shimmy can cause severe damage to landing gear hardware or even loss of the aircraft. In less extreme cases, shimmy can be little more than an annoyance. However, it does affect customer satisfaction and can cause added maintenance expense. Thus, the ability

to predict and to control shimmy is important to the landing gear designer. This work discusses two analytical landing gear shimmy models. The first model, featuring an improved torsional model, is nonlinear. Its results can be integrated numerically to simulate the response of the landing gear to a specified initial disturbance. The second model is linear, combining a finite element model of the landing gear structure with a rigid or a point-contact tire model. This model can be analyzed with standard eigenvalue/eigenvector techniques to determine stability. A test case run with two models shows good correlation and illustrates the effects of changes to various parameters. Dissert. Abstr.

N93-19941# Wichita State Univ., KS. Inst. for Aviation Research.
CONSUMER INTEREST IN THE AIR SAFETY DATA OF THE AIRLINE QUALITY RATING. TESTIMONY TO THE US HOUSE OF REPRESENTATIVES, COMMITTEE ON GOVERNMENT OPERATIONS, GOVERNMENT ACTIVITIES AND TRANSPORTATION SUBCOMMITTEE
BRENT D. BOWEN and DEAN E. HEADLEY 1 Apr. 1992 20 p
(NIAR-92-4) Avail: CASI HC A03/MF A01

The availability of aviation safety information is of vital importance to the air travel consumer. This information can provide both a positive benefit to the air travel consumer and also serve as a key element in the marketing of airline services according to Dr. Tim Becker, a noted airline consultant. At the International Forum on Airline Quality, held March 6 & 7, 1992, in Washington, D.C., Dr. Becker and others reported on the value and benefit of this information to both consumers and airlines alike. Presently, a comprehensive measure of airline safety does not exist. Research verifies that such an indicator is of significant interest to the aviation consumer. The Airline Quality Rating (AQR) is regarded as perhaps the most comprehensive measure of overall airline quality yet conceived. An explanation of these AQR factors which include data regarding airline safety is presented. Author

N93-23030*# National Aeronautics and Space Administration, Washington, DC.
NATIONAL SECURITY AND NATIONAL COMPETITIVENESS: OPEN SOURCE SOLUTIONS; NASA REQUIREMENTS AND CAPABILITIES
GLADYS A. COTTER Mar. 1993 11 p
(NASA-TM-4458; NAS 1.15:4458) Avail: CASI HC A03/MF A01

Foreign competitors are challenging the world leadership of the U.S. aerospace industry, and increasingly tight budgets everywhere make international cooperation in aerospace science necessary. The NASA STI Program has as part of its mission to support NASA R&D, and to that end has developed a knowledge base of aerospace-related information known as the NASA Aerospace Database. The NASA STI Program is already involved in international cooperation with NATO/AGARD/TIP, CENDI, ICSU/ICSTI, and the U.S. Japan Committee on STI. With the new more open political climate, the perceived dearth of foreign information in the NASA Aerospace Database, and the development of the ESA database and DELURA, the German databases, the NASA STI Program is responding by sponsoring workshops on foreign acquisitions and by increasing its cooperation with international partners and with other U.S. agencies. The STI Program looks to the future of improved database access through networking and a GUI; new media; optical disk, video, and full text; and a Technology Focus Group that will keep the NASA STI Program current with technology. Author

N93-23446# Department of Defense, Washington, DC.
YOU WANT IT WHEN: A TQM GUIDE TO CUSTOMER SERVICE
Sep. 1992 21 p
(PB93-154540) Avail: CASI HC A03/MF A01

The intention of the booklet is to give you the information needed to give great customer service. Various aspects of total quality management (TQM) are discussed. NTIS

N93-29561*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
DETERMINING RULES FOR CLOSING CUSTOMER SERVICE CENTERS: A PUBLIC UTILITY COMPANY'S FUZZY DECISION
ANDRE DEKORVIN (Houston Univ., TX.), MARGARET F. SHIPLEY (Houston Univ., TX.), and ROBERT N. LEA *In its* North American Fuzzy Logic Processing Society (NAFIPS 1992), Volume 2 p 398-407 Dec. 1992
Avail: CASI HC A02/MF A03

In the present work, we consider the general problem of knowledge acquisition under uncertainty. Simply stated, the problem reduces to the following: how can we capture the knowledge of an expert when the expert is unable to clearly formulate how he or she arrives at a decision? A commonly used method is to learn by examples. We observe how the expert solves specific cases and from this infer some rules by which the decision may have been made. Unique to our work is the fuzzy set representation of the conditions or attributes upon which the expert may possibly base his fuzzy decision. From our examples, we infer certain and possible fuzzy rules for closing a customer service center and illustrate the importance of having the decision closely relate to the conditions under consideration. Author (revised)

N93-30718*# David Sarnoff Research Center, Princeton, NJ. National Information Display Lab.
INTRODUCTION TO THE NATIONAL INFORMATION DISPLAY LABORATORY
CURTIS R. CARLSON *In* NASA, Washington, Technology Transfer and the Civil Space Program. Volume 2: Workshop Proceedings 9 p 1992
Avail: CASI HC A02/MF A04

The goals of the National Information Display Laboratory (NIDL) are described in viewgraph form. The NIDL is a Center of Excellence in softcopy technology with the overall goal to develop new ways to satisfy government information needs through aggressive user support and the development of advanced technology. Government/industry/academia participation, standards development, and various display technologies are addressed. CASI

09
TQM TOOLS AND PHILOSOPHIES

A92-10172
ORGANIZATIONAL IMPACT OF INTRODUCING CONCURRENT ENGINEERING
ELLEN R. DOMB, ROBERT C. CULVER, and RICHARD H. RAWCLIFFE (Aerojet, Electronic Systems Div., Azusa, CA) IN: International SAMPE Symposium and Exhibition, 36th, San Diego, CA, Apr. 15-18, 1991, Proceedings. Book 1 1991 12 p refs
Copyright

The introduction of concurrent engineering as the primary method of new product development stimulates organizational change. An existing model is examined which integrates all elements of the organization, not just the structure and strategy. This '7-S' model draws attention to the issues which must be addressed effectively to institutionalize the formal tools of concurrent engineering. Key formal methods include Quality Function Deployment (QFD) to help the planning for a quality product; Robust Design, including Taguchi methods, to desensitize the product to manufacturing and user environments; and Statistical Process Control (SPC) to help manufacture the quality product. Products that combine hardware, software, and field support elements present particular challenges, but demonstrate significant benefits from the concurrent engineering approach. Author

A92-10173
TOTAL QUALITY MANAGEMENT IMPLEMENTATION
SANDRA K. SAULT (Leads Corp., Sacramento, CA) IN: International SAMPE Symposium and Exhibition, 36th, San Diego, CA, Apr. 15-18,

1991, Proceedings. Book 1 1991 11 p
Copyright

LEADS Corporation provides consulting assistance in a broad range of consulting and educational services, specializing in Total Quality Management (TQM). This paper will discuss the key elements of the implementation process that have been proven successful in institutionalizing TQM within public and private sector organizations. Author

A92-11604#
INITIATING TOTAL QUALITY MANAGEMENT WITH A GOVERNMENT CONTRACTOR
JOHN H. FRANCE (U.S. Navy, Naval Weapons Center, China Lake, CA) AIAA, SAE, and ASME, Joint Propulsion Conference, 27th, Sacramento, CA, June 24-26, 1991. 7 p. refs
(AIAA PAPER 91-2062)

Quality and total quality management (TQM) are defined with attention given to a case study of initiating TQM between a government agency and a contractor. The implementation of TQM by the agency's technical monitor is described beginning in training workshops and continuing with improvements in relations. Important results of the TQM program include an experimental series using the Taguchi method and the identification of new areas of technology for development. C.C.S.

A92-12495* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
ASSURED CREW RETURN VEHICLE
D. A. STONE, J. W. CRAIG, B. DRONE, R. H. GERLACH, and R. J. WILLIAMS (NASA, Johnson Space Center, Houston, TX) IAF, International Astronautical Congress, 42nd, Montreal, Canada, Oct. 5-11, 1991. 14 p. Oct. 1991 14 p refs
(IAF PAPER 91-088) Copyright

The developmental status is discussed regarding the 'lifeboat' vehicle to enhance the safety of the crew on the Space Station Freedom (SSF). NASA's Assured Crew Return Vehicle (ACRV) is intended to provide a means for returning the SSF crew to earth at all times. The 'lifeboat' philosophy is the key to managing the development of the ACRV which further depends on matrixed support and total quality management for implementation. The risk of SSF mission scenarios are related to selected ACRV mission requirements, and the system and vehicle designs are related to these precepts. Four possible ACRV configurations are mentioned including the lifting-body, Apollo shape, Discoverer shape, and a new lift-to-drag concept. The SCRAM design concept is discussed in detail with attention to the 'lifeboat' philosophy and requirements for implementation. C.C.S.

A92-14382
TAGUCHI DESIGN OF EXPERIMENTS FOR PROBLEM SOLVING
BILL KEITH (Bell Helicopter Textron, Inc., Fort Worth, TX) IN: AHS, Annual Forum, 47th, Phoenix, AZ, May 6-8, 1991, Proceedings. Vol. 1 1991 6 p
Copyright

This paper will discuss and demonstrate a practical application of Genichi Taguchi's Design of Experiments, as applied to solving problems associated with controlling thread heights of internal formed threads. The discussion will identify the real time use of concurrent engineering in selecting the manufacturing factors and noise factors used in this experiment. These factors were arranged in a Taguchi L-12 orthogonal array with dimension levels for each factor. This paper will conclude with a table of actual results along with the predicted improvements. These predicted improvements are based on the implementation of the 'Taguchi Analysis of Variation' (ANOVA) data. Additionally, histograms describing before the experiment and projected after the experiment results demonstrate the process improvement. This paper will conclude with a brief discussion on improving factory processes and imparting design characteristics through design of experiment methodologies. Author

A92-14393
CONCURRENT ENGINEERING AT BOEING HELICOPTERS
BRIAN CHIESI, TONY PARASIDA, and ERIC WALLISER (Boeing Defense and Space Group, Helicopters Div., Philadelphia, PA) IN: AHS, Annual Forum, 47th, Phoenix, AZ, May 6-8, 1991, Proceedings. Vol. 2 1991 10 p
Copyright

Concurrent engineering methods, which consider all elements of the product life cycle from conception through fabrication, have been implemented on the MH-47E and V-22 pilot production programs, and are part of the planning for the LH prototype program. By these means, the product, its manufacturing processes, and the requisite life-cycle support processes, are simultaneously defined. These concurrent methods employ the CATIA Computer-Aided Three-dimensional Interactive Application 2D/3D graphics system for electronic mockups and digital preassembly. Digital preassembly automatically checks for fit-and-function errors within the CATIA data base to prevent engineering errors from reaching the factory floor. O.C.

A92-14451
THE PROCESS CONTROL TOOLBOX - A GUIDE TO TOTAL QUALITY MANAGEMENT
ANTHONY C. LAWRENCE (Sikorsky Aircraft, Stratford, CT) AHS, Annual Forum, 47th, Phoenix, AZ, May 6-8, 1991, Paper. 6 p.

Statistical process control is considered in terms of effectively controlling variation and providing constant improvement of a process. Several models are described which contribute mechanisms for understanding potential sources and effects of variation in the process, and the critical aspects of process control are outlined. Statistical process control is concluded to be a significant source of knowledge about a process when it is combined with other process-control tools. C.C.S.

A92-24327#
OPERABILITY IMPACTS ON SPACE TRANSPORTATION INFRASTRUCTURES
TODD MOSHER and MICHAEL LABBEE (General Dynamics Corp., Space Systems Div., Huntsville, AL) IN: AIAA/SOLE Space Logistics Symposium, 4th, Cocoa Beach, FL, Nov. 4-6, 1991, Technical Papers 1991 9 p refs
(AIAA PAPER 91-4051) Copyright

Until very recently, performance has governed the design of space transportation systems. As a consequence of this approach, U.S. launch vehicles, while having the highest performance and best precision, often encounter difficulties in meeting schedule and cost goals. This paper reviews work accomplished in identifying and defining cost and operability goals for new space transportation systems. The different facets of operability are explored, and the effects of their application as design criteria are discussed in relation to a space transportation infrastructure as a whole, as well as the individual elements. This is followed by a discussion of the traditional practice of only examining nominal operations versus including the analysis of system perturbations in an effort to meet operability goals. Finally, methods of measuring operability and tools developed to apply these methods in a TQM environment to the complete life cycle of a program are discussed. Author

A92-26994#
MODELING THE ENTERPRISE - THE FIRST STEP IN ENGINEERING COMPLEX, VOLATILE REQUIREMENTS
ROGER GUISINGER (McDonnell Douglas Space Systems Co., Houston, TX) and ERNEST CORDELL, JR. AIAA, Aerospace Sciences Meeting and Exhibit, 30th, Reno, NV, Jan. 6-9, 1992. 11 p.
(AIAA PAPER 92-0592) Copyright

A principle risk to successful systems and software engineering is low visibility and currency of 'the big picture', or the context into which each part of the product must fit and be able to evolve. The absence of clearly defined criteria for strategic success and project decision-making is an accompanying risk. Enterprise modeling is described and recommended as a method for providing and maintaining that visibility. Related principles of several methodologies are summarized, with recommendations for enterprise modeling techniques that are consistent with real-world experience. Author

A92-28238
HEAT TREATMENT OPTIMIZATION OF ALUMINA/ALUMINUM METAL MATRIX COMPOSITES USING THE TAGUCHI APPROACH
ANIL SAIGAL and GARY LEISK (Tufts University, Medford, MA) Scripta Metallurgica et Materialia (ISSN 0956-716X), vol. 26, March 15, 1992, p. 871-876. refs
Copyright

The paper describes the use of the Taguchi approach for optimizing the heat treatment process of alumina-reinforced Al-6061 metal-matrix composites (MMCs). It is shown that the use of the Taguchi method makes it possible to test a great number of factors simultaneously and to provide a statistical data base that can be used for sensitivity and optimization studies. The results of plotting S/N values versus vol pct, solutionizing time, aging time, and aging temperature showed that the solutionizing time and the aging temperature significantly affect both the yield and the ultimate tensile strength of alumina/Al MMCs. I.S.

A92-28251
ADVANCED MATERIALS FOR AIRCRAFT ENGINE APPLICATIONS
DANIEL G. BACKMAN (GE Aircraft Engines, Lynn, MA) and JAMES C. WILLIAMS (GE Aircraft Engines, Cincinnati, OH) *Science* (ISSN 0036-8075), vol. 255, Feb. 28, 1992, p. 1082-1087. refs
Copyright

Enhancements in aircraft gas turbine performance have been paced by the development of improved materials and processing technologies for turbine blades and disks; the blades are produced via investment casting. Attention is given to enhanced gamma-prime volume fraction Ni-base superalloys, their directional solidification, and the effects of thermal-barrier ceramic coatings. Turbine disk development has concentrated on the creation of low-cycle fatigue superalloys via improved powder-metallurgy processing, isothermal forging, and billet spray-forming. Producers are striving to incorporate intelligent processing, total quality management, and concurrent engineering. O.C.

A92-28655* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
THERMAL IMAGING OF GRAPHITE/EPOXY COMPOSITE SAMPLES WITH FABRICATED DEFECTS
JOSEPH N. ZALAMEDA (NASA, Langley Research Center; U.S. Army, Aviation Research and Technology Activity, Hampton, VA) and WILLIAM P. WINFREE (NASA, Langley Research Center, Hampton, VA) IN: Review of progress in quantitative nondestructive evaluation; Proceedings of the 17th Annual Review, La Jolla, CA, July 15-20, 1990. Vol. 10A 1991 8 p refs
Copyright

Consideration is given to a thermal inspection system for quickly inspecting large area composites for increased reliability and maintainability of helicopters resulting from improved quality assurance manufacturing. The infrared camera/image processor-based inspection system was used to image defects in composites. Noncontacting and single-sided measurements were performed on graphite/epoxy samples with fiber volume fraction variations, fabricated porosity, impact damage, and inclusions in incurred lay ups. These defects were imaged by determining the variations in the cooling rates caused by differences in through ply thermal diffusivity. Attention is also given to the system's sensitivity to measuring the defects due to sample thickness. O.G.

A92-36950
TOTAL QUALITY TREATMENT FOR SCIENCE AND TECHNOLOGY
ROBERT R. RANKINE, JR. (USAF, Systems Command, Andrews AFB, DC) *Aerospace America* (ISSN 0740-722X), vol. 30, no. 5, May 1992, p. 36-40.
Copyright

A review is presented of the organizational total quality management techniques applied to the planning process for science and technology programs in the laboratories of the USAF. Specifically, this involves the creation of metrics that assess vital aspects of the programs and provide a basis for continuing improvement. Consideration is given to the management of the hundreds of improvements, involving thousands of technical details, required for the technology that goes into better airframes, engines, avionics and weapons for fighters, as well as for technologies that support other weapon systems. Attention is given to certain total quality management aspects including, the work of the technology executive officer, the advanced technology transition demonstrations, and technology area plans. R.E.P.

A92-38543#
TOTAL QUALITY MANAGEMENT AS AN OPERATIONAL PROCESS IN TESTING
RAY E. WEAVER and CHARLES G. WELLER (Martin Marietta Manned Space Systems, New Orleans, LA) AIAA, Space Programs and Technologies Conference, Huntsville, AL, Mar. 24-27, 1992. 7 p.
(AIAA PAPER 92-1377) Copyright

Total Quality Management (TQM) is defined and examined in terms of its applicability to aerospace testing and other operations. The key concepts of TQM are listed including continuous improvement, employee involvement, and customer satisfaction. The application of TQM to space-systems testing is analyzed, and performance-refinement teams are proposed to improve intra- and interdepartmental processes. This procedure is described in terms of its use at one testing facility, and the results show that small teams can effectively be employed to reduce redundant test procedures and tools. The TQM effort at the facility also resulted in the development of improved designs for circuit analyzers, software handling, and work platforms. Attention is also given to the benefits of statistical process control which can be employed to highlight trends, preclude tolerance anomalies, and automatically adjust test systems to compensate for variability. C.C.S.

A92-38674*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
THE ROLE OF CRITERIA IN DESIGN AND MANAGEMENT OF SPACE SYSTEMS
J. C. BLAIR and R. S. RYAN (NASA, Marshall Space Flight Center, Huntsville, AL) AIAA, Space Programs and Technologies Conference, Huntsville, AL, Mar. 24-27, 1992. 10 p.
(AIAA PAPER 92-1585) Copyright

Explicit requirements and standards arising in connection with space systems management serve as a framework for technical management and furnish legally binding control of development, verification, and operations. As a project develops, additional requirements are derived which are unique to the system in question; these are designated 'derived requirements'. The reliability and cost-effectiveness of a space system are best ensured where a balance has arisen between formal (legally binding) and informal. Attention is presently given to the development of criteria consistent with total quality management. O.C.

A92-38696*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
EVALUATING SPACE TRANSPORTATION SENSITIVITIES WITH TAGUCHI METHODS
NORMAN S. BROWN and SAROJ PATEL (NASA, Marshall Space Flight Center, Huntsville, AL) AIAA, Space Programs and Technologies Conference, Huntsville, AL, Mar. 24-27, 1992. 12 p. refs
(AIAA PAPER 92-1276) Copyright

The lunar and Mars transportation system sensitivities and their effect on cost is discussed with reference to several design concepts using Taguchi analysis. The general features of the approach are outlined, and the selected Taguchi matrix (L18) is described. The modeling results

are displayed in a Design of Experiments format to aid the evaluation of sensitivities. V.L.

A92-42060
HOW WE PUT RELIABILITY TOOLS INTO THE HANDS OF DESIGNERS
TYRONE JACKSON (Hughes Aircraft Co., El Segundo, CA) IN: Annual Reliability and Maintainability Symposium, Orlando, FL, Jan. 29-31, 1991, Proceedings 1991 6 p refs
Copyright

The FRATOOLS computerized methodology for failure-rate analysis, which was initially developed for a concurrent-engineering environment, consists of several stand-alone programs that have been integrated to constitute a single software package. FRATOOLS has been successfully used by designers to analyze the F-18 Radar Upgrade system, in keeping with MIL-Hdbk-217E; FRATOOLS also integrates this failure-rate analysis methodology with the design process in a way that is ideal for concurrent engineering. 'Smart' software methods are used by FRATOOLS to automate the decision-making process. O.C.

A92-42068
FMECA - AN INTEGRATED APPROACH
PURAN LUTHRA (Electronics and Space Corp., Saint Louis, MO) IN: Annual Reliability and Maintainability Symposium, Orlando, FL, Jan. 29-31, 1991, Proceedings 1991 7 p refs
Copyright

Failure modes/effects/criticality analyses (FMECA) are performed by reliability engineers to ascertain the effects of probable component and assembly failure modes. In addition to improving the FMECA analysis and format, an effort is made to develop software capable of transfering data for various reports in order to eliminate duplications. The results of these FMECA improvements allows its results to serve as automated inputs to such other analyses as those of logistics support, fault trees, and test requirement documents, in the interest of meeting TQM objectives. O.C.

A92-42072
A TECHNIQUE FOR PROPER DESIGN AND IMPACT ANALYSIS OF 'EVENT SEQUENCING' FOR SAFETY AND AVAILABILITY
AJAY S. AGARWALA (Boeing Co., Helicopters Div., Philadelphia, PA) IN: Annual Reliability and Maintainability Symposium, Orlando, FL, Jan. 29-31, 1991, Proceedings 1991 5 p refs
Copyright

This paper discusses 'Event Sequencing', that is, the requirement for certain events to occur in a particular order to achieve a desirable effect or to avoid an undesirable effect. Such requirements are often motivated by Functionality and Safety considerations. A simple structured technique is formed from a combination of Goal Tree Analysis and broad Fault Tree analysis to analyze 'Event Sequencing' in each operational mode. In addition, this technique provides an effective tool for managing and communicating the design requirements in a concurrent engineering environment involving complex designs with interactive functions. Author

A92-42088
IMPLEMENTING TOTAL QUALITY MANAGEMENT INTO RELIABILITY AND MAINTAINABILITY
JAMES N. YOO and GEORGE SMITH, II (TRW, Inc., Military Electronics and Avionics Div., San Diego, CA) IN: Annual Reliability and Maintainability Symposium, Orlando, FL, Jan. 29-31, 1991, Proceedings 1991 4 p refs
Copyright

Future DOD contractors will be required to implement TQM programs. Attention is presently given to a training text concerning analysis methods that are useful in TQM activities, as well as a methodology for the implementation of TQM approaches in reliability and maintainability engineering. Manufacturing resource planning systems are ideal settings for TQM implementation, as presently illustrated by requisite flowcharting. O.C.

A92-46014
EMPLOYEE INVOLVEMENT IN QUALITY IMPROVEMENT - A COMPARISON OF AMERICAN AND JAPANESE MANUFACTURING FIRMS OPERATING IN THE U.S
MALING EBRAHIMPOUR (Rhode Island, University, Kingston) and BARBARA E. WITHERS (Old Dominion University, Norfolk, VA) *IEEE Transactions on Engineering Management* (ISSN 0018-9391), vol. 39, no. 2, May 1992, p. 142-148. refs
Copyright

The study determines whether firms classified as incorporating a Japanese quality management approach had significantly higher levels of worker involvement in the quality effort as well as higher utilization of statistical quality control (SQC) tools. The three types of firms represented were traditional American firms, Japanese firms operating in the U.S., and nontraditional American firms (firms emulating the Japanese approach to quality management). Results suggest that Japanese and nontraditional American firms have a significantly higher level of worker involvement and use simple SQC tools to a significantly higher degree than traditional American firms. Japanese firms operating in the U.S. showed results comparable to these American firms practicing Japanese quality management techniques. P.D.

A92-48175
PROPOSAL PREPARATION (2ND REVISED AND ENLARGED EDITION)
RODNEY D. STEWART and ANN L. STEWART New York, Wiley-Interscience, 1992, 368 p. refs
(ISBN 0-471-55269-0) Copyright

The proposal documentation whose preparation is discussed and illustrated is a written description of work to be performed, on the basis of which a prospective client will make a purchase decision. The present introduction to proposal preparation takes into account recent years' increase in the complexity of work activities in both private and public sectors, increasing sophistication of source-evaluation and selection techniques, and the growth of number and complexity of requirements imposed by prospective clients in the procurement/purchase process, without relaxation of the short time intervals allocated for proposal preparation and submission. O.C.

A92-48202
APPLYING TAGUCHI'S QUALITY ENGINEERING TO TECHNOLOGY DEVELOPMENT
STEVEN ASHLEY Mechanical Engineering (ISSN 0025-6501), vol. 114, no. 7, July 1992, p. 58-60.
Copyright

In recent years, Genichi Taguchi has attempted to apply his 'robust product' engineering design quality concepts to earlier stages of product development, in order to smooth a given technology's transition into the realm of commercial products. It is presently noted that in the development context, the Taguchi method allows experts on multidisciplinary product-development teams to communicate more easily, through the direct relation of all engineering choices to the 'common currency' of money. Traditional developmental engineering problem-solving methods are compared and contrasted with Taguchi methods. O.C.

A92-48573
APPLYING TQM TO TECHNICAL SERVICES PROJECTS
E. G. STRONG IN: NAECON 91; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1991. Vol. 3 1991 6 p
Copyright

It is noted that total quality management (TQM) literature traditionally either focuses on examples from manufacturing industries or provides strategic insights for upper managers. However, much of the work done in the aerospace and defense industries involves technical services. It is suggested that, with shrinking government budgets, the ability to perform project-level technical services using quality-centered approaches becomes a competitive factor. The author addresses these shortcomings in the literature by providing practical lessons learned from successful aerospace technical services projects using TQM principles. The lessons

learned include observations on successes and failures. Recommendations for implementation in projects are provided. It is concluded that, for a technical services company, the organizational unit which will benefit the most from TQM is the one that interfaces directly with customers-the project. I.E.

A92-48941#
AN EIGHT MONTH GEARBOX DEVELOPMENT PROGRAM
GREGORY PEREZ, JR. and ROBERT B. BOSSLER, JR. (Lucas Western, Inc., City of Industry, CA) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 28th, Nashville, TN, July 6-8, 1992. 6 p.
(AIAA PAPER 92-3368) Copyright

An engine-mounted accessory-drive gearbox for a new gas turbine engine for commercial aircraft was developed from layout to delivery of the first unit in eight months, rather than the 15 to 18 months normally required. The gearbox drives seven accessories, weighs 50 pounds and has an input of 121 horsepower at 19,837 RPM. The design includes a zerol-type spiral-bevel set and eight spur gears, all carburized and ground. The program required detailed project management, innovative concurrent engineering, manufacturing coordination and careful attention to component lead times. Author

A92-48980*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
ROCKET ENGINE PROPULSION 'SYSTEM RELIABILITY'
K. J. O'HARA AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 28th, Nashville, TN, July 6-8, 1992. 11 p. Research supported by NASA. refs
(AIAA PAPER 92-3421) Copyright

A system reliability approach is discussed which is based on a quantitative assessment of both the engine system and hardware reliability during the design process. The approach makes it possible to evaluate design trades as the design matures. It is concluded that the system reliability assessment approach offers the following benefits. The uncertainty of each design variable is explicitly considered in the analysis process. The most significant design variables are ranked in order of their effect on reliability. Design trades can be assessed for reliability impact. It is concluded that the approach facilitates communication between disciplines and thus aids in concurrent engineering. . O.G.

A92-49011#
TITAN NOZZLE EXTENSION - A CONCURRENT ENGINEERING APPROACH
B. P. BEAUDETTE, E. W. HIGGINS, JR., and L. C. MELAND (Aerojet, Propulsion Div., Sacramento, CA) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 28th, Nashville, TN, July 6-8, 1992. 8 p.
(AIAA PAPER 92-3457) Copyright

The use of a concurrent engineering team is described in the context of a nozzle-contour optimization study and the related redesign of the exit closure on the Titan IV stage-one engine. The design tasks included: (1) payload increase of 300 lbs; (2) ordnance reduction; (3) development of integrated external thermal insulation; and (4) the improvement of subassembly reliability. The design changes are detailed and illustrated with references to the inputs of members of the concurrent engineering team from all affected disciplines. The nozzle extension has an optimized area ratio of 16.7:1 and an ablative skirt and bumper designed for the configuration. The revised design is shown to be effective in terms of reaching design goals such as reduced life-cycle costs and enhanced reliability, and the concurrent engineering approach facilitates the accelerated development of the product. C.C.S.

A92-49047*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
TOTAL QUALITY MANAGEMENT IN SPACE SHUTTLE MAIN ENGINE MANUFACTURING
J. DING (NASA, Marshall Space Flight Center, Huntsville, AL) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 28th, Nashville, TN, July 6-8, 1992. 7 p. refs
(AIAA PAPER 92-3521) Copyright

The Total Quality Management (TQM) philosophy developed in the Marshall Space Flight Center (MSFC) is briefly reviewed and the ongoing TQM implementation effort which is being pursued through the continuous improvement (CI) process is discussed. TQM is based on organizational excellence which integrates the new supportive culture with the technical tools necessary to identify, assess, and correct manufacturing processes. Particular attention is given to the prime contractor's change to the organizational excellence management philosophy in SSME manufacturing facilities. O.G.

A92-51572
THE TOTAL QUALITY DESIGN (TQD) APPROACH FOR COMPOSITES
VISTASP M. KARBHARI, JAMES S. BURNS, and DICK J. WILKINS (Delaware, University, Newark) IN: International SAMPE Technical Conference, 23rd, Kiamesha Lake, NY, Oct. 21-24, 1991, Proceedings 1991 15 p refs
Copyright

The TQD approach furnishes a framework for the successful implementation of an integrated decision-production system. By applying TQM to composites, both production and cost estimate questions can be addressed simultaneously. TQD encompasses team-building, mission-statement, requirement-definition, benchmarking, and go/no-go reviews. O.C.

A92-54200*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
DESIGN OF A PROTOTYPE ADVANCED MAIN COMBUSTION CHAMBER FOR THE SPACE SHUTTLE MAIN ENGINE
J. D. LACKEY and W. N. MYERS (NASA, Marshall Space Flight Center, Huntsville, AL) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 28th, Nashville, TN, July 6-8, 1992. 7 p.
(AIAA PAPER 92-3847) Copyright

Development of a prototype advanced main combustion chamber is underway at NASA Marshall Space Flight Center. The Advanced Main Combustion Chamber (AMCC) project is being approached utilizing a 'concurrent engineering' concept where groups from materials, manufacturing, stress, quality, and design are involved from the initiation of the project. The AMCC design has been tailored to be compatible with the investment casting process. Jacket, inlet/outlet manifolds, inlet/outlet neck coolant flow splitters, support ribs, actuator lugs, and engine controller mounting bracket will all be a part of the one-piece AMCC casting. Casting of the AMCC in a one-piece configuration necessitated a method of forming a liner in its structural jacket. A method of vacuum plasma spraying the liner is being developed. In 1994, the AMCC will be hot-fired on the Technology Test Bed Space Shuttle Main Engine. Author

A92-54275* National Aeronautics and Space Administration, Washington, DC.
QUALITY INDEXING WITH COMPUTER-AIDED LEXICOGRAPHY
RONALD L. BUCHAN (NASA, Washington) *Information Services and Use* (ISSN 0167-5265), vol. 12, no. 1, 1992, p. 77-84. refs
Copyright

Indexing with computers is a far cry from indexing with the first indexing tool, the manual card sorter. With the aid of computer-aided lexicography, both indexing and indexing tools can provide standardization, consistency, and accuracy, resulting in greater quality control than ever before. A brief survey of computer activity in indexing is presented with detailed illustrations from NASA activity. Applications from techniques mentioned, such as Retrospective Indexing (RI), can be made to

many indexing systems. In addition to improving the quality of indexing with computers, the improved efficiency with which certain tasks can be done is demonstrated. Author

A92-55728
INTEGRATED PROGRAM MANAGEMENT FOR THE 21ST CENTURY. II
GEORGE J. VLAY (Systems Management Associates, Los Altos, CA) and LAWRENCE T. BREKKA (BDM International, Inc., Washington) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 11 p. refs
(IAF PAPER 92-0300) Copyright

Consideration is given to concepts of system engineering, program management, concurrent engineering, Total Quality Management, and risk management which can be executed through integrated product development teams. It is pointed out that the critical ingredients of an effective management process include early identification of the likely sources of problems, accurate reporting of status information to the management levels able to act with sufficient authority and resources, and quick execution of corrective actions. All of this can be accomplished with careful planning, clear assignment of responsibilities, proper design of reporting procedures and tools, and discipline in the execution of the activities. O.G.

A92-56204* National Aeronautics and Space Administration, Washington, DC.
NASA PREFERRED RELIABILITY-PRACTICES FOR DESIGN AND TEST
RONALD C. LISK (NASA, Washington) IN: Annual Reliability and Maintainability Symposium, Las Vegas, NV, Jan. 21-23, 1992, Proceedings 1992 5 p refs

NASA HQ established the NASA R&M Steering Committee (R&MSC) comprised of membership from each NASA field center. The primary charter of the R&MSC is to obtain, record, and share the best design practices that NASA has applied to successful space flight programs and current design considerations (guidelines) that should enhance flight reliability on emerging programs. The practices and guidelines are being assembled in a living document for distribution to NASA centers and the aerospace community. The document will be updated annually with additional practices and guidelines as contributions from the centers are reviewed and approved by the R&MSC. Practices and guidelines are not requirements, but rather a means of sharing procedures and techniques that a given center and the R&MSC together feel have strong technical merit and application to the design of space-related equipment. I.E.

A92-56211
R&M-CONTRACTING STRATEGY
JOHN A. HARTMAN (U.S. Army, Strategic Defense Command, Huntsville, AL) and JAMES H. WHITT (Teledyne Brown Engineering, Huntsville, AL) IN: Annual Reliability and Maintainability Symposium, Las Vegas, NV, Jan. 21-23, 1992, Proceedings 1992 5 p
Copyright

The authors define and describe a novel approach to R&M (reliability and maintainability) contracting. The current approach to R&M contracting used almost universally by government and industry is discussed, and the problems normally encountered are identified. The techniques and sources of data used in the preparation of R&M statements of work are identified and discussed. The application of total quality management (TQM) principles and practices as a prerequisite to the new R&M contracting strategy is presented. A brief discussion of the procedures for defining and implementing the strategy is provided. It is noted that the R&M contracting strategy presented will simplify the R&M program requirements definition process, ensure key R&M tasks are selected and appropriately tailored, and produce a cost-effective program. I.E.

A92-56212
IMPROVING RELIABILITY AND MAINTAINABILITY THROUGH PROCESS MANAGEMENT
TIMOTHY J. SHARP and CAY A. ERVIN (USAF, Wright-Patterson AFB, OH) IN: Annual Reliability and Maintainability Symposium, Las Vegas, NV, Jan. 21-23, 1992, Proceedings 1992 5 p refs

A recent study by the Scientific Advisory Board found that the US Air Force spends approximately $2 billion a year on simple structural aircraft parts. Responsibility and management of these parts (fasteners, actuators, connectors, tools, and subsystems, or FACTS) is spread across the Air Force major commands and weapon systems. In order to improve the reliability and maintainability (R&M) of these parts and decrease the amount of time needed to acquire and provide the parts to the aircraft maintainers the Acquisition Logistics Division FACTS Office was founded. The FACTS Office acts as an advocate for maintainers by helping with the procurement of better parts. The office also attempts to change the systems by which the parts are acquired. The FACTS Office has established an internal process using project teams, a sophisticated computer hardware and software system, and management support to improve the R&M of simple aircraft parts. This management system was developed around the total quality management concept of process improvement. Several projects have been completed successfully with both tangible and intangible savings identified. I.E.

A92-56246
DESIGN FOR IMPROVED MAINTENANCE OF THE FIBER-OPTIC CABLE SYSTEM (AS CARRIED OUT IN A CONCURRENT ENGINEERING ENVIRONMENT)
P. C. TREMOULET (ITTA/CD, Clifton, NJ) IN: Annual Reliability and Maintainability Symposium, Las Vegas, NV, Jan. 21-23, 1992, Proceedings 1992 9 p
Copyright

The author describes a number of maintenance improvements in the Fiber Optic Cable System (FOCS). They were achieved during a production phase pilot concurrent engineering program. Listed in order of importance (saved maintenance time and material) by maintenance level, they are: (1) organizational level: improved fiber optic converter (FOC) BITE; (2) Intermediate level: reduced FOC adjustments from 20 to 2; partitioned FOC into electrical and optical parts; developed cost-effective fault isolation test points and test using standard test equipment; improved FOC chassis to have lower mean time to repair; and (3) depot level: revised test requirements documents (TRDs) for common automatic test equipment and incorporated ATE testability into circuit and assemblies and application-specific integrated circuits. These improvements met this contract's tailored logistics MIL-STD 1388-1A requirements of monitoring the design for supportability and determining the most effective support equipment. Important logistics lessons learned while accomplishing these maintainability and supportability improvements on the pilot concurrent engineering program are also discussed. I.E.

A92-57241* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
THE IMPORTANCE OF OPERATIONS, RISK, AND COST ASSESSMENT TO SPACE TRANSFER SYSTEMS DESIGN
J. M. BALL, R. J. KOMERSKA (McDonnell Douglas Space Systems Co., Huntington Beach, CA), and L. F. ROWELL (NASA, Langley Research Center, Hampton, VA) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 10 p. refs
(Contract NAS1-18763)
(IAF PAPER 92-0847) Copyright

This paper examines several methodologies which contribute to comprehensive subsystem cost estimation. The example of a space-based lunar space transfer vehicle (STV) design is used to illustrate how including both primary and secondary factors into cost affects the decision of whether to use aerobraking or propulsion for earth orbit capture upon

lunar return. The expected dominant cost factor in this decision is earth-to-orbit launch cost driven by STV mass. However, to quantify other significant cost factors, this cost comparison included a risk analysis to identify development and testing costs, a Taguchi design of experiments to determine a minimum mass aerobrake design, and a detailed operations analysis. As a result, the predicted cost advantage of aerobraking, while still positive, was subsequently reduced by about 30 percent compared to the simpler mass-based cost estimates. Author

A92-57267
OPERATIONAL DESIGN FACTORS FOR ADVANCED SPACE TRANSPORTATION VEHICLES
C. L. WHITEHAIR, R. A. HICKMAN, J. D. ADAMS, and M. G. WOLFE (Aerospace Corp., El Segundo, CA) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 10 p. refs
(IAF PAPER 92-0879) Copyright

The tools and techniques needed to provide design decision-makers with balanced quantitative assessments of the potential operability consequences of their decisions are addressed. The factors controlling operability are identified, and a methodology to predict the impact of these factors on a specific launch vehicle is developed. Requirements to control these factors are established, and analytical tools developed specifically for performing detailed simulations to verify specific operability characteristics are described. An approach to collect, store, organize, and access high-quality historical, current, and future launch system data for the benefit of the USAF and the U.S. launch system community at large is outlined. P.D.

A93-11282#
THE EFFECTS OF USE OF CIVIL AIRWORTHINESS CRITERIA ON U.S. AIR FORCE ACQUISITION, TEST AND EVALUATION PRACTICES
ROBERT I. MARX and CRAIG A. CASSINO (USAF, Aeronautical Systems Center, Wright-Patterson AFB, OH) *In* AIAA Biennial Flight Test Conference, 6th, Hilton Head Island, SC, Aug. 24-26, 1992, Technical Papers Washington American Institute of Aeronautics and Astronautics 1992 p. 333-381. refs
(AIAA PAPER 92-4114) Copyright

In response to the initiatives to comply with the Public Law for Non-Developmental Item Preference, DOD has increased its use of commercial products. Some of the significant steps in 'commercializing' and streamlining the DOD acquisition and test and evaluation processes are discussed. A review of regulatory changes made and recommended is presented. R.E.P.

A93-11964
MULTIPLE OBJECTIVE OPTIMIZATION APPROACH TO ADAPTIVE AND LEARNING CONTROL
ALLON GUEZ, ILAN RUSNAK, and IZHAK BAR-KANA (Drexel Univ., Philadelphia, PA) *International Journal of Control* (ISSN 0020-7179) vol. 56, no. 2 Aug. 1992 p. 469-482. refs
(Contract AF-AFOSR-89-0010)
Copyright

A novel approach to the classical learning/adaptive control problem is formulated. The present approach is formulated for a general nonlinear time-varying plant. Thus, unlike existing adaptive control theory, the theory for a linear time-invariant system evolves as a special case of the general case. The design for the full lifetime of the system creates a methodology that specifies what current actions should be taken in addition to the tracking of the current reference trajectory, at the expense of some performance degradation in the current task, so as to improve the performance of future tasks. The conflicting objectives, namely, tracking vs learning and current tasks vs future tasks, are posed and partially solved in the domain of 'multiple objective optimization theory.' It is demonstrated for linear time-invariant plants with quadratic cost that Pareto optimal learning adaptive controllers may be obtained by simple 'out of loop' mixing, where a scalar reliably controls the tracking vs learning trade-off. P.D.

A93-13344#
MANAGEMENT ISSUES AND TECHNIQUES IN CONCURRENT ENGINEERING
D. P. SCHRAGE and M. GORDON (Georgia Inst. of Technology, Atlanta) Aug. 1992 19 p. AIAA, Aircraft Design Systems Meeting, Hilton Head Island, SC, Aug. 24-26, 1992 refs
(AIAA PAPER 92-4206) Copyright

One of the key barriers to implementation of Total Quality Management (TQM) and Concurrent Engineering (CE) is management. This has been true in both Japan and the USA, so it is not a cultural dependent barrier. This paper will address management issues common to Total Quality Control (TQC), TQM, and CE. Techniques for resolving these issues will be presented through a generic CE Design Methodology that is being developed at Georgia Tech and implemented through coursework and CE pilot projects. The methodology allows for the interactions of the four key elements of CE: a Top Down Design Decision Support Process, System Engineering Methods, Quality Engineering Methods, and a Computer Integrated Environment. Author

A93-13349#
AEROSPACE CONCEPTUAL VEHICLE DESIGN USING AN INTELLIGENT DESIGN AND ANALYSIS ENVIRONMENT - DESIGN SHEET
MARK GONDA (Rockwell International Corp., Space Transportation Systems Div., Downey, CA), KENNETH W. FERTIG (Rockwell International Science Center, Palo Alto, CA), and RONALD J. TEETER (Rockwell International Corp., Space Transportation Systems Div., Downey, CA) Aug. 1992 14 p. AIAA, Aircraft Design Systems Meeting, Hilton Head Island, SC, Aug. 24-26, 1992 Research supported by Rockwell International Corp refs
(AIAA PAPER 92-4222) Copyright

This paper presents an AI based software program named Design Sheet that facilitates trade studies during conceptual design. Design Sheet permits the designer to construct a model by entering a set of algebraic equations in a very flexible form. The designer can then utilize the system to easily change the set of independent variables in the algebraic model and to rapidly conduct trade studies, optimization and sensitivity analyses. R.E.P.

A93-14155
IMPLEMENTING CONTINUOUS QUALITY IMPROVEMENT (CQI) IN A LARGE ENGINEERING ORGANIZATION
ROBERT H. HAMMER and DAVID W. HARRIS (Boeing Commercial Airplane Group, Renton, WA) *In* ICAS, Congress, 18th, Beijing, China, Sept. 20-25, 1992, Proceedings. Vol. 1 Washington American Institute of Aeronautics and Astronautics, Inc. 1992 p. LXI-LXIX.
Copyright

This paper reviews the implementation of Continuous Quality Improvement (CQI) in a large engineering organization. CQI processes strive to eliminate errors, promote technical excellence, and provide customer satisfaction. Toward those goals, a process called 'Plan, Do, Check, Act', (PDCA) has been adopted that is complementary to this technically-oriented environment. Working together, management and nonmanagement are incorporating this action plan into their daily work routines. Employees also receive training that concentrates on the application of problem-solving 'tools' to reinforce quality improvement methodology. In addition, tools called Process Error Prevention (PEP) and Design Success Measurement System (DSMS) have been adopted throughout engineering, using data from our products to identify problems with the related processes. Continuous monitoring through periodic progress reviews and data analysis ensures standardization and sustaining of quality improvement goals and objectives. A summarized examination of this CQI philosophy as well as its implementation and monitoring is discussed. Author

A93-14215
THE VALUE OF A COMPUTATIONAL/EXPERIMENTAL PARTNERSHIP IN AERODYNAMIC DESIGN
R. L. BENGELINK and T. W. PURCELL (Boeing Commercial Airplane Group, Seattle, WA) *In* ICAS, Congress, 18th, Beijing, China, Sept. 20-25, 1992, Proceedings. Vol. 1 Washington American Institute of Aeronautics and Astronautics, Inc. 1992 p. 493-499. refs
Copyright

This paper reviews some of the key lessons learned from the past twenty years of Computational Fluid Dynamics (CFD) development. These lessons include the need for careful validation and verification studies, the need for application specialists in CFD and experimental testing areas, and the need for continued improvement in the teamwork between computational and experimental groups. This nature of this teamwork is discussed and several examples are presented to illustrate the broad coverage of problems that a more cooperative approach enables. A good partnership between all required disciplines is suggested to be a key condition necessary for developing tomorrow's competitive air transport designs. Author

A93-15043
METHODOLOGY IN THE DEVELOPMENT OF AVIONICS [METHODOLOGIE DANS LE DEVELOPPEMENT DE L'AVIONIQUE]
ALAIN COUPIER (Toulouse, Centre d'Essais Aeronautique; Ecole Nationale Superieure d'Ingenieurs de Constructions Aeronautiques, France) L'Aeronautique et l'Astronautique (ISSN 0001-9275) no. 144 1990 p. 25-29. In French.
Copyright

This paper reviews the principal standards used throughout the French avionics industry. A product-oriented approach is utilized which aims at estimating quality by measuring inductive well-chosen values. Also a process-oriented approach is employed which aims at obtaining a commitment toward using suitable techniques and tools to obtain the right product at the first attempt. R.E.P.

A93-15739
SPRING-BACK OF THE COMPOSITE LAMINATE DURING CURE
TSANG-LUH YANG, SHIH-MING CHEN, and JONG-PYNG CHEN (Industrial Technology Research Inst., Hsinchu, Taiwan) *In* International SAMPE Symposium and Exhibition, 37th, Anaheim, CA, Mar. 9-12, 1992, Proceedings Covina, CA Society for the Advancement of Material and Process Engineering 1992 p. 213-223. Research supported by Ministry of Economic Affairs of Taiwan refs
Copyright

The occurrence of dimensional changes during cure is utmost importance during tool/part interaction. This paper presents a simple calculation model for predicting the thermal deformation of graphite-epoxy components during cure resulting in the spring-back of the composite laminate. The factors causing spring-backs are obtained from Taguchi methods and they are tool angle, layup plies, layup length and proper sequence of stacking. Also an equation is proposed for the calculation of the angle changes during the experiments. Author

A93-15760
DIMENSIONAL STABILITY OF C/E COMPOSITE LAMINATE CURED WITH AUTOCLAVE
MING-YAN CHEN, SHIH-MING CHEN, LONG-ZENG ZENG, and JONG-PYNG CHEN (Industrial Technology Research Inst., Hsinchu, Taiwan) *In* International SAMPE Symposium and Exhibition, 37th, Anaheim, CA, Mar. 9-12, 1992, Proceedings Covina, CA Society for the Advancement of Material and Process Engineering 1992 p. 462-472. refs
Copyright

Composite laminate thickness is greatly affected by curing process, such as applied pressure, heat-up rate, bleeder quantities, temperature, etc. This paper investigates the dimensional stability of a carbon/epoxy composite laminate under various autoclave curing conditions, using the economical, highly reproducible Taguchi Method. The optimum curing condition that could stabilize the laminate thickness was obtained after dynamic characteristic signal-to-noise analysis. A regression equation that can predict the laminate thickness is postulated after analyzing the experimental data with this statistical method. Author

A93-15809
FABRICATION OF LOW COST COMPOSITE TOOLING FOR FILAMENT WINDING LARGE STRUCTURES
TIMOTHY S. MILLER and CHRISTOPHER J. FORTIN (Martin Marietta Astronautics Group, Denver, CO) *In* International SAMPE Symposium and Exhibition, 37th, Anaheim, CA, Mar. 9-12, 1992, Proceedings Covina, CA Society for the Advancement of Material and Process Engineering 1992 p. 1160-1169.
Copyright

A TQM/concurrent engineering approach has been used to create a low cost filament-winding mandrel for large launch-vehicle structure fabrication. The process involves the fabrication of a low cost/low temperature master model, followed by the building of the mandrel and its backup structure within the master. Mandrels fabricated by these means are able to maintain full vacuum integrity and dimensional stability throughout high-temperature cure cycles; the reduced thermal mass of the mandrel results in part-cure cycles that are shorter than those associated with conventional mandrel materials. O.C.

A93-18646
IDA - AN ARCHITECTURE FOR AN INTELLIGENT DESIGN ASSISTANT FOR ASSESSING THE INSPECTABILITY OF STRUCTURES FROM A DESCRIPTION OF THEIR GEOMETRY
STEPHEN M. NUGEN, BABAK FOROURAGHI, and LESTER W. SCHMERR, JR. (Iowa State Univ. of Science and Technology, Ames) *In* Review of progress in quantitative nondestructive evaluation. Vol. 11A; Proceedings of the 18th Annual Review, Brunswick, ME, July 28-Aug. 2, 1991 New York Plenum Press 1992 p. 671-675. Research supported by Iowa State Univ. of Science and Technology refs
Copyright

An intelligent design assistant (IDA) is intended to integrate design, NDE, and manufacturing specializations and furnish expert advice on the improvement of performance and reliability. IDA is constructed on the basis of an architecture that can take advantage of advancements in rule-based expert systems, neural networks, Taguchi-type analysis, and case-based reasoning. IDA operates by deploying a family of distributed AI modules, each of which uses a single method to evaluate a given design from a focused perspective. O.C.

A93-23228
PHOTOCHEMICAL AEROSOL FORMATION FROM ALPHA-PINENE- AND BETA-PINENE
SHOU-HUA ZHANG, MARTHA SHAW, JOHN H. SEINFELD, and RICHARD C. FLAGAN (California Inst. of Technology, Pasadena) *Journal of Geophysical Research* (ISSN 0148-0227) vol. 97, no. D18 Dec. 20, 1992 p. 20,717-20,729. Research supported by Coordinating Research Council refs
(Contract NSF ATM-90-03186)
Copyright

Aerosol formation from alpha-pinene and beta-pinene was studied in a series of outdoor smog chamber experiments. The initial hydrocarbon and NO(x) concentrations ranged from 37 to 582 ppb and 31 to 380 ppb, respectively. The aerosol carbon yield, the fraction of the carbon initially present that is converted to aerosol, varied from 0 to 5.3 percent for alpha-pinene, depending on the initial hydrocarbon-to-NO(x) ratio. Dual-bag experiments demonstrate that alpha-pinene is more rapidly photooxidized, and produces higher yields of both aerosol and ozone in a given period of time than beta-pinene, although given sufficient time, beta-pinene can produce equivalent aerosol yields. The addition of isoprene to the alpha-pinene/NO(x) system leads to an increased aerosol yield through the enhanced photochemical activity generated. Author

A93-23312*# National Aeronautics and Space Administration, Washington, DC.
TOTAL QUALITY MANAGEMENT - IT WORKS FOR AEROSPACE INFORMATION SERVICES
JAMES ERWIN (NASA, Washington), CARL EBERLINE, and WANDA COLQUITT (NASA, Center for AeroSpace Information, Baltimore, MD) Jan. 1993 12 p. AIAA, Aerospace Sciences Meeting and Exhibit, 31st, Reno, NV, Jan. 11-14, 1993
(AIAA PAPER 93-0581) Copyright

Today we are in the midst of information and 'total quality' revolutions. At the NASA STI Program's Center for AeroSpace Information (CASI), we are focused on using continuous improvements techniques to enrich today's services and products and to ensure that tomorrow's technology supports the TQM-based improvement of future STI program products and services. The Continuous Improvements Program at CASI is the foundation for Total Quality Management in products and services. The focus is customer-driven; its goal, to identify processes and procedures that can be improved and new technologies that can be integrated with the processes to gain efficiencies, provide effectiveness, and promote customer satisfaction. This Program seeks to establish quality through an iterative defect prevention approach that is based on the incorporation of standards and measurements into the processing cycle. Author

A93-24017
MULTICRITERIA OPTIMIZATION IN ANTENNA DESIGN
T. S. ANGELL (Delaware Univ., Newark) and A. KIRSCH (Erlangen-Nuernberg, Univ., Erlangen, Germany) *Mathematical Methods in the Applied Sciences* (ISSN 0170-4214) vol. 15, no. 9 Dec. 1992 p. 647-660. refs
(Contract AF-AFOSR-91-0277; DFG-KR-940/1-1)
Copyright

We formulate certain problems in the optimal design of radiating structures such as multicriteria optimization problems. We review the basic background of such problems, prove the existence of Pareto optimal points, and give necessary conditions. We apply the latter to the numerical computation of optimal surface currents for the problem of simultaneously optimizing both the quality factor and the signal-to-noise ratio of a conformal antenna. Author

A93-25475
SYSTEMS ENGINEERING AND INFORMATION TECHNOLOGY - CATALYSTS FOR TOTAL QUALITY IN INDUSTRY AND EDUCATION
ANDREW P. SAGE (George Mason Univ., Fairfax, VA) *IEEE Transactions on Systems, Man, and Cybernetics* (ISSN 0018-9472) vol. 22, no. 5 Sept.-Oct. 1992 p. 833-864. refs
(Contract NSF EET-88-20124)
Copyright

The present account of the historical development and prospective improvements of systems-engineering-supported uses of information technology gives attention to U.S. capabilities for improvement in industrial productivity and the quality of higher education. Suggestions are made concerning the implementation of required actions and their probable results in the realms of quality and productivity. The relevance of education in general and engineering education in particular is stressed. O.C.

A93-27785
RELIABILITY GROWTH THROUGH APPLICATION OF ACCELERATED RELIABILITY TECHNIQUES AND CONTINUAL IMPROVEMENT PROCESSES
CHARLES E. SCHINNER (Hewlett-Packard Co., San Diego, CA) *In* Institute of Environmental Sciences, Annual Technical Meeting, 37th, San Diego, CA, May 6-10, 1991, Proceedings Mount Prospect, IL Institute of Environmental Sciences 1991 p. 347-354. refs
Copyright

Accelerated reliability techniques, the test-analyze-correct-verify process, and the broad spectrum stress portfolio are discussed. It is concluded that using these parallel strategies enables a comprehensive evaluation of the power supply in an abbreviated evaluation time period. This evaluation uncovers design, component, and manufacturing deficiencies in the product that would have taken months of field warranty data to observe. This process makes it possible to considerably improve the reliability of the product and satisfy customers without affecting the product schedule. O.G.

A93-27967
EVOLUTION OF PERMANENT COMPOSITE REPAIR DESIGNS
D. A. REISDORFER (Bell Helicopter Textron, Inc., Fort Worth, TX) *In* AHS National Technical Specialists' Meeting on Rotorcraft Structures, Williamsburg, VA, Oct. 29-31, 1991, Proceedings Alexandria, VA American Helicopter Society 1991 10 p.

This paper emphasizes the challenges in composite repair by presenting two repair concepts developed under the V-22 Composite Repair Development program. These two concepts represents repair designs of high-strain structure and of stability-critical structure. A general description of the repair design process, the design drivers, and repair issues associated with each design concept is provided. The paper highlights the different philosophy between repairs of high-strain structure and stability-critical structure. The results of finite-element analysis and design support tests are presented for each type of repair. The importance of concurrent engineering (consisting of design engineering specialists, logistics engineers, and government repair specialists) on the final repair design is also discussed. Lessons learned and specific problem areas associated with each concept are emphasized. Author

A93-30935#
INTEGRATING RELIABILITY AND MAINTAINABILITY INTO A CONCURRENT ENGINEERING ENVIRONMENT
CLIFTON B. PHILLIPS (California Univ., La Jolla) and ROBERT R. PETERSON (General Dynamics Corp., Space Systems Div., San Diego, CA) Feb. 1993 8 p. AIAA, AHS, and ASEE, Aerospace Design Conference, Irvine, CA, Feb. 16-19, 1993 refs
(AIAA PAPER 93-1021) Copyright

This paper describes the results of a reliability and maintainability study conducted at the University of California, San Diego and supported by private industry. Private industry thought the study was important and provided the university access to innovative tools under cooperative agreement. The current capability of reliability and maintainability tools and how they fit into the design process is investigated. The evolution of design methodologies leading up to today's capability is reviewed for ways to enhance the design process while keeping cost under control. A method for measuring the consequences of reliability and maintainability policy for design configurations in an electronic environment is provided. The interaction of selected modern computer tool sets is described for reliability, maintainability, operations, and other elements of the engineering design process. These tools provide a robust system evaluation capability that brings life cycle performance improvement information to engineers and their managers before systems are deployed, and allow them to monitor and track performance while it is in operation. Author

A93-30942*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
GENOPERSISTATING THE SYSTEM
EDWIN B. DEAN (NASA, Langley Research Center, Hampton, VA) Feb. 1993 7 p. AIAA, AHS, and ASEE, Aerospace Design Conference, Irvine, CA, Feb. 16-19, 1993 refs
(AIAA PAPER 93-1031)

The concept of competitiveness is considered as a function of both high quality and low cost, and the techniques which drive a design simultaneously in both directions. In order to examine these techniques, the term 'genopersistation', which is derived from the words 'genesis' and 'persistence' and defined to mean the bringing forth, sustaining, and eventual annihilation of something. For a product, the term includes the conceptual design, design development, test and evaluation, production, deployment, operation, support, evolution, and retirement of product. The

techniques are summarized which can be used to simultaneously genopersistate both the high quality and low cost into a product. Attention is given to Taguchi (1986) methods, the response surface methodology (Montgomery, 1984), Quality Function Deployment (Akao, 1990), Hoshin Kanari (Akao, 1991), activity based costing (O'Guin, 1991), concurrent engineering (Carter and Baker, 1991), and multidisciplinary optimization (Evans, 1984). I.S.

A93-30985*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
MULTIDISCIPLINARY DESIGN OF A ROCKET-BASED COMBINED CYCLE SSTO LAUNCH VEHICLE USING TAGUCHI METHODS
JOHN R. OLDS and GERALD D. WALBERG (North Carolina State Univ., Raleigh) Feb. 1993 13 p. AIAA, AHS, and ASEE, Aerospace Design Conference, Irvine, CA, Feb. 16-19, 1993 refs
(Contract NCC1-168)
(AIAA PAPER 93-1096) Copyright

Results are presented from the optimization process of a winged-cone configuration SSTO launch vehicle that employs a rocket-based ejector/ramjet/scramjet/rocket operational mode variable-cycle engine. The Taguchi multidisciplinary parametric-design method was used to evaluate the effects of simultaneously changing a total of eight design variables, rather than changing them one at a time as in conventional tradeoff studies. A combination of design variables was in this way identified which yields very attractive vehicle dry and gross weights. O.C.

A93-31019#
THE CUSTOMER INFLUENCE IN 777 DESIGN
R. G. SCHAAD and J. M. HOPPER (Boeing Commercial Airplane Group, Seattle, WA) Feb. 1993 9 p. AIAA, AHS, and ASEE, Aerospace Design Conference, Irvine, CA, Feb. 16-19, 1993 refs
(AIAA PAPER 93-1139) Copyright

The Boeing plan for the 777 airplane is to actively seek inputs from the airline customers and the internal design process customers in order to produce the airplane that is preferred. This paper discusses the business processes and culture changes that were introduced to execute this plan and provides specific examples of changes in the configuration of the airplane and particular design details or features as a result of having this early coordination and input from these customers. Author

A93-31020*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
LAUNCH VEHICLE SYSTEMS DESIGN ANALYSIS
ROBERT RYAN and V. VERDERAIME (NASA, Marshall Space Flight Center, Huntsville, AL) Feb. 1993 8 p. AIAA, AHS, and ASEE, Aerospace Design Conference, Irvine, CA, Feb. 16-19, 1993 refs
(AIAA PAPER 93-1140) Copyright

Current launch vehicle design emphasis is on low life-cycle cost. This paper applies total quality management (TQM) principles to a conventional systems design analysis process to provide low-cost, high-reliability designs. Suggested TQM techniques include Steward's systems information flow matrix method, quality leverage principle, quality through robustness and function deployment, Pareto's principle, Pugh's selection and enhancement criteria, and other design process procedures. TQM quality performance at least-cost can be realized through competent concurrent engineering teams and brilliance of their technical leadership. Author

A93-31021#
USE OF 3-D DESIGN TOOLS FOR SPACE HARDWARE DEVELOPMENT IN THE TQM ENVIRONMENT
JIM CAPPA, FRANK DUGGER, BRUCE LOOSLI, and JOHN MOORE (Boeing Defense & Space Group, Kent, WA) Feb. 1993 10 p. AIAA, AHS, and ASEE, Aerospace Design Conference, Irvine, CA, Feb. 16-19, 1993
(AIAA PAPER 93-1141) Copyright

Due to the high costs of building one-of-a-kind space hardware, Boeing Spacecraft Structures Subsystems improved its design development process to reduce costs, improve flow times and enhance customer satisfaction. Our organization implemented concurrent engineering methods using the Boeing Product Development Team (PDT) approach along with the use of new generation design and analysis tools with an overall Total Quality Management (TQM) environment. A more efficient design development process was demonstrated on flight hardware using reduced engineering staff to successfully achieve scheduled milestones and address all requirements for space qualified hardware - while being responsible to our customer. Author

A93-31049#
RELATING ECONOMICS TO ROTORCRAFT DESIGN PARAMETERS THROUGH A CRITERION FUNCTION
DANIEL P. SCHRAGE (Georgia Inst. of Technology, Atlanta) Feb. 1993 12 p. AIAA, AHS, and ASEE, Aerospace Design Conference, Irvine, CA, Feb. 16-19, 1993 refs
(AIAA PAPER 93-1180) Copyright

It is no secret that economics will be the key for rotorcraft, both civil and military, fulfilling their potential as well accepted transportation and weapon systems. As more focus is placed on quality and minimizing the loss to society after the product is delivered, understanding and addressing the relationships between economics and rotorcraft design parameters will be essential. While terms such as concurrent engineering and integrated product and process development are used to describe the environment to achieve better, higher quality products in reduced time, the concurrent design of the product and process (both manufacturing and support) is the essential enabler. Concurrent design to address quality improvements and reduced cycle time requires metrics relating economics to rotorcraft design parameters. While relationships exist between economics and rotorcraft design parameters they are not well understood by the cross section of operators, manufacturers, and government agencies involved in the design, development, qualification and certification, production, and support of rotorcraft. This paper will attempt to shed some light on these relationships through the use of a criterion function. The criterion function can be used as a formal objective function, addressing both product and process considerations, and can provide the missing linkage between economics and rotorcraft design parameters. Author

A93-32036
EFFECT OF FABRICATION PARAMETERS ON VOID CONTENT FOR FILAMENT-WOUND COMPOSITES
R. J. STANGO, J. E. MATAR, V. CARIAPA (Marquette Univ., Milwaukee, WI), and W. E. RYAN (A.O. Smith Corp., Milwaukee, WI) *In* Processing and manufacturing of composite materials; Proceedings of the Symposium, 112th ASME Winter Annual Meeting, Atlanta, GA, Dec. 1-6, 1991 New York American Society of Mechanical Engineers 1991 p. 277-290. refs
Copyright

This research examines the effects of fabrication parameters on void content for filament-wound composites. The problem is approached by employing Taguchi's method of experimental design. Filament-wound composites are manufactured by using several different fabrication parameters, and the corresponding void content for the material systems is measured by employing image analysis microscopy. Results are reported which describe the relationship between discrete fabrication parameters and void content of the composite material system. Parameters which were found to yield a composite material system with least void content were subsequently used in a confirming experiment. Results of this confirming experiment demonstrate that the present methodology can be used for fabricating composites with minimal void content. Author

A93-32555* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
APPLICATION OF TAGUCHI METHODS TO PROPULSION SYSTEM OPTIMIZATION FOR SSTO VEHICLES

DOUGLAS O. STANLEY (NASA, Langley Research Center, Hampton, VA), RESIT UNAL (Old Dominion Univ., Hampton, VA), and C. R. JOYNER (Pratt & Whitney Grupe, West Palm Beach, FL) *Journal of Spacecraft and Rockets* (ISSN 0022-4650) vol. 29, no. 4 July-Aug. 1992 p. 453-459. AIAA, Aerospace Sciences Meeting and Exhibit, 30th, Reno, NV, Jan. 6-9, 1992, AIAA Paper 92-0213. Previously cited in issue 09, p. 1492, Accession no. A92-25686 refs
Copyright

A93-34014*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
UTILIZATION OF CAD/CAE FOR CONCURRENT DESIGN OF STRUCTURAL AIRCRAFT COMPONENTS
WILLIAM C. KAHN (E-Systems, Inc., Greenville, TX) *In* AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 34th and AIAA/ASME Adaptive Structures Forum, La Jolla, CA, Apr. 19-22, 1993, Technical Papers. Pt. 3 Washington American Institute of Aeronautics and Astronautics 1993 p. 1405-1408. Research supported by NASA
(AIAA PAPER 93-1466) Copyright

The feasibility of installing the Stratospheric Observatory for Infrared Astronomy telescope (named SOFIA) into an aircraft for NASA astronomy studies is investigated using CAD/CAE equipment to either design or supply data for every facet of design engineering. The aircraft selected for the platform was a Boeing 747, chosen on the basis of its ability to meet the flight profiles required for the given mission and payload. CAD models of the fuselage of two of the aircraft models studied (747-200 and 747 SP) were developed, and models for the component parts of the telescope and subsystems were developed by the various concurrent engineering groups of the SOFIA program, to determine the requirements for the cavity opening and for design configuration. It is noted that, by developing a plan to use CAD/CAE for concurrent engineering at the beginning of the study, it was possible to produce results in about two-thirds of the time required using traditional methods. AIAA

A93-34468
CE - ENGINEERING A CHANGE IN THE DESIGN PROCESS
ROBERT SIMMS (Martin Marietta Manned Space Systems, New Orleans, LA) *Aerospace America* (ISSN 0740-722X) vol. 31, no. 4 April 1993 p. 18-22.
Copyright

Concurrent engineering (CE) is a well orchestrated and integrated design process described as 'a systematic approach to the integrated, concurrent design of products and their related processes, including manufacture and support'. Inputs are obtained from experts in a multitude of disciplines, from the customer, and from suppliers and are incorporated early in the product development program. This paper discusses features characterizing CE, as defined by the DOD and commonly known as the 'ten plus one commandments of CE'. AIAA

A93-34471
ROCKET ENGINE DEVELOPMENT
KATHLEEN N. BUTLER (Rockwell International Corp., Rocketdyne Div., Canoga Park, CA) *Aerospace America* (ISSN 0740-722X) vol. 31, no. 4 April 1993 p. 28-30.
Copyright

The paper discusses the National Launch System Space Transportation Main Engine (STME) development program, which is a joint USAF/NASA project to produce a heavy-lift launch vehicle at a cost significantly below that of current systems and which incorporates efforts by three member companies. The STME project is organized into seven product development teams (systems engineering and integration, engine system, thrust chamber assembly, fuel turbopump assembly, oxidizer turbopump assembly, control system, and engine hardware), each led by one of the three member companies along with a NASA deputy. Most teams are assigned several components, each having a product-oriented concurrent engineering team involving all relevant disciplines. AIAA

A93-34473
CE AT GENERAL DYNAMICS
STEVEN A. KEWLEY and MARK S. KNODLE (General Dynamics Corp., Space Systems Div., San Diego, CA) *Aerospace America* (ISSN 0740-722X) vol. 31, no. 4 April 1993 p. 34-37.
Copyright

To shorten the development cycles, continuous quality improvement, and cost reduction of Atlas launch vehicle, General Dynamics developed a concurrent engineering (CE) strategy based on internal and external assessment. This paper describes the implementation of the CE process at GE, using, as a pilot CE project, the development of a new payload adapter, which is an aluminum alloy structural assembly that provides the mechanical and electrical interface between the Atlas launch vehicle and the satellite it carries. A comparison of the pilot project results with those of a non-CE development program showed a drastic improvement obtained with CE methods, in terms of the number of engineering drawing changes after original releases. AIAA

A93-34474
SPACE STATION FREEDOM
SCOTT STRODE (McDonnell Douglas Aerospace, Saint Louis, MO) *Aerospace America* (ISSN 0740-722X) vol. 31, no. 4 April 1993 p. 38-40.
Copyright

The design of the Space Station Freedom is a based on a complex mixture of user requirements, design constraints, and function limitations. This paper discusses the Freedom's current configuration; its elements, which will be launched within the Shuttle, with final assembly to occur in stages on orbit; the habitable cluster; and the key requirements driving the station design. Particular attention is given to the approach used by MDA (which is one of the three prime contractors involved in the design, development, test, and evaluation phases of the Freedom program) to concurrent engineering used in the element- and system-level design, development, test, and evaluation. AIAA

A93-35944
A TAGUCHI ANALYSIS OF HELICOPTER MANEUVERABILITY AND AGILITY
SCOTT SWINSICK (McDonnell Douglas Helicopter Co., Mesa, AZ) *In* AHS, Annual Forum, 48th, Washington, June 3-5, 1992, Proceedings. Vol. 1 Alexandria, VA American Helicopter Society 1992 p. 543-553. refs
Copyright

The objective of the Rotorcraft Maneuverability and Agility Survivability Sensitivity Analysis (RMASSA) was to investigate rotorcraft survivability sensitivity to maneuverability and agility (M&A) variations. The goal was to identify those performance parameters (load factor, power available, roll rate, etc.) which contributed to improved M&A. Once identified, the performance parameters were related to specific design parameters (rotor diameter, blade solidity, engine size, etc.). The result was an investigation of nine derivative helicopter designs each having variations in M&A capabilities and design weight. The results of analytic combat simulations were used to examine the trade-offs between M&A, weight, and survivability. Author (revised)

A93-36203
NONDESTRUCTIVE TEST AND INSPECTION REQUIREMENTS FOR AEROMECHANICAL LIFTING AND HANDLING EQUIPMENT - A COMPARISON OF LAUNCH SITE TO INDUSTRY STANDARDS
DONALD E. CLAY (TRW Space & Technology Group, Engineering and Test Div., Redondo Beach, CA) *In* Aerospace Testing Seminar, 13th, Manhattan Beach, CA, Oct. 8-10, 1991, Proceedings Mount Prospect, IL Institute of Environmental Sciences 1991 p. 15-19. refs
Copyright

Launch site safety regulations require lifting devices to provide a

safety factor of five at ultimate to be periodically proof load tested to 200 percent of capacity; visually inspected prior to use; and undergo nondestructive crack detection tests such as magnetic particle, dye penetrant, or X-ray. Industry standards are similar, but do not require crack detection tests. A TQM process improvement study has found the additional tests do not improve the quality of safety for this type equipment. Author

A93-36490
THE MILSTAR ADVANCED PROCESSOR
KHIEM-HIAN TJIA, STEPHEN D. HEELY, JOHN P. MORPHET, and KEVIN S. WIRICK (TRW Space & Defense Sector, Redondo Beach, CA) Quest vol. 14, no. 1 Summer 1991 p. 47-64.
Copyright

The Milstar Advanced Processor (MAP) is a 'drop-in' replacement for its predecessor which preserves existing interfaces with other Milstar satellite processors and minimizes the impact of such upgrading to already-developed application software. In addition to flight software development, and hardware development that involves the application of VHSIC technology to the electrical design, the MAP project is developing two sophisticated and similar test environments. High density RAM and ROM are employed by the MAP memory array. Attention is given to the fine-pitch VHSIC design techniques and lead designs used, as well as the tole of TQM and concurrent engineering in the development of the MAP manufacturing process. AIAA

A93-37883
THE QUALITY IMPROVEMENT TOOLS
DAVID T. YOEST (Sverdrup Technology, Inc., Arnold AFB, TN) *In* International Instrumentation Symposium, 38th, Las Vegas, NV, Apr. 26-30, 1992, Proceedings Research Triangle Park, NC Instrument Society of America 1992 p. 671-715.
Copyright

Attention is given to Total Quality Management (TQM), a long-term success strategy for organizations that is endorsed by many leaders in government and industry. TQM is performed to solve chronic problems within the workplace. Emphasis is placed on the many tools available to focus attention and encourage creativity for problem solving, namely, flow diagrams, brainstorming, cause and effect diagrams, data collection, graphs and charts, pareto analysis, histograms, and box plots. AIAA

A93-41515* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
PLANT GROWTH MODELING AT THE JSC VARIABLE PRESSURE GROWTH CHAMBER - AN APPLICATION OF EXPERIMENTAL DESIGN
ADAM M. MILLER (McDonnell Douglas Space Systems, Huntington Beach, CA), MARYBETH EDEEN (NASA, Johnson Space Center, Houston, TX), and ROBERT J. SIRKO (McDonnell Douglas Space Systems, Huntington Beach, CA) Jul. 1992 11 p. SAE, International Conference on Environmental Systems, 22nd, Seattle, WA, July 13-16, 1992 refs
(SAE PAPER 921356) Copyright

This paper describes the approach and results of an effort to characterize plant growth under various environmental conditions at the Johnson Space Center variable pressure growth chamber. Using a field of applied mathematics and statistics known as design of experiments (DOE), we developed a test plan for varying environmental parameters during a lettuce growth experiment. The test plan was developed using a Box-Behnken approach to DOE. As a result of the experimental runs, we have developed empirical models of both the transpiration process and carbon dioxide assimilation for Waldman's Green lettuce over specified ranges of environmental parameters including carbon dioxide concentration, light intensity, dew-point temperature, and air velocity. This model also predicts transpiration and carbon dioxide assimilation for different ages of the plant canopy. Author

A93-42835
CRAFTING A TQM-ORIENTED SOFTWARE DEVELOPMENT LIFECYCLE - PROGRAM EXPERIENCE
SUDHIR SHAH and JAMES SUTTON (Lockheed Aeronautical Systems Co., Marietta, GA) *In* NAECON 92; Proceedings of the IEEE 1992 National Aerospace and Electronics Conference, Dayton, OH, May 18-22, 1992. Vol. 2 New York Institute of Electrical and Electronics Engineers, Inc. 1992 p. 643-649.
Copyright

The authors discuss practical ways to implement essential principles of TQM (total quality management) within four perspectives: people, quality, mission, and environment. The TQM approach described was developed and implemented at Lockheed Aeronautical Systems Company (LASC) on a very successful medium-scale software-development project: the Ground Processing System Software Update Project (GPSSUP). It is noted that GPSSUP has outperformed previous LASC *software development projects according to all major criteria: quality*, reliability, profitability, productivity, building personnel capabilities and motivation, schedule performance, and increasing the company technology base. Avail: Issuing Activity (National Technical Information Service (NTIS)) This performance improved as the program progressed, due to a deepening incorporation of TQM via continuous process improvement and a reuse life cycle. Author

A93-42853
R&M 2000 FIELD DATA REQUIREMENTS FOR A SPO *OPERATION*
PHILLIP HERMES (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH) *In* NAECON 92; Proceedings of the IEEE 1992 National Aerospace and Electronics Conference, Dayton, OH, May 18-22, 1992. Vol. 2 New York Institute of Electrical and Electronics Engineers, Inc. 1992 p. 767-773.

Traditional and modern perspectives on field data systems are compared, with emphasis on the R&M 2000 and total quality management initiatives which stress operational impacts and customer satisfaction. The Tactical Air Command reporting system is used to illustrate how to develop a user-driven field data system where TAC's top-level metrics (break rate, fix rate, ground abort rate, and mission capable rate) are used as reference points for all levels of data collection, processing, and output reports. A matrix of output reports is reviewed which illustrates three levels of reports (summary, detail, and raw) for each TAC metric. This matrix approach establishes an integrated systems approach to field data systems wherein all reports are interrelated to provide a complete picture to the SPO decision makers. Selected output displays are reviewed using field data obtained from the TICARRS (F-16 CDS) data system. A baseline change request is being processed by the REMIS SPO to incorporate this approach into the REMIS data system. Author

A93-47291#
DESIGN OPTIMIZATION STUDY FOR F-15 PROPULSION/ FORWARD FAIRING COMPATIBILITY
K. E. ACHESON, S. E. LEHMAN, and T. D. SMITH (McDonnell Douglas Aerospace, Saint Louis, MO) *In* AIAA Applied Aerodynamics Conference, 11th, Monterey, CA, Aug. 9-11, 1993, Technical Papers. Pt. 2 Washington American Institute of Aeronautics and Astronautics 1993 p. 1071-1081. refs
(AIAA PAPER 93-3484) Copyright

An F-15E propulsion system compatibility analysis and test program was required in the preliminary design phase of a forward-mounted antenna fairing integration effort. The goal of the program was to identify antenna fairing configurations that would ensure compatibility with the F-15E propulsion system. Taguchi statistical methods were used to eliminate half of the required parametrics. Computational fluid dynamics numerical simulations and wind runnel testing were used in a complimentary manner to provide both qualitative and quantitative measures of performance.

A93-49626
TABES 93 - ANNUAL TECHNICAL AND BUSINESS EXHIBITION AND SYMPOSIUM, 9TH, HUNTSVILLE, AL, MAY 11, 12, 1993, SUBMITTED PAPERS
Huntsville, AL Huntsville Association of Technical Societies 1993 258 p. For individual items see A93-49627 to A93-49647
Copyright

The present symposium on space science and engineering discusses commercial space opportunities, materials processing in space, and the impact of TQM concepts on inspection of aerospace systems. Attention is given to the defense budget environment, tactical missiles and the changing world, and government/contractor development teams. Topics addressed include technology demonstration and evaluation activities in the Department of the Army, total environmental quality management in corporate America, and environmental lessons to be learned from the upcoming CFC phase-out. AIAA

A93-49638* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
'EMERGING TECHNOLOGIES FOR THE CHANGING GLOBAL MARKET' - PRIORITIZATION METHODOLOGY FOR CHEMICAL REPLACEMENT
WENDY CRUIT, SCOTT SCHUTZENHOFER, BEN GOLDBERG (NASA, Marshall Space Flight Center, Huntsville, AL), and KURT EVERHART (Sverdrup Technology, Inc., Huntsville, AL) *In* TABES 93 - Annual Technical and Business Exhibition and Symposium, 9th, Huntsville, AL, May 11, 12, 1993, Submitted Papers Huntsville, AL Huntsville Association of Technical Societies 1993 12 p.
(TABES PAPER 93-612) Copyright

This project served to define an appropriate methodology for effective prioritization of technology efforts required to develop replacement technologies mandated by imposed and forecast legislation. The methodology used is a semiquantitative approach derived from quality function deployment techniques (QFD Matrix). This methodology aims to weight the full environmental, cost, safety, reliability, and programmatic implications of replacement technology development to allow appropriate identification of viable candidates and programmatic alternatives. The results will be implemented as a guideline for consideration for current NASA propulsion systems. Author (revised)

A93-49730#
OVERVIEW OF THE SPACE PROPULSION SYNERGY GROUP (SPSG) STRATEGIC PLANNING SUPPORT EFFORTS FOR EARTH TO ORBIT TRANSPORTATION
WALTER F. DANKHOFF and WILLIAM P. HOPE, JR. (SRS Technologies, Arlington, VA) Jun. 1993 22 p. AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 29th, Monterey, CA, June 28-30, 1993 refs
(AIAA PAPER 93-1851) Copyright

An essential requirement of a successful space program is the assurance of a safe affordable routine access to space. In view of this, a national organization known as the Space Propulsion Synergy Group (SPSG) has been directed for the past two years toward supporting strategic planning for earth-to-orbit space transportation and propulsion systems. This paper presents a short description of the approach the SPSG followed in their space transportation and propulsion systems strategic planning support activities. The SPSG study emphasized the identification of the transportation systems users/customers and the characteristics of attributes most valued by them in earth-to-LEO payload transportation services. The study initiated the process known as Quality Function Deployment to ensure that the customer/user real requirements and needs are properly addressed and that the transportation system concepts advocated had the greatest probability of satisfying the custosmer's requirements and desired attributes. AIAA

A93-49731#
PAYOFFS FOR APPLYING QFD TECHNIQUES IN THE SPSG STRATEGIC PLANNING SUPPORT EFFORT FOR ETO TRANSPORTATION AND PROPULSION SYSTEMS
JAMES BRAY (Martin Marietta Space Systems, New Orleans, LA) Jun. 1993 16 p. AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 29th, Monterey, CA, June 28-30, 1993
(AIAA PAPER 93-1852) Copyright

The paper discusses the payoffs of using the process known as Quality Function Deployment (QFD), initiated by the Space Propulsion Synergy Group (SPSG) to ensure that the requirements and needs of the customer/user of space programs are properly addressed. Using the structured QFD approach, the SPSG provided valuable assessments to strategic planners, improved communication between the users and technologists, and gave users a voice in technology planning. The three key benefits derived from using QFD in the strategic planning process are: establishing focus on the customer, improving communications, and providing traceable rationale. AIAA

A93-49764#
QFD EMPHASIS OF IME DESIGN
C. M. ERICKSON and A. MARTINEZ (Rockwell International Corp., Rocketdyne Div., Canoga Park, CA) Jun. 1993 13 p. AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 29th, Monterey, CA, June 28-30, 1993
(AIAA PAPER 93-1892) Copyright

The 1992 Integrated Modular Engine (IME) design concept, proposed to the Air Force Space Systems Division as a candidate for a National Launch System (NLS) upper stage, emphasized a detailed Quality Functional Deployment (QFD) procedure which set the basis for its final selection. With a list of engine requirements defined and prioritized by the customer, a QFD procedure was implemented where the characteristics of a number of engine and component configurations were assessed for degree of requirement satisfaction. The QFD process emphasized operability, cost, reliability and performance, with relative importance specified by the customer. Existing technology and near-term advanced technology were surveyed to achieve the required design strategies. In the process, advanced nozzles, advanced turbomachinery, valves, controls, and operational procedures were evaluated. The integrated arrangement of three conventional bell nozzle thrust chambers with two advanced turbopump sets selected as the configuration meeting all requirements was rated significantly ahead of the other candidates, including the Aerospike and horizontal flow nozzle configurations.

A93-49990#
IMPROVED DATA VALIDATION AND QUALITY ASSURANCE IN TURBINE ENGINE TEST FACILITIES
DONALD J. MALLOY (Sverdrup Technology, Inc., Arnold AFB, TN) Jun. 1993 14 p. AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 29th, Monterey, CA, June 28-30, 1993 refs
(AIAA PAPER 93-2178)

In the past several years significant advances have been made in altitude ground test facilities with respect to data validation and quality assurance. To a large measure, the advances have been the result of comprehensive data validation and quality assurance programs to improve data quality and reduce data transmittal time. This paper introduces a data validation and quality assurance methodology used in the Engine Test Facility, Arnold Engineering Development Center, to the aircraft turbine engine industry. Data quality relationships are defined from an engineering perspective and management goals, and customer objectives are established. To introduce the methodology, the reader is guided through the data validation methodology for turbine engine performance resolution. The paper concludes with a discussion of how the data validation and quality assurance methodology is implemented to improve data quality. Author (revised)

A93-50289#
DECREASING F-16 NOZZLE DRAG USING COMPUTATIONAL FLUID DYNAMICS
JEFFREY A. CATT, TRACY J. WELTERLEN (Lockheed Corp., Fort Worth, TX), and JEFFREY M. RENO (General Electric Co., Cincinnati, OH) Jun. 1993 10 p. AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference and Exhibit, 29th, Monterey, CA, June 28-30, 1993 refs
(AIAA PAPER 93-2572) Copyright

Results of a two-dimensional computational fluid dynamics sensitivity study, *focused on decreasing F-16 afterbody drag, are presented.*

These results may allow Lockheed and General Electric to refine the F110 engine installation, with the intent of decreasing F-16 drag and securing a net increase in range. Drag increments were evaluated in comparison to the baseline F110 installation by integrating afterbody pressures predicted by Lockheed's HAWK2D full Navier-Stokes flow solver. A sensitivity study was developed to investigate the effect of lengthening the nozzle, eliminating aft-facing steps in the afterbody contour, and altering the shape of the nozzle external contour. The Design of Experiments (or Taguchi) methodology was used to approximate the results of a full parametric evaluation while evenly distributing as few as ten configurations over the entire design space. Sensitivity study results indicate that both lengthening the nozzle and eliminating aft-facing steps have a significant impact on drag. Variations in nozzle external contour had little impact on drag, although local surface pressure variations changed significantly.

A93-53074
ACQUISITION OF DEFENSE SYSTEMS
J. S. PRZEMIENIECKI, ED. (USAF, Inst. of Technology, Wright-Patterson AFB, OH) Washington American Institute of Aeronautics and Astronautics, Inc. 1993 383 p. No individual items are abstracted in this volume (ISBN 1-56347-069-1) Copyright

The present textbook provides information on the latest concepts and procedures for the acquisition of defense systems conforming with current policies and directives of the Department of Defense. Topics addressed include the defense requirements, an acquisition process, external and internal program management, total quality, integrated weapon system and science and technology management, financial management, program control, contracting management, and systems engineering. Also discussed are configuration and data management, computer hardware and software, integrated logistics support, manufacturing management, test and evaluation, maintenance management, environmental issues in weapon systems acquisition, international programs, and acquisition education. AIAA

A93-53493
TOTAL QUALITY MANAGEMENT OF FORGED PRODUCTS THROUGH FINITE ELEMENT SIMULATION
U. CHANDRA, S. RACHAKONDA, and S. CHANDRASEKHARAN (Concurrent Technologies Corp., Johnstown, PA) *In* International SAMPE Technical Conference, 24th and International SAMPE Metals and Metals Processing Conference, 3rd, Toronto, Canada, Oct. 20-22, 1992, Proceedings. Vol. 3 Covina, CA Society for the Advancement of Material and Process Engineering 1992 p. M379-M393. Research supported by U.S. Navy refs
Copyright

The paper reviews the entire thermo-mechanical history experienced by a complex shaped, high strength forged part during all stages of its manufacturing process, i.e. forging, heat treatment, and machining. It examines the current practice of selecting the process parameters using finite element simulation of forging and quenching operations on an individual basis. Some recent work related to the simulation of aging and machining operations is summarized. The capabilities of several well-known finite element codes for these individual simulations are compared. Then, an integrated simulation approach is presented which will permit the optimization of process parameters for all operations, as opposed to a single operation. This approach will ensure a total quality management of forged products by avoiding costly problems which, under the current practice, are detected only at the end of the manufacturing cycle, i.e. after final machining.

A93-53642
ON DEFINITION AND USE OF SYSTEMS ENGINEERING PROCESSES, METHODS AND TOOLS
ARTHUR STONE, CHARLES SCOTT, and SHAWN RAHMANI (Rockwell International Corp., Collins Air Transport Div., Downey, CA) *In* 1993 IEEE Aerospace Applications Conference, 14th, Steamboat Springs, CO, Jan. 31-Feb. 5, 1993, Digest New York Institute of Electrical and Electronics Engineers, Inc. 1993 p. 197-205. refs
Copyright

A case study on the development and deployment of a systems engineering process for use on commercial avionics systems is discussed. The systems engineering process is presented in the context of the overall product development process, called the common process (CP), which identifies goals, objectives, major milestones and top level activities for the systems engineering, hardware engineering, software engineering, project management and authorization/budgeting processes. The systems engineering development plan is described. The scope of the systems engineering process and its major activities are described. Emphasis is on using techniques that reduce cultural and organizational impact and improve the likelihood that the changes are accepted.

A93-54536
MULTICRITERION STRUCTURAL OPTIMIZATION - STATE OF THE ART
JUHANI KOSKI (Tampere Univ. of Technology, Finland) *In* Optimization of large structural systems; Proceedings of the NATO/DFG Advanced Study Institute, Berchtesgaden, Germany, Sept. 23-Oct. 4, 1991. Vol. 2 Dordrecht, Netherlands Kluwer Academic Publishers 1993 p. 793-809. refs
Copyright

In this article the present state of the multicriterion structural optimization is considered from the basis of about seventy publications which all are connected with the Pareto optimality concept. The completed works rather than open questions in the field are particularly emphasized. The basic concepts and the motivation of the multicriterion approach are briefly discussed. The classification of the multicriterion structural design process is proposed and it is used in describing the published applica tions.

N92-12992# Naval Postgraduate School, Monterey, CA.
IMPLEMENTING TOTAL QUALITY MANAGEMENT AT THE INTERMEDIATE LEVEL OF AIRCRAFT MAINTENANCE M.S. Thesis
ROLANDO C. SALVANERA Dec. 1990 64 p
(AD-A241768) Avail: CASI HC A04/MF A01

This thesis will show how Total Quality Management (TQM) can be taken from theory and operationalized at the intermediate level of aircraft maintenance. It begins by presenting four factors that will support the implementation process: top level commitment in the form of CNO support; the closed loop environment of intermediate maintenance activities; the successful implementation at the depot level; and the fact that components of TQM already exist within the Navy. The thesis then introduced some of the resource centers that can assist with the implementation process. The methods of TQM implementation as advocated by Navy Resource Centers (the Navy Personnel Research and Development Center and the Naval Aviation Maintenance Office) are explored. The thesis illustrates how the use of these resource centers, the early targeting of key personnel, and the use of a pilot program can help facilitate the implementation process. An examination of the obstacles to the TQM implementation process such as adapting existing programs and reward systems, conclude the thesis. DTIC

N92-14966# David Taylor Research Center, Bethesda, MD.
AVIATION DIAGNOSTICS AND MAINTENANCE (ADAM) SYSTEM PRELIMINARY CONCEPT OF OPERATION AND FUNCTIONAL DESCRIPTION Final Report, Oct. 1990 - Sep. 1991
RAYMOND P. LEBEAU, MARK T. KRAMER, JAMES R. CARLBERG, MICHAEL S. DEPRIEST, and HARVEY A. EIKEL Sep. 1991 76 p (AD-A242598; DTRC-91/017; PB92-120401) Avail: CASI HC A05/MF A01

The Aviation Diagnostics and Maintenance (ADAM) System is an initiative to acquire, store, distribute, and use technical maintenance information for aircraft in a digitized, integrated, and task-oriented format.

The initiative is consistent with DoD Computer-aided Acquisition and Logistics Support (CALS) direction and provides tools for Statistical Process Control (SPC) under Total Quality Management (TQM) concepts. While oriented toward new technology aircraft, segments of the concept have applicability to the existing Naval Aviation inventory. ADAM consists of a maintenance system equipped with state of the art hardware/software through which complete, current and consistent data will be made automatically available in electronic format to all maintenance technicians and production managers, thereby improving maintenance performance and unit readiness with reduced Life Cycle Costs (LCC). The ADAM system incorporates expert system diagnostic techniques, which interface with the aircraft's Built *In*Test (BIT) data, to generate subsets of optimized maintenance task information for fault isolation and repair processes. This maintenance task information will be available to the technician on both workcenter display devices and on portable display devices which can be used at the work site. NTIS

N92-15390# Rome Air Development Center, Griffiss AFB, NY.
TOTAL QUALITY MANAGEMENT (TQM): AN OVERVIEW
ANTHONY COPPOLA Sep. 1991 48 p
(AD-A242594; RL-TR-91-305) Avail: CASI HC A03/MF A01

This report is essentially a slight modification of a tutorial paper prepared by the author for the 1992 Annual Reliability and Maintainability Symposium, providing a comprehensive overview of Total Quality Management (TQM). It discusses the reasons TQM is a current growth industry, what it is, and how one implements it. It describes the basic analytical tools, statistical process control, some advanced analytical tools, tools used by process improvement teams to enhance their own operations, and action plans for making improvements. The final sections discuss assessing quality efforts and measuring the quality to knowledge work. DTIC

N92-17005*# National Aeronautics and Space Administration, Washington, DC.
NASA TOTAL QUALITY MANAGEMENT 1989 ACCOMPLISHMENTS REPORT
BETTY P. TAI, ed. and LYNNE M. STEWART, ed. Jun. 1990 125 p (ISSN 1051-225X)
(NASA-TM-105467; NAS 1.15:105467) Avail: CASI HC A06/MF A02

NASA and contractor employees achieved many notable improvements in 1989. The highlights of those improvements, described in this seventh annual Accomplishments Report, demonstrate that the people who support NASA's activities are getting more involved in quality and continuous improvement efforts. Their gains solidly support NASA's and this Nation's goal to remain a leader in space exploration and in world-wide market competition, and, when communicated to others through avenues such as this report, foster improvement efforts across government and industry. The principles in practice which led to these process refinements are important cultural elements to any organization's productivity and quality efforts. The categories in this report reflect NASA principles set forth in the 1980's and are more commonly known today as Total Quality Management (TQM): top management leadership and support; strategic planning; focus on the customer; employee training and recognition; employee empowerment and teamwork; measurement and analysis; and quality assurance. Author

N92-17199*# National Aeronautics and Space Administration, Washington, DC.
NASA TOTAL QUALITY MANAGEMENT 1990 ACCOMPLISHMENTS REPORT Annual Report No. 8
Sep. 1991 200 p (ISSN 1051-225X)
(NASA-TM-105465; NAS 1.15:105465) Avail: CASI HC A09/MF A03

NASA's efforts in Total Quality Management are based on continuous improvement and serve as a foundation for NASA's present and future endeavors. Given here are numerous examples of quality strategies that have proven effective and efficient in a time when cost reduction is critical. These accomplishment benefit our Agency and help to achieve our primary goal, keeping American in the forefront of the aerospace industry. Author

N92-18370*# National Aeronautics and Space Administration, Washington, DC.
GEORGE M. LOW TROPHY: NASA'S QUALITY AND EXCELLENCE AWARD
Jul. 1991 32 p Prepared in cooperation with American Society for Quality Control, Milwaukee, WI
(NASA-TM-105469; NAS 1.15:105469)

NASA's major goal is the preservation of America's position as a leader in the aerospace industry. To maintain that status, it is crucial that the products and services we depend upon from NASA contractors, subcontractors, and suppliers meet the highest quality standards to ensure the space program's success. The George M. Low Trophy: NASA's Quality and Excellence Award is the result of NASA's desire to encourage continuous improvement and Total Quality Management (TQM) in the aerospace industry and is awarded to members of NASA's contractor community that have demonstrated sustained excellence, customer orientation, and outstanding achievements in a Total Quality Management (TQM) environment. The purpose in presenting this award is to increase public awareness of the importance of quality and productivity to the nation's aerospace industry and the nation's leadership position overall; encourage domestic business to continuously pursue efforts that enhance quality and increase productivity which will strengthen the nation's competitiveness in the international arena; and provide a forum for sharing the successful techniques and strategies used by applicants with other American organizations. Awards to Rockwell International and Marotta Scientific Controls, Inc. are announced and discussed. Author

N92-19947# CALS/CE, Washington, DC. Industry Steering Group.
FRAMEWORK FOR CONCURRENT ENGINEERING. REPORT OF THE CE FRAMEWORK TASK GROUP OF THE CALS/CE INDUSTRY STEERING GROUP
13 Mar. 1991 59 p
(PB92-102516; CALS-TR-003) Avail: CASI HC A04/MF A01

The need for a generic concurrent engineering information architecture, constraints on its development, and implementation issues is identified. The information architecture must allow a large multidisciplinary group to behave as a close-knit interdisciplinary team, creating, analyzing, modifying, and applying product data information in concurrent engineering. The document addresses process definition and description; product information attributes and features; information management and exchange; concurrent engineering implementation needs; resource consideration; concurrent engineering performance assessment and validation; and a transition roadmap. NTIS

N92-19949# CALS/CE, Washington, DC. Industry Steering Group.
CONCURRENT ENGINEERING TECHNICAL INTERFACE PROCESS FLOW. REPORT OF THE CE TECHNICAL/ ADMINISTRATIVE INTERFACE TASK GROUP OF THE CALS/ CE INDUSTRY STEERING GROUP
9 Jul. 1991 73 p
(PB92-102532; CALS-TR-004) Avail: CASI HC A04/MF A01

A general guide to the components of the Department of Defense (DoD) and Industry needed to describe the technical interfaces required for implementing concurrent engineering is provided. These interfaces address the key components of design, manufacturing, and logistic support in an integrated environment. This document is intended to provide a transition structure for the other concurrent engineering task groups to build a more complete definition of the concurrent engineering process. The document addresses the technical interfaces of the government's acquisition process and does not attempt to define the business relationships or interfaces of administering the acquisition process. NTIS

N92-21170# Naval Postgraduate School, Monterey, CA. Dept. of Administrative Sciences.

SELF-RATINGS OF EIGHT FACTORS OF QUALITY MANAGEMENT AT NAVAL AVIONICS CENTER

SUSAN P. HOCEVAR, CAROLYN APPLEGATE, and KENNETH W. THOMAS Dec. 1991 54 p

(AD-A245218; NPS-AS-92-005PR) Avail: CASI HC A04/MF A01

The focus of this report is the implementation of Total Quality Management in ten DoD organizations. The Participating organizations were all identified by the Federal Quality Institute as either winners or finalists of the Productivity/Quality Management and Budget. Qualitative data collected included interviews with either top executives or TQM coordinators, documentation of quality management activities. A questionnaire survey was also administered to the executive steering committee of each organization providing a self-assessment of eight dimensions of quality management practices. The report describes the lessons learned, promising practices and the results of the self assessment survey for the participating organizations. DTIC

N92-21304*# Pennsylvania State Univ., University Park, PA. Dept. of Industrial and Systems Engineering.

TOTAL QUALITY MANAGEMENT: ANALYSIS, EVALUATION AND IMPLEMENTATION WITHIN ACRV PROJECT TEAMS Final Report

LAURA B. RAIMAN *In* Texas A and M Univ., NASA/ASEE Summer Faculty Fellowship Program, 1991, Volume 2 12 p Dec. 1991

Avail: CASI HC A03/MF A02

Total quality management (TQM) is a cooperative form of doing business that relies on the talents of everyone in an organization to continually improve quality and productivity, using teams and an assortment of statistical and measurement tools. The Assured Crew Return Vehicle (ACRV) Project Office was identified as an excellent project in which to demonstrate the applications and benefits of TQM processes. As the ACRV Program moves through its various stages of development, it is vital that effectiveness and efficiency be maintained in order to provide the Space Station Freedom (SSF) crew an affordable, on-time assured return to Earth. A critical factor for the success of the ACRV is attaining the maximum benefit from the resources applied to the program. Through a series of four tutorials on various quality improvement techniques, and numerous one-on-one sessions during the SSF's 10-week term in the project office, results were obtained which are aiding the ACRV Office in implementing a disciplined, ongoing process for generating fundamental decisions and actions that shape and guide the organization. Significant advances were made in improving the processes for two particular groups - the correspondence distribution team and the WATER Test team. Numerous people from across JSC were a part of the various team activities including engineering, man systems, and safety. The work also included significant interaction with the support contractor to the ACRV Project. The results of the improvement activities can be used as models for other organizations desiring to operate under a system of continuous improvement. In particular, they have advanced the ACRV Project Teams further down the path of continuous improvement, in support of a working philosophy of TQM. Author

N92-22175# Naval Postgraduate School, Monterey, CA.

A MODEL PROCEDURE INTEGRATING TOTAL QUALITY MANAGEMENT INTO THE SOURCE SELECTION PROCESS M.S. Thesis

RICHARD L. WILSON Jun. 1991 119 p

(AD-A245061) Avail: CASI HC A06/MF A02

An attempt to construct and refine a model procedure for DoD contracting activities is presented. The model is to be utilized when integrating quality factors such as Total Quality Management into the source selection process for major acquisitions. The primary objective of this thesis was to modify application guidelines for the Malcolm Baldridge Quality Award into source selection criteria, and then devise a procedure to temper the results of the basic proposal evaluation with a degree of risk determined from a Performance Risk Assessment of the offeror. A secondary objective of this thesis was to construct the model's algorithm in a manner which will offer maximum flexibility to contracting agencies to tailor any aspects of the procedure to fit local requirements, regulations, and standard operating procedures. The final objective of this thesis was to obtain feedback from knowledgeable and experienced Government contracting or policy personnel, and to modify or refine the procedure into a more feasible, useful model. DTIC

N92-22235*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

THE ROLE OF FAILURE/PROBLEMS IN ENGINEERING: A COMMENTARY OF FAILURES EXPERIENCED - LESSONS LEARNED

R. S. RYAN Mar. 1992 142 p

(NASA-TP-3213; M-684; NAS 1.60:3213) Avail: CASI HC A07/MF A02

The written version of a series of seminars given to several aerospace companies and three NASA centers are presented. The results are lessons learned through a study of the problems experienced in 35 years of engineering. The basic conclusion is that the primary cause of problems has not been mission technologies, as important as technology is, but the neglect of basic principles. Undergirding this is the lack of a systems focus from determining requirements through design, verification, and operations phases. Many of the concepts discussed are fundamental to total quality management (TQM) and can be used to augment this product enhanced philosophy. Fourteen principles are addressed with problems experienced and are used as examples. Included is a discussion of the implication of constraints, poorly defined requirements, and schedules. Design guidelines, lessons learned, and future tasks are listed. Two additional sections are included that deal with personal lessons learned and thoughts on future thrusts (TQM). Author

N92-22646*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

TQM: A BIBLIOGRAPHY WITH ABSTRACTS

GRETCHEN L. GOTTLICH, ed. Apr. 1992 207 p

(NASA-TM-104204; NAS 1.15:104204) Avail: CASI HC A10/MF A03

This document is designed to function as a special resource for NASA Langley scientists, engineers, and managers during the introduction and development of total quality management (TQM) practices at the Center. It lists approximately 300 bibliographic citations for articles and reports dealing with various aspects of TQM. Abstracts are also available for the majority of the citations. Citations are organized by broad subject areas, including case studies, customer service, senior management, leadership, communication tools, TQM basics, applications, and implementation. An introduction and indexes provide additional information on arrangement and availability of these materials. Author

N92-22664*# National Aeronautics and Space Administration, Washington, DC.

THE NASA SCIENTIFIC AND TECHNICAL INFORMATION PROGRAM: PROLOGUE TO THE FUTURE

1991 50 p Original contains color illustrations

(NASA-TM-107814; NAS 1.15:107814)

The NASA STI Program offers researchers an infrastructure of people and systems that facilitates access to STI; worldwide. The Program is also NASA's institutional mechanism for disseminating the results of its research and developing activities. Through discussions in 1991, the STI Program formulated its Strategic Plan. The plan gives the Program a renewed sense of direction by focusing on future opportunities, customer requirements and Program goals, along with the changes needed to achieve those goals. The Program provides users access to a massive flow of STI which, in fact, represents the largest collection of aeronautical and space science information in the world. The STI Program products and services are outlined, along with the NASA centers, international operations, and the fact that total quality management drives NASA wide program developments. As is detailed, the NASA STI Program is using its resources as effectively as possible to meet the missing needs of NASA. Author

N92-22665* National Aeronautics and Space Administration, Washington, DC.
CONTINUOUS IMPROVEMENT: A BIBLIOGRAPHY WITH INDEXES, 1989-1991
Feb. 1992 59 p
(NASA-SP-7097; NAS 1.21:7097) Avail: CASI HC A04

This bibliography contains 198 annotated references to reports and journal articles entered into the NASA Scientific and Technical Information Database during 1989 to 1991. Author

N92-22710*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
INCREASING PRODUCTIVITY THROUGH TOTAL REUSE MANAGEMENT (TRM)
M. P. SCHULER *In* NASA, Washington, Technology 2001: The Second National Technology Transfer Conference and Exposition, Volume 2 p 294-300 Dec. 1991
Avail: CASI HC A02/MF A04

Total Reuse Management (TRM) is a new concept currently being promoted by the NASA Langley Software Engineering and Ada Lab (SEAL). It uses concepts similar to those promoted in Total Quality Management (TQM). Both technical and management personnel are continually encouraged to think in terms of reuse. Reuse is not something that is aimed for after a product is completed, but rather it is built into the product from inception through development. Lowering software development costs, reducing risk, and increasing code reliability are the more prominent goals of TRM. Procedures and methods used to adopt and apply TRM are described. Reuse is frequently thought of as only being applicable to code. However, reuse can apply to all products and all phases of the software life cycle. These products include management and quality assurance plans, designs, and testing procedures. Specific examples of successfully reused products are given and future goals are discussed. Author

N92-22742*# Gates Aerospace Batteries, Gainesville, FL.
PROFILE OF A CELL TEST DATABASE AND A CORRESPONDING RELIABILITY DATABASE
GEORGE R. BREARLEY and GLENN C. KLEIN *In* NASA. Marshall Space Flight Center, The 1991 NASA Aerospace Battery Workshop p 27-35 Feb. 1992
Avail: CASI HC A02/MF A10

The development of computerized control, and data retrieval for aerospace cell testing affords an excellent opportunity to incorporate three specific concepts to both manage the test area and to track product performance on a real-time basis. The adoption and incorporation of precepts fostered by this total quality management (TQM) initiative are critical to us for retaining control of our business while substantially reducing the separate quality control inspection activity. Test discrepancies are all 'equally bad' in cell acceptance testing because, for example, we presently do not discriminate between 1 or 25 mV for an overvoltage condition. We must take leadership in classifying such discrepancies in order to expedite their clearance and redirect our resources for prevention activities. The development and use of engineering alerts (or guardbanding) which more closely match our product capabilities and are toleranced tighter than the required customer specification are paramount to managing the test unit in order to remain both quality and cost effective. Author

N92-24890*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
NASA TOTAL QUALITY MANAGEMENT 1989 ACCOMPLISHMENTS REPORT
Jun. 1990 116 p
(NASA-TM-107848; NAS 1.15:107848; PB92-163138) Avail: CASI HC A06/MF A02

Described here are the accomplishments of NASA as a result of the use of Total Quality Management (TQM). The principles in practice which led to these process refinements are important cultural elements to any organization's productivity and quality efforts. The categories of TQM discussed here are top management leadership and support, strategic planning, focus on the customer, employee training and recognition, employee empowerment and teamwork, measurement and analysis, and quality assurance. Author

N92-24900*# National Aeronautics and Space Administration, Washington, DC.
GOVERNMENT QUALITY CONFERENCE PROCEEDINGS
1992 70 p Conference held in Washington, DC, 29 Oct. 1985
(NASA-TM-107841; NAS 1.15:107841; PB92-162825) Avail: CASI HC A04/MF A01

The Government Quality Conference was an attempt to bring together executive organizations and senior individuals in the Federal Government that have a desire to improve productivity. It was designed to provide an exchange of ideas based on experience, and to encourage individual management initiatives to tap the capabilities of Federal employees. Author

N92-24901*# National Aeronautics and Space Administration, Washington, DC.
GEORGE M. LOW TROPHY NASA'S QUALITY AND EXCELLENCE AWARD, 1992. APPLICATION GUIDELINES: SMALL BUSINESS
1992 29 p Prepared in cooperation with American Society for Quality Control, Milwaukee, WI
(NASA-TM-107834; NAS 1.15:107834; PB92-160720) Avail: CASI HC A03/MF A01

Guidelines are given for the selection of small business candidates for the George M. Low Trophy, NASA's Quality and Excellence Award, 1992. Topics covered include candidate eligibility, the selection process milestone schedule, the nomination letter, and the application report. Author

N92-25542# Air Force Systems Command, Bolling AFB, Washington, DC.
METRICS HANDBOOK (AIR FORCE SYSTEMS COMMAND)
Aug. 1991 82 p
(PB92-162643) Avail: CASI HC A05/MF A01

The handbook is designed to help one develop and use good metrics. It is intended to provide sufficient information to begin developing metrics for objectives, processes, and tasks, and to steer one toward appropriate actions based on the data one collects. It should be viewed as a road map to assist one in arriving at meaningful metrics and to assist in continuous process improvement. Author

N92-25559*# National Aeronautics and Space Administration, Washington, DC.
GEORGE M. LOW TROPHY NASA'S QUALITY AND EXCELLENCE AWARD, 1992. APPLICATION GUIDELINES: LARGE BUSINESS
1992 33 p Prepared in cooperation with American Society for Quality Control, Milwaukee, WI
(NASA-TM-107835; NAS 1.15:107835; PB92-160738) Avail: CASI HC A03/MF A01

The George M. Low Trophy is awarded to current NASA contractors, subcontractors, and suppliers in the aerospace industry who have demonstrated sustained excellence and outstanding achievements in quality and productivity for three or more years. The objectives of the award are to increase public awareness of the importance of quality and productivity to the Nation's aerospace program and industry in general; encourage domestic business to continue efforts to enhance quality, increase productivity, and thereby strengthen competitiveness; and provide the means for sharing the successful methods and techniques used by the applicants with other American enterprises. Information is given on candidate eligibility for large businesses, the selection process, the nomination letter, and the application report. Author

N92-27602# Naval Postgraduate School, Monterey, CA.
HIGHLIGHTS OF TOTAL QUALITY MANAGEMENT IN THE DEPARTMENT OF DEFENSE: LESSONS LEARNED, QUALITY MEASUREMENTS, AND INNOVATIVE PRACTICES M.S. Thesis
CAROLYN L. APPLEGATE 26 Sep. 1991 112 p
(AD-A246167) Avail: CASI HC A06/MF A02

This thesis aids in understanding the implementation of Total Quality Management (TQM) through both quantitative and qualitative analyses. Interviews were conducted with top executives from ten organizations within the Department of Defense (DOD). Survey questionnaires on perceptions of quality practices were administered to a sample of 102 representing members of the executive steering committees at the same organizations. Research identifies lessons learned by top executives during TQM implementation, discusses measures of organization-wide quality management, specifies evaluation mechanisms to discern strategic issues vital to a quality focus, and describes the TQM implementation plan. Research also identifies innovative practices such as self-managing work teams, learning centers and productivity gain sharing, which may benefit the top executive during his/her own TQM implementation. Conclusions and recommendations concern maturity of TQM implementations in the DOD, performance appraisal systems and quality assessment tools. DTIC

N92-27760# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Systems and Logistics.
AN ANALYSIS OF TOTAL QUALITY MANAGEMENT IN AERONAUTICAL SYSTEMS DIVISION M.S. Thesis
MARK D. CAUDLE Sep. 1991 145 p
(AD-A246661; AFIT/GSM/LSG/91S-6) Avail: CASI HC A07/MF A02

This study investigated the major schools of thought on various aspects of quality management and quality improvement. Areas covered included definitions of waste and quality, views on the cost of quality, tools and techniques used for quality improvement, and management philosophies and frameworks for continuous improvement. In addition, this study analyzed the structure and training content of the current Total Quality Management program at Aeronautical Systems Division (ASD). Pre- and post-test surveys on employee attitudes toward organizational effectiveness were analyzed from the Advanced Cruise Missile System Program Office (SPO), the F-15 SPO, and the ASD Deputy Chief of Staff for Human Resources (ASD/DP). Data was supplemented with semi-structured, personal interviews with ASD personnel involved in TQM. Survey analysis showed that the ACM SPO significantly improved, ASD/DP significantly digressed, and the F-15 SPO remained basically consistent. This led to the conclusion that ASD allows too much flexibility in the implementation of TQM in the three-letter organizations. DTIC

N92-28456*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
TAGUCHI METHODS IN ELECTRONICS: A CASE STUDY
R. KISSEL May 1992 22 p
(NASA-TM-103586; NAS 1.15:103586) Avail: CASI HC A03/MF A01

Total Quality Management (TQM) is becoming more important as a way to improve productivity. One of the technical aspects of TQM is a system called the Taguchi method. This is an optimization method that, with a few precautions, can reduce test effort by an order of magnitude over conventional techniques. The Taguchi method is specifically designed to minimize a product's sensitivity to uncontrollable system disturbances such as aging, temperature, voltage variations, etc., by simultaneously varying both design and disturbance parameters. The analysis produces an optimum set of design parameters. A 3-day class on the Taguchi method was held at the Marshall Space Flight Center (MSFC) in May 1991. A project was needed as a follow-up after the class was over, and the motor controller was selected at that time. Exactly how to proceed was the subject of discussion for some months. It was not clear exactly what to measure, and design kept getting mixed with optimization. There was even some discussion about why the Taguchi method should be used at all. Author

N92-30349# Pacific Northwest Lab., Richland, WA.
COMPRESSION PLANNING FOR CONTINUOUS IMPROVEMENT IN QUALITY PROGRAMS
YOLANDA A. WILLIS (Willis Consulting, Pittsburgh, PA.) and FRANK C. HOOD Apr. 1992 7 p Presented at the International High Level Radioactive Waste Management (IHLRWM) Conference: Promoting Understanding Through Education and Communication, Las Vegas, NV, 12-16 Apr. 1992
(Contract DE-AC06-76RL-01830)
(DE92-012331; PNL-SA-20246; CONF-920430-83) Avail: CASI HC A02/MF A01

This paper describes an innovative approach to planning and prioritizing. The approach, 'Compression Planning,' conserves time for the planners while building commitment to continuous improvement and implementation of the plan. Beginning May 1990, 'Compression Planning' was applied to the first organization-wide effort at training integration for regulatory compliance at Battelle Pacific Northwest laboratory (PNL), a multi-program national laboratory. Various applications of this methodology have been used at PNL for programs since then. DOE

N92-32172# Maryland Univ., Baltimore, MD.
TOTAL QUALITY MANAGEMENT: A MANAGEMENT PHILOSOPHY FOR PROVIDING HIGH QUALITY CONSTRUCTION
PAUL D. BECKWITH 1992 83 p
(AD-A252743) Avail: CASI HC A05/MF A01

Total Quality Management (TQM) is not a new concept. Only recently (within the past ten years or so) have American companies started to realize the potential of TQM as a means of ensuring high quality products and services. With this realization has come implementation in manufacturing and service companies. A commercial construction company, like any other business, must provide a top quality finished product to its customer if it intends to stay in business. TQM is one way to work to that end. This report explores the quality problems facing my fictitious construction company, which I believe are fairly typical among the commercial construction industry, existing management methods, and the TQM method to ensure top quality production. It will be shown why I believe TQM or a variation thereof is the best method for controlling the quality of products and service during the construction process. Under the philosophy of TQM, we build quality into the finished product. DTIC

N92-32870*# Maryland Univ., College Park, MD. Inst. for Advanced Computer Studies.
METHODOLOGICAL AND ARCHITECTURAL ISSUES IN THE EXPERIENCE FACTORY
VICTOR R. BASILI and GIANLUIGI CALDIERA *In* NASA. Goddard Space Flight Center, Proceedings of the Sixteenth Annual Software Engineering Workshop p 17-46 Dec. 1991
Avail: CASI HC A03/MF A03; NASA Goddard Space Flight Center, Code 552, Greenbelt, MD 20771 HC

The concept of the experience factory has been introduced in order to institutionalize the collective learning of the organization that is at the root of continuous improvement and competitive advantage. The real advantage will come from the ability of the software organization to deliver solutions that anticipate the needs of the system users. The experience factory can be a logical and/or physical organization, but it is important that activities are separated and made independent from the ones of the project organization. H.A.

N92-32871*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

CLEANROOM PROCESS EVOLUTION IN THE SEL
SCOTT E. GREEN and ROSE PAJERSKI *In its* Proceedings of the Sixteenth Annual Software Engineering Workshop p 47-63 Dec. 1991
Avail: CASI HC A03/MF A03; NASA Goddard Space Flight Center, Code 552, Greenbelt, MD 20771 HC

The cleanroom development methodology is a software life cycle approach which emphasizes as its primary goal defect prevention rather than defect removal, and focuses on incrementally producing error-free software through statistical quality control. Since all testing is performed by independent groups, the development team is forced to rely on a structured and verifiable design approach, complemented with a peer review process, as its central verification technique. The focus of the system testing is on intended operational scenarios, rather than a pure and evenly distributed functional testing of the system requirements. The testing approach also involves a statistical profile of all system inputs, selections and paths, ensuring that the testing activities mimic the projected end-user actions. Author

N92-32873*# Bell Telephone Labs., Inc., Murray Hill, NJ.
INVESTIGATING THE APPLICATION OF CAPTURE-RECAPTURE TECHNIQUES TO REQUIREMENT AND DESIGN REVIEWS
LAWRENCE G. VOTTA, STEPHEN G. EICK, CLIVE R. LOADER, M. DAVID LONG, and SCOTT VANDERWIEL *In* NASA. Goddard Space Flight Center, Proceedings of the Sixteenth Annual Software Engineering Workshop p 89-102 Dec. 1991
Avail: CASI HC A03/MF A03; NASA Goddard Space Flight Center, Code 552, Greenbelt, MD 20771 HC

An objective of all software projects is to minimize the number of faults in the delivered code. Standard software development processes consist of multiple steps, resulting in a delivered system. At each stage of the process a key objective is to minimize the number of faults passed onto the next stage. Reviews consist of engineers who in preparation identify parts of the document that may contain design faults. Described are techniques to estimate the number of residual faults at each stage in the software development process. Author

N92-32884*# TRW, Inc., Cleveland, OH. Systems Integration Group.
DEVELOPING BETTER SOFTWARE: A FIVE YEAR HISTORY OF SOFTWARE ENGINEERING ADVANCEMENT
HERBERT P. WOODWARD *In* NASA. Goddard Space Flight Center, Proceedings of the Sixteenth Annual Software Engineering Workshop p 283-301 Dec. 1991
Avail: CASI HC A03/MF A03; NASA Goddard Space Flight Center, Code 552, Greenbelt, MD 20771 HC

The topics covered include the following: the spiral model requirement development approach; the spiral model of the software development process; the Ada total quality management factory; architecture and software layering; building on a layered architecture; achieving a software requirements baseline; designing and building a quality low cost system; and the Ada programming support environment. Author

N92-33320*# Houston Univ., Clear Lake, TX. Studies of the Future.
ORGANIZATIONAL CHANGE: INCENTIVES AND RESISTANCE
PETER C. BISHOP *In* NASA. Lyndon B. Johnson Space Center, Third SEI Technical Interchange: Proceedings p 161-177 1992
Avail: CASI HC A03/MF A05

Topics concerning Space Exploration Initiative technical interchange are presented in viewgraph form and include the following: models of change, elements of the current period, the signs of change, leaders' contribution, paradigms - our worldview, paradigm change, the effects of revealing paradigms, a checklist for change, and organizational control. Author

N92-33339*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
SATWG NETWORKED QUALITY FUNCTION DEPLOYMENT
DON BROWN *In its* Third SEI Technical Interchange: Proceedings p 483-488 1992
Avail: CASI HC A02/MF A05

The initiative of this work is to develop a cooperative process for continual evolution of an integrated, time phased avionics technology plan that involves customers, technologists, developers, and managers. This will be accomplished by demonstrating a computer network technology to augment the Quality Function Deployment (QFD). All results are pre sented in viewgraph format. H.A.

N93-10270# EG and G Rocky Flats, Inc., Golden, CO.
TOTAL QUALITY MANAGEMENT (TQM) CONCEPTS APPLIED TO INSTRUCTION
E. J. NUCCIO 1992 10 p Presented at the 1992 DOE Training Accreditation Program Conference, Phoenix, AZ, 16 Jun. 1992
(Contract DE-AC34-90DP-62349)
(DE92-013399; RFP-4571; CONF-9206164-1) Avail: CASI HC A02/MF A01

Drawing on DOE Order 5700.6C and other industry standards, this document presents several concepts and tools of Total Quality Management (TQM), a brief history of their use at EG&G Rocky Flats, and how they are being applied to address processes of instruction common to TAP. Concepts presented and applied include: statistical process control (SPC), e.g., using control charts, as an evaluation methodology for learners and instructors; TQM conceptual tools, e.g., brainstorming, affinity diagrams, and interrelationship digraphs, as a methodology for planning programs of instruction such as TAP; and team activities to construct instructional process systems. DOE

N93-10350*# Rockwell International Corp., Canoga Park, CA. Rocketdyne Div.
SPACE TRANSPORTATION ENGINE PROGRAM (STEP), PHASE B Progress Report, Jul - Sep. 1990
31 Oct. 1990 18 p
(Contract NAS8-38160)
(NASA-CR-184062; NAS 1.26:184062) Avail: CASI HC A03/MF 01

The Space Transportation Engine Program (STEP) Phase 2 effort includes preliminary design and activities plan preparation that will allow smooth and time transition into a Prototype Phase and then into Phases 3, 4, and 5. A Concurrent Engineering approach using Total Quality Management (TQM) techniques, is being applied to define an oxygen-hydrogen engine. The baseline from Phase 1/1' studies was used as a point of departure for trade studies and analyses. Existing STME system models are being enhanced as more detailed module/component characteristics are determined. Preliminary designs for the open expander, closed expander, and gas generator cycles were prepared, and recommendations for cycle selection made at the Design Concept Review (DCR). As a result of July '90 DCR, and information subsequently supplied to the Technical Review Team, a gas generator cycle was selected. Results of the various Advanced Development Programs (ADP's) for the Advanced Launch Systems (ALS) were contributive to this effort. An active vehicle integration effort is supplying the NASA, Air Force, and vehicle contractors with engine parameters and data, and flowing down appropriate vehicle requirements. Engine design and analysis trade studies are being documented in a data base that was developed and is being used to organize information. To date, seventy four trade studies were input to the data base. Author

N93-12597# Air Univ., Maxwell AFB, AL. Airpower Research Inst.
PRINCIPLES OF INFORMATION RESOURCE MANAGEMENT: A FOUNDATION FOR THE FUTURE
PAUL D. CONDIT Jun. 1992 116 p
(AD-A254447; AU-ARI-91-1) Avail: CASI HC A06/MF A02

The Department of Defense (DOD) is dependent on many automated information systems which have been implemented over several decades. These systems represent widely diverse technology in the form of fragmented, inflexible, and often inconsistent information resources such as software, hardware, and data. Although technology has advanced rapidly, efficient and effective management of DOD's total information resources has not yet been realized. The DOD information

resource management (IRM) program, initiated in the early 1980's, attempted to bring order to this chaotic environment. Less than a decade later the corporate information management (CIM) program has been established for the very same reason. The CIM program is focused on actions to improve the quality of DOD information systems, actions deemed essential to cope with budget and force reduction, and actions in harmony with DOD's total quality management (TQM) initiative and its fundamental principle of continuous process improvement. Information systems, whether manual or automated, are mechanisms to integrate the processes of enterprises (an industry or government agency), whose efficiency and effectiveness are determined to a large extent by the level of integration achieved. To understand TQM and IRM is to understand that an enterprise is a complex system that requires design through the application of sound engineering practice. This paper presents a cohesive set of principles and motivating concepts for IRM with the principles of TQM as the nucleus. Together, TQM and IRM provide the general principles for engineering enterprises with information systems treated as an integral part of the enterprise and information used as the primary integrating agent. DTIC

N93-13379*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
WEIGHT OPTIMIZATION OF AN AEROBRAKE STRUCTURAL CONCEPT FOR A LUNAR TRANSFER VEHICLE
LANCE B. BUSH, RESIT UNAL (Old Dominion Univ., Norfolk, VA.), LAWRENCE F. ROWELL, and JOHN J. REHDER Dec. 1992 20 p
(Contract RTOP 593-11-11-01)
(NASA-TP-3262; L-17120; NAS 1.60:3262) Avail: CASI HC A03/MF A01

An aerobrake structural concept for a lunar transfer vehicle was weight optimized through the use of the Taguchi design method, finite element analyses, and element sizing routines. Six design parameters were chosen to represent the aerobrake structural configuration. The design parameters included honeycomb core thickness, diameter-depth ratio, shape, material, number of concentric ring frames, and number of radial frames. Each parameter was assigned three levels. The aerobrake structural configuration with the minimum weight was 44 percent less than the average weight of all the remaining satisfactory experimental configurations. In addition, the results of this study have served to bolster the advocacy of the Taguchi method for aerospace vehicle design. Both reduced analysis time and an optimized design demonstrated the applicability of the Taguchi method to aerospace vehicle design. Author

N93-13774 Iowa Univ., Iowa City, IA.
FINITE ELEMENT STUDY OF ULTRASONIC IMAGING Ph.D. Thesis
ZHONGQING YOU 1991 216 p
Avail: Univ. Microfilms Order No. DA9126275

An increasing requirement for engineering system reliability provides the motivation for further development of nondestructive evaluation (NDE) techniques. An important objective of NDE system measurements is related to the inverse process which either images the defect or sizes and locates the defect from the detected signals. Many inverse algorithms involve assumptions and approximations which are not realistic. Evaluation of these effects on the reconstructed images has always been difficult, as experimentally, these different factors cannot be easily distinguished. Thus, a powerful test bed is essential to study the sensitivity of an inverse algorithm. Numerical models are the most suitable technique for this purpose. The development and use of finite element analysis to model ultrasonic wave propagation phenomena and to study diffraction tomography is discussed. The nature of the finite element model allows the accurate prediction of the displacement field for complicated situations including arbitrary anisotropy, inhomogeneity, and attenuation. Basic formulations are presented for general three-dimensional (3-D) geometries and verified by comparing to analytical solutions. To optimize computer resources, the combination of central difference and forward difference schemes is chosen to approximate the time derivatives and a lumped mass scheme is introduced to avoid the expensive matrix inversion. The 2-D and axisymmetric formulations discussed at length in this thesis effectively model problems satisfying either plane strain or axisymmetric conditions. Absorbing boundary conditions are introduced for large geometries and applied to some typical test situations. Using this finite element model as a test bed, the diffraction tomographic algorithm is studied with regard to finite aperture effects and material anisotropy. Extensive comparison of the finite element results with analytic solutions proves the validity of the 2-D, axisymmetric and 3-D models. Applications of the 2-D and axisymmetric formulations correctly predict useful phe nomena associated with wave/defect interactions and the anisotropic property of the material. Dissert. Abstr.

N93-13876# Naval Postgraduate School, Monterey, CA.
AN EXAMINATION OF THE TOTAL QUALITY MANAGEMENT (TQM) CONCEPT GIVEN CURRENT FEDERAL/DOD COMPETITION INITIATIVES M.S. Thesis
MICHAEL E. STABILE Jun. 1992 138 p
(AD-A255556) Avail: CASI HC A07/MF A02

Quality is vital to our defense and quality improvement is key to increasing productivity. The Department of Defense (DoD) Total Quality Management (TQM) effort has been given top priority by the Secretary of Defense. Many questions exist concerning the problems encountered when implementing TQM throughout DoD. This thesis looks at the compatibility of the TQM philosophy with current Federal Acquisition Regulation competition requirements. The writer concludes that the TQM philosophy implementation is compatible with existing competition policy. DTIC

N93-13885*# National Aeronautics and Space Administration, Washington, DC.
COORDINATING COUNCIL. NINTH MEETING: TOTAL QUALITY MANAGEMENT
1992 129 p Meeting held in Arlington, VA, 28 Oct. 1992
(NASA-TM-108106; NAS 1.15:108106) Avail: CASI HC A07/MF A02

This report summarizes the 9th meeting of the STI Coordinating Council. The council listened to the speakers' understanding of Total Quality Management (TQM) principles and heard stories of successful applications of these principles. Definitions of quality stated were focused on customer satisfaction. Reports presented by the speakers are also included. I.I.C.

N93-14500# Naval Postgraduate School, Monterey, CA.
THE USE OF INTERNATIONAL STANDARDS ORGANIZATION ISO 9000 QUALITY ASSURANCE STANDARDS IN PLACE OF MILITARY STANDARDS M.S.Thesis
STANLEY M. BECKERDITE Jun. 1992 149 p
(AD-A256203) Avail: CASI HC A07/MF A02

The implementation of quality standards within the European Community by the creation of International Quality Standards 9000 is another step toward development of a global marketplace. It is in the interests of DoD to support this trend in order to help maintain the defense industrial base. The first part of this study performs a comparison of DoD quality standards to the ISO 9000 Standards. The second part of the study consists of a survey of U.S. firms that have become ISO 9000 registered. This survey is intended to provide an assessment of the current movement within the defense industrial base toward adoption of ISO 9000 Standards. The survey also attempts to identify potential implementation issues relating to adoption of ISO 9000 Standards in place of military standards. It is concluded that DoD should implement ISO 9000 and that the impact of this implementation will be favorable. DTIC

N93-15234# Naval Postgraduate School, Monterey, CA. Dept. of Administrative Sciences.
A PROPOSAL TO APPLY TAGUCHI-INSPIRED METHODS TO THE REDUCTION OF MACHINING VARIANCE Technical Report, period ending 1992
DAN TRIETSCH 16 Sep. 1992 37 p
(AD-A256129; NPS-AS-92-021) Avail: CASI HC A03/MF A01

The probability that a machined part will be defective increases with the variance of the machined dimensions. Even for parts within tolerance,

the quality decreases with the variance. By reducing the variance of these dimensions better parts will be produced. Several factors, some of which are controllable, impact this variance, and they may also interact with each other. By choosing an appropriate level for each controllable factor we can minimize the variance. Since factors may interact with each other, a factorial experimental design is appropriate to optimize the levels of the factors; optimizing one factor at a time is not likely to yield the global optimum in the presence of interactions. The designed experiments must be conducted in stages: (1) at the preliminary stage one determines which factors and interactions are likely to be important; (2) at the exploratory stage one runs a fractional design to identify the factors that are really important and to verify/update the preliminary hypotheses about the interactions; (3) at the search stage one uses a sequence of experiments with varying levels of the factors that were identified as important to optimize their levels; finally, (4) at the verification stage one runs the process under the levels deemed to be optimal, to check if the process behaves according to the predictions. At any stage, after analyzing the current data, one may have to go back to a previous stage. This report presents a list of factors and interactions (preliminary stage output), and a design for the exploratory stage. We also discuss how to interpret the results and conduct the search stage. The plan is designed as a generic blueprint that can be used at any machine shop. DTIC

N93-15620*# Martin Marietta Corp., Denver, CO. Astronautics Group.
TQM IN A TEST ENVIRONMENT
GARY D. CHAMBERS, ELIZABETH A. KING, and KEITH OLESON *In* NASA. Goddard Space Flight Center, The Seventeenth Space Simulation Conference. Terrestrial Test for Space Success p 315-326 Nov. 1992
Avail: CASI HC A03/MF A03

In response to the changing aerospace economic climate, Martin Marietta Astronautics Group (MMAG) has adopted a Total Quality Management (TQM) philosophy to maintain a competitive edge. TQM emphasizes continuous improvement of processes, motivation to improve from within, cross-functional involvement, people empowerment, customer satisfaction, and modern process control techniques. The four major initiatives of TQM are Product Excellence, Manufacturing Resource Planning (MRP II), People Empowerment, and Subcontract Management. The Defense Space and Communications (DS&C) Test Lab's definition and implementation of the MRP II and people empowerment initiatives within TQM are discussed. The application of MRP II to environmental test planning and operations processes required a new and innovative approach. In an 18 month span, the test labs implemented MRP II and people empowerment and achieved a Class 'A' operational status. This resulted in numerous benefits, both tangible and intangible, including significant cost savings and improved quality of life. A detailed description of the implementation process and results are addressed. Author

N93-15863# Microelectronics and Computer Technology Corp., Austin, TX.
AN MCM/CHIP CONCURRENT ENGINEERING VALIDATION Quarterly Report No. 3, Jul. - Sep. 1992
HECTOR MORENO 30 Sep. 1992 26 p
(Contract MDA972-92-C-0022)
(AD-A257415; HVE-232-92) Avail: CASI HC A03/MF A01

A software link was established between three commercially available Multi-Chip Module design systems: Allegro, EDGE and Finesse. The link was implemented through a database system based on the ROSE system developed under the sponsorship of the DICE program. The code was written in C++ and uses various methods to feed the information in and obtain it out of the design systems: IGES for Allegro, SKILL for EDGE and d-file for Finesse. The DDR2 (Digital Drop Receiver, version 2) multichip module from Harris has been entered into the system and routed, and the information transferred to all the designers through the ROSE database. DTIC

N93-16686*# Martin Marietta Corp., Denver, CO. Astronautics Group.
SPACE TRANSFER VEHICLE CONCEPTS AND REQUIREMENTS, VOLUME 2, BOOK 1
Apr. 1991 365 p
(Contract NAS8-37856)
(NASA-CR-184489; NAS 1.26:184489; MCR-91-7503-VOL-2-BK-1) Avail: CASI HC A16/MF A03

The objective of the systems engineering task was to develop and implement an approach that would generate the required study products as defined by program directives. This product list included a set of system and subsystem requirements, a complete set of optimized trade studies and analyses resulting in a recommended system configuration, and the definition of an integrated system/technology and advanced development growth path. A primary ingredient in the approach was the TQM philosophy stressing job quality from the inception. Included throughout the Systems Engineering, Programmatics, Concepts, Flight Design, and Technology sections are data supporting the original objectives as well as supplemental information resulting from program activities. The primary result of the analyses and studies was the recommendation of a single propulsion stage Lunar Transportation System (LTS) configuration that supports several different operations scenarios with minor element changes. This concept has the potential to support two additional scenarios with complex element changes. The space based LTS concept consists of three primary configurations—Piloted, Reusable Cargo, and Expendable Cargo. Author

N93-16788*# Troy State Univ., Norfolk Naval Base, VA. Dept. of Public Administration and Human Resources Management.
TOTAL QUALITY MANAGEMENT: STRENGTHS AND BARRIERS TO IMPLEMENTATION AND CULTURAL ADAPTATION
DENISE V. SIEGFELDT, MICHAEL GLENN, and LOUISE HAMILTON *In* Hampton Univ., NASA/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program 1992 p 173-174 Sep. 1992
Avail: CASI HC A01/MF A03

NASA/Langley Research Center (LaRC) is in the process of implementing Total Quality Management (TQM) throughout the organization in order to improve productivity and make the Center an even better place to work. The purpose of this project was to determine strengths and barriers to TQM being implemented and becoming a part of the organizational culture of the Human Resources Management Division (HRMD) at Langley. The target population for this project was both supervisory and nonsupervisory staff of the HMRD. In order to generate data on strengths and barriers to TQM implementation and cultural adaptation, a modified nominal group technique was used. L.R.R.

N93-18141*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
SYSTEMS DESIGN ANALYSIS APPLIED TO LAUNCH VEHICLE CONFIGURATION
R. RYAN and V. VERDERAIME Jan. 1993 37 p
(NASA-TP-3326; M-709; NAS 1.60:3326) Avail: CASI HC A03/MF A01

As emphasis shifts from optimum-performance aerospace systems to least lift-cycle costs, systems designs must seek, adapt, and innovate cost improvement techniques in design through operations. The systems design process of concept, definition, and design was assessed for the types and flow of total quality management techniques that may be applicable in a launch vehicle systems design analysis. Techniques

discussed are task ordering, quality leverage, concurrent engineering, Pareto's principle, robustness, quality function deployment, criteria, and others. These cost oriented techniques are as applicable to aerospace systems design analysis as to any large commercial system. Author

N93-18159# Air War Coll., Maxwell AFB, AL.
A PARADIGM SHIFT IN AIR FORCE MEDICINE
EDWARD A. MILLER May 1992 45 p
(AD-A258334) Avail: CASI HC A03/MF A01

Air Force medicine has been utilizing a quality assurance (QA) program for little less than a decade. The momentous success of total quality management (TQM) in the industrial business is starting to spill over into the American medical business in the form of continuous quality improvement (CQI). A QA program is a mandated, externally driven reactive program which focuses on the provider and who did it. CQI in contrast is proactive, internally driven, fosters participation, and focuses on process improvement and what is wrong. QA programs are set up to identify those individuals who deviate far from the norm. CQI focuses on the norm and continuously improves the norm. My thesis is that Air Force medicine must transition from QA to CQI. DTIC

N93-18253# Maryland Univ., Baltimore, MD.
PARADIGM SHIFT: CAN TQM SAVE DOD'S PROCUREMENT PROCESS?
ROSS V. ROMEO 25 Nov. 1992 43 p
(AD-A258319) Avail: CASI HC A03/MF A01

The Department of Defense's (DOD) ambitious introduction of total quality management (TQM) will fail, unless they change their paradigm and reengineer how they do business. TQM implementation in the defense department and possibilities for reengineering DOD's management structure were investigated. This paper uses a case study to investigate DOD's procurement efficiency and effectiveness with information technology. The findings show DOD is faced with its greatest challenge since WWII in meeting the rapidly evolving environment of the 1990s and the 21st century. DTIC

N93-19938*# National Aeronautics and Space Administration, Washington, DC.
TOTAL QUALITY MANAGEMENT: IT WORKS FOR AEROSPACE INFORMATION SERVICES
JAMES ERWIN, CARL EBERLINE, and WANDA COLQUITT Jan. 1993 13 p Previously announced in IAA as A93-23312
(NASA-TM-108980; NAS 1.15:108980) Avail: CASI HC A03/MF A01

Today we are in the midst of information and 'total quality' revolutions. At the NASA STI Program's Center for AeroSpace Information (CASI), we are focused on using continuous improvements techniques to enrich today's services and products and to ensure that tomorrow's technology supports the TQM-based improvement of future STI program products and services. The Continuous Improvements Program at CASI is the foundation for Total Quality Management in products and services. The focus is customer-driven; its goal, to identify processes and procedures that can be improved and new technologies that can be integrated with the processes to gain efficiencies, provide effectiveness, and promote customer satisfaction. This Program seeks to establish quality through an iterative defect prevention approach that is based on the incorporation of standards and measurements into the processing cycle. Four projects are described that utilize cross-functional, problem-solving teams for identifying requirements and defining tasks and task standards, management participation, attention to critical processes, and measurable long-term goals. The implementation of these projects provides the customer with measurably improved access to information that is provided through several channels: the NASA STI Database, document requests for microfiche and hardcopy, and the Centralized Help Desk. Author

N93-21304# Pacific Northwest Lab., Richland, WA.
CONTINUOUS IMPROVEMENT ON A RESEARCH AND DEVELOPMENT ENVIRONMENT
F. C. HOOD Sep. 1992 9 p Presented at the 19th Annual American Society for Quality Control (ASQC) National Energy Division Conference, Orlando, FL, 20-23 Sep. 1992
(Contract DE-AC06-76RL-01830)
(DE93-001561; PNL-SA-21253; CONF-9209141-4) Avail: CASI HC A02/MF A01

At Pacific Northwest Laboratory (PNL), continuous improvement (CI) concepts are integrated into research and development (R&D) program and project management. Major management initiatives have been established to promote cultural acceptance of CI and foster a working environment for excellence. Laboratory management are committed to CI tailored to specific R&D, functional, and staff needs to ensure PNL's integrated management system provides the means to quality in performance and customer satisfaction. Continuous improvement philosophy applies to R&D as well as more conventional engineering and administrative activities. It is a value-added process for excellence and success. DOE

N93-23447# Department of Energy, Richland, WA.
TOTAL QUALITY IMPLEMENTATION GUIDE
2 Oct. 1992 26 p
(PB93-154524) Avail: CASI HC A03/MF A01

The purpose of the Implementation Guide is to communicate and to document the Quality Council's design of the elements to implement Total Quality (TQ) within the Richland Field Office (RL) organization. NTIS

N93-23954# Air Univ., Maxwell AFB, AL. Airpower Research Inst.
TOTAL QUALITY MANAGEMENT: GOOD ENOUGH FOR GOVERNMENT WORK
MIKE PROWSE Oct. 1992 242 p
(AD-A259847; AU-ARI-90-9) Avail: CASI HC A11/MF A03

Changing the management foundation principles under which we work is addressd. The management principles discussed are based on the concept of strategic quality management, which includes total quality management (TQM). Total quality management covers the entire life cycle of an organization, including the organization's products or services. It is strategic to an organization because it deals not only with the internal environment but also the external environment. TQM goes beyond systems engineering to provide principles of organizational design, leadership, and human engineering. It is the system integrator in an organization, bringing together people, equipment, methods, and machines to effectively satisfy customer expectations. TQM is an organizational culture, a set of norms, and a way to perform the organization's functions. DTIC

N93-23976# Argonne National Lab., IL.
TAGUCHI METHODS APPLIED TO OXYGEN-ENRICHED DIESEL ENGINE EXPERIMENTS
W. W. MARR, R. R. SEKAR, R. L. COLE, T. J. MARCINIAK, and D. E. LONGMAN (AutoResearch Labs., Inc., Chicago, IL.) 1992 5 p Presented at the 16th Annual Energy-sources Technology Conference and Exhibition, Houston, TX, 25 Jan. - 4 Feb. 1993
(Contract W-31-109-ENG-38)
(DE93-004873; ANL/CP-77378; CONF-930124-2) Avail: CASI HC A01/MF A01

This paper describes a test series conducted on a six-cylinder diesel engine to study the impacts of controlled factors (i.e., oxygen content of the combustion air, water content of the fuel, fuel rate, and fuel-injection timing) on engine emissions using Taguchi methods. Three levels of each factor were used in the tests. Only the main effects of the factors were examined; no attempt was made to analyze the interactions among the factors. It was found that, as in the case of the single-cylinder engine tests, oxygen in the combustion air was very effective in reducing particulate and smoke emissions. Increases in NO(sub x) due to the oxygen enrichment observed in the single-cylinder tests also occurred in the present six-cylinder tests. Water in the emulsified fuel was found to be much less effective in decreasing NO(sub x) emissions for the six-cylinder engine than it was for the single-cylinder engine. DOE

N93-23981# Aerospace Medical Research Labs., Brooks AFB, TX. Human Resources Directorate.

IMPLEMENTING TOTAL QUALITY MANAGEMENT (TQM) 1: THE COMMAND IMPERATIVE Interim Report, Nov. 1990 - Nov. 1991

CHARLES N. WEAVER and MALCOLM T. UPTON Dec. 1992 23 p (Contract AF PROJ. 7719)

(AD-A259885; AL-SR-1992-0012) Avail: CASI HC A03/MF A01

The role senior leadership must play in the Total Quality Management/Methodology for Generating Efficiency and Effectiveness Measures (TQM/MGEEM) process and philosophy is documented. Generally observed characteristics of DOD organization TQM implementations and their weaknesses are discussed. Successful TQM implementation depends on direct commander involvement in several areas of the TQM effort including training, empowerment through the Quality Council, establishment of measures, championing of TQM and the mission statement, and continual improvement efforts. Finally, a call to action is issued for the commanders, explaining that with their continual, visible commitment to a TQM effort, all else will follow and without this type of commitment, any efforts toward TQM are doomed to failure. DTIC

N93-24306# Eastern Washington State Coll., Cheney, WA.

TOTAL QUALITY MANAGEMENT IN THE FEDERAL GOVERNMENT. IMPLEMENTATION OF TQM IN FEDERAL AGENCIES RECEIVING THE FEDERAL QUALITY INSTITUTE QUALITY IMPROVEMENT PROTOTYPE AWARD, 1990-1992

CLAUDIA DRAKE Dec. 1992 84 p

(PB93-154573) Avail: CASI HC A05/MF A01

The paper attempts to analyze case studies of federal agencies which have been deemed successful at implementing total quality management (TQM) to (1) identify which components of TQM (based on W. Edwards Deming's Fourteen Points) are being implemented in those agencies, and (2) identify the pathway of implementation. As a result, it can be determined whether selected Federal Agencies have been able to implement all components of orthodox TQM, and which strategy or model for the implementation of TQM in Federal Government have been used successfully. NTIS

N93-24413# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Systems and Logistics.

AN EVALUATION OF SCHEDULE METRICS USED WITHIN AERONAUTICAL SYSTEMS CENTER M.S. Thesis

ROBERT J. HAYES and LAWRENCE M. MILLER Sep. 1992 221 p

(AD-A260113; AFIT/GSM/LSY/92S-12) Avail: CASI HC A10/MF A03

This study focused on a selected group of schedule metrics in use at Aeronautical Systems Center (ASC) acquisition program offices. Over 300 metrics were collected from the System Program Offices (SPO's). The metrics data was sorted into the categories of cost, schedule, and performance. In order to narrow the scope of the project, the team decided to focus on schedule metrics. Seven of the most common schedule metrics were selected for evaluation by a group of five experienced acquisition professionals. The group was asked to input the likely behaviors driven by the metrics being addressed by the study. Next, they were asked to rate the metrics through a Group Support System at Armstrong Laboratory, Human Resources Division. The evaluation group rated how well the metric-driven behaviors contributed to continuous improvement. Results of the study showed a wide spread of behaviors, both positive and negative, that would likely be driven by the metrics. Most of the metrics rated were found to need improvement in terms of influencing behaviors that would lead to continuous improvement. However, many good metric-driven behaviors were identified and could prove helpful to program offices undergoing the challenge of developing their own internal metrics. DTIC

N93-25601*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

INTEGRATION OF DESIGN, THERMAL, STRUCTURAL, AND OPTICAL ANALYSIS, INCLUDING THERMAL ANIMATION

RUTH M. AMUNDSEN *In* NASA, Washington, Technology 2002: The Third National Technology Transfer Conference and Exposition, Volume 1 p 376-384 Feb. 1993

Avail: CASI HC A02/MF A04

In many industries there has recently been a concerted movement toward 'quality management' and the issue of how to accomplish work more efficiently. Part of this effort is focused on concurrent engineering; the idea of integrating the design and analysis processes so that they are not separate, sequential processes (often involving design rework due to analytical findings) but instead form an integrated system with smooth transfers of information. Presented herein are several specific examples of concurrent engineering methods being carried out at Langley Research Center (LaRC): integration of thermal, structural and optical analyses to predict changes in optical performance based on thermal and structural effects; integration of the CAD design process with thermal and structural analyses; and integration of analysis and presentation by animating the thermal response of a system as an active color map — a highly effective visual indication of heat flow. Author

N93-26063*# Florida International Univ., Miami, FL. Industrial and Systems Engineering.

USE OF TAGUCHI DESIGN OF EXPERIMENTS TO OPTIMIZE AND INCREASE ROBUSTNESS OF PRELIMINARY DESIGNS Final Report

HECTOR R. CARRASCO *In* NASA. Johnson Space Center, National Aeronautics and Space Administration (NASA)/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1992, Volume 1 14 p Dec. 1992

(Contract NGT-44-005-803)

Avail: CASI HC A03/MF A02

The research performed this summer includes the completion of work begun last summer in support of the Air Launched Personnel Launch System parametric study, providing support on the development of the test matrices for the plume experiments in the Plume Model Investigation Team Project, and aiding in the conceptual design of a lunar habitat. After the conclusion of last years Summer Program, the Systems Definition Branch continued with the Air Launched Personnel Launch System (ALPLS) study by running three experiments defined by L27 Orthogonal Arrays. Although the data was evaluated during the academic year, the analysis of variance and the final project review were completed this summer. The Plume Model Investigation Team (PLUMMIT) was formed by the Engineering Directorate to develop a consensus position on plume impingement loads and to validate plume flowfield models. In order to obtain a large number of individual correlated data sets for model validation, a series of plume experiments was planned. A preliminary 'full factorial' test matrix indicated that 73,024 jet firings would be necessary to obtain all of the information requested. As this was approximately 100 times more firings than the scheduled use of Vacuum Chamber A would permit, considerable effort was needed to reduce the test matrix and optimize it with respect to the specific objectives of the program. Part of the First Lunar Outpost Project deals with Lunar Habitat. Requirements for the habitat include radiation protection, a safe haven for occasional solar flare storms, an airlock module as well as consumables to support 34 extra vehicular activities during a 45 day mission. The objective for the proposed work was to collaborate with the Habitat Team on the development and reusability of the Logistics Modules. Author

N93-26074*# Pennsylvania State Univ., University Park, PA. Dept. of Industrial and Systems Engineering.

IMPLEMENTATION OF QUALITY IMPROVEMENT TECHNIQUES FOR MANAGEMENT AND TECHNICAL PROCESSES IN THE ACRV PROJECT Final Report

LAURA B. RAIMAN *In* NASA. Johnson Space Center, National Aeronautics and Space Administration (NASA)/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1992, Volume 2 9 p Dec. 1992

(Contract NGT-44-005-803)

Avail: CASI HC A02/MF A02

Total Quality Management (TQM) is a cooperative form of doing business that relies on the talents of everyone in an organization to continually improve quality and productivity, using teams and an assortment of statistical and measurement tools. The objective of the activities described in this paper was to implement effective improvement tools and techniques in order to build work processes which support good management and technical decisions and actions which are crucial to the success of the ACRV project. The objectives were met by applications in both the technical and management areas. The management applications involved initiating focused continuous improvement projects with widespread team membership. The technical applications involved applying proven statistical tools and techniques to the technical issues associated with the ACRV Project. Specific activities related to the objective included working with a support contractor team to improve support processes, examining processes involved in international activities, a series of tutorials presented to the New Initiatives Office and support contractors, a briefing to NIO managers, and work with the NIO Q+ Team. On the technical side, work included analyzing data from the large-scale W.A.T.E.R. test, landing mode trade analyses, and targeting probability calculations. The results of these efforts will help to develop a disciplined, ongoing process for producing fundamental decisions and actions that shape and guide the ACRV organization. Author

N93-26242# School of Aerospace Medicine, Brooks AFB, TX.
PROCEEDINGS OF THE 33RD ANNUAL MILITARY LIBRARIANSWORKSHOP Final Report
THOMAS H. KERNS Dec. 1992 181 p Workshop held in San Antonio, TX, 18-20 Oct. 1989
(AD-A261071; USAFSAM-PROC-89-29) Avail: CASI HC A09/MF A02

The theme of the Thirty-Third Annual Military Librarians Workshop was Technology in Transition. The workshop, sponsored by the USAF School of Aerospace Medicine, was held at the Sheraton Gunter Hotel in downtown San Antonio. Discussion topics included Hypermedia, Local Area Networks, CD-ROM Catalogs, Emerging Technologies, and Total Quality Management. DTIC

N93-26246# Naval Postgraduate School, Monterey, CA.
EXPLORING THE LINK BETWEEN INTRINSIC MOTIVATION AND QUALITY M.S. Thesis
STEVEN M. CHRISTY Dec. 1992 80 p
(AD-A261722) Avail: CASI HC A05/MF A01

This thesis proposes that it is workers' intrinsic motivation that leads them to produce quality work. It reviews two different types of evidence-expert opinion and empirical studies—to attempt to evaluate a link between intrinsic motivation and work quality. The thesis reviews the works of Total Quality writers and behavioral scientists for any connection they might have made between intrinsic motivation and quality. The thesis then looks at the works of Deming and his followers in an attempt to establish a match between Deming's motivational assumptions and the four task rewards in the Thomas/Tymon model of intrinsic motivation: choice, competence, meaningfulness, and progress. Based upon this analysis, it is proposed that the four Thomas/Tymon task rewards are a promising theoretical foundation for explaining the motivational basis of quality for workers in Total Quality organizations. DTIC

N93-26461# Institute for Defense Analyses, Alexandria, VA.
CALS-HSC DATA ELEMENT DICTIONARY Final Report, Mar. 1991 - Oct. 1992
EARL A. ALLUISI Oct. 1992 113 p
(Contract MDA903-89-C-0003)
(AD-A261560; IDA-D-1183; IDA/HQ-92-42001; AD-E501629) Avail: CASI HC A06/MF A02

The data element dictionary (DED) presented was developed under a human system integration (HSI) effort to integrate all human system components (HSC) into the weapon system acquisition process as part of a joint Department of Defense (DoD)-industry initiative in computer-assisted acquisition and logistic support/concurrent engineering (CALS/CE). The present version of the CALS-HSC data element dictionary evolved from an earlier CALS-Training DED developed at the Defense Training and Performance Data Center, Orlando, Florida, and augmented later with HSC data elements that extend beyond training. The final set of over 430 data elements was coordinated through the CALS-HSC Work Group with representatives of the DoD and industry, first in May 1990 and more recently in April, May, and June 1992. Although the materials presented constitute a current baseline for the CALS-HSC DED, they are viewed as comprising a living document to be amended and updated continuously. DTIC

N93-26546# National Goals Research Staff, Washington, DC. Center for Policy Research and Analysis.
DESIGNING AND IMPLEMENTING A STATE QUALITY AWARD
E. N. DOBSON Feb. 1993 55 p Sponsored by National Inst. of Standards and Technology
(PB93-154458; NIST/GCR-92/620) Avail: CASI HC A04/MF A01

To remain competitive in today's global economy, businesses need to ensure customer satisfaction by offering high-quality products and services. Governors and state governments can play a critical role in ensuring the economic health of the business in their state by encouraging the adoption of quality practices and recognizing successful efforts by firms to improve quality and productivity. The manual is intended to help state government officials and other individuals implement a state quality award program. NTIS

N93-26926*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
NTP COMPARISON PROCESS
ROBERT CORBAN *In its* Nuclear Propulsion Technical Interchange Meeting, Volume 1 p 430-437 1993
Avail: CASI HC A02/MF A04

The systems engineering process for the concept definition phase of the program involves requirements definition, system definition, and consistent concept definition. The requirements definition process involves obtaining a complete understanding of the system requirements based on customer needs, mission scenarios, and nuclear thermal propulsion (NTP) operating characteristics. A system functional analysis is performed to provide a comprehensive traceability and verification of top-level requirements down to detailed system specifications and provides significant insight into the measures of system effectiveness to be utilized in system evaluation. The second key element in the process is the definition of system concepts to meet the requirements. This part of the process involves engine system and reactor contractor teams to develop alternative NTP system concepts that can be evaluated against specific attributes, as well as a reference configuration against which to compare system benefits and merits. Quality function deployment (QFD), as an excellent tool within Total Quality Management (TQM) techniques, can provide the required structure and provide a link to the voice of the customer in establishing critical system qualities and their relationships. The third element of the process is the consistent performance comparison. The comparison process involves validating developed concept data and quantifying system merits through analysis, computer modeling, simulation, and rapid prototyping of the proposed high risk NTP subsystems. The maximum amount possible of quantitative data will be developed and/or validated to be utilized in the QFD evaluation matrix. If upon evaluation of a new concept or its associated subsystems determine to have substantial merit, those features will be incorporated into the reference configuration for subsequent system definition and comparison efforts. Derived from text

N93-28459# Sandia National Labs., Albuquerque, NM.
APPLICATION OF QUALITY FUNCTION DEPLOYMENT TO THE DESIGN OF A LITHIUM BATTERY
L. HALBLEIB, P. WORMINGTON, W. CIESLAK, and H. STREET 1992 5 p Presented at the 43rd Electronic Component and Technology Conference, Orlando, FL, 1-3 Jun. 1993
(Contract DE-AC04-76DP-00789)
(DE93-008346; SAND-92-2345C; CONF-9306104-1) Avail: CASI HC A01/MF A01

Quality Function Deployment (QFD) is the tool we have selected to aid in the design, development and subsequent commercial manufacture of a Lithium/Thionyl Chloride 'D' cell for use in weapons applications. QFD is a structured methodology used to help assure that customer needs and expectations will be satisfied throughout the product life cycle. In this paper, we will describe our application of QFD, some of the lessons learned, and what we expect to be the final product of this QFD exercise. DOE

N93-30636# Los Alamos National Lab., NM.
THE QUALITY ASSURANCE LIAISON: COMBINED TECHNICAL AND QUALITY ASSURANCE SUPPORT
S. L. BOLIVAR and J. L. DAY (Los Alamos Technical Associates, Inc., NM.) 1993 8 p Presented at the 17th Annual Rocky Mountain Quality Conference, Denver, CO, 6-8 Jun. 1993
(Contract W-7405-ENG-36)
(DE93-008725; LA-UR-93-690; CONF-9306114-1) Avail: CASI HC A02/MF A01

The role of the quality assurance liaison, the responsibilities of this position, and the evolutionary changes in duties over the last six years are described. The role of the quality assurance liaison has had a very positive impact on the Los Alamos Yucca Mountain Site Characterization (YW) quality assurance program. Having both technical and quality assurance expertise, the quality assurance liaisons are able to facilitate communications with scientists on quality assurance issues and requirements, thereby generating greater productivity in scientific investigations. The quality assurance liaisons help ensure that the scientific community knows and implements existing requirements, is aware of new or changing regulations, and is able to conduct scientific work within Project requirements. The influence of the role of the quality assurance liaison can be measured by an overall improvement in attitude of the staff regarding quality assurance requirements and improved job performance, as well as a decrease in deficiencies identified during both internal and external audits and surveillances. This has resulted in a more effective implementation of quality assur-ance requirements. DOE

N93-30975*# New Mexico Univ., Albuquerque, NM. Dept. of Mechanical Engineering.
TAGUCHI METHOD OF EXPERIMENTAL DESIGN IN MATERIALS EDUCATION
MARTIN W. WEISER *In* NASA. Langley Research Center, National Educators' Workshop. Update 92: Standard Experiments in Engineering Materials Science and Technology p 403-414 Jun. 1993
Avail: CASI HC A03/MF A04

Some of the advantages and disadvantages of the Taguchi Method of experimental design as applied to Materials Science will be discussed. This is a fractional factorial method that employs the minimum number of experimental trials for the information obtained. The analysis is also very simple to use and teach, which is quite advantageous in the classroom. In addition, the Taguchi loss function can be easily incorporated to emphasize that improvements in reproducibility are often at least as important as optimization of the response. The disadvantages of the Taguchi Method include the fact that factor interactions are normally not accounted for, there are zero degrees of freedom if all of the possible factors are used, and randomization is normally not used to prevent environmental biasing. In spite of these disadvantages it is felt that the Taguchi Method is extremely useful for both teaching experimental design and as a research tool, as will be shown with a number of brief examples. Author (revised)

N93-30976*# New Mexico Univ., Albuquerque, NM. Dept. of Mechanical Engineering.
POWDER METALLURGY: SOLID AND LIQUID PHASE SINTERING OF COPPER
REX SHELDON and MARTIN W. WEISER *In* NASA. Langley Research Center, National Educators' Workshop. Update 92: Standard Experiments in Engineering Materials Science and Technology p 415-430 Jun. 1993
Avail: CASI HC A03/MF A04

Basic powder metallurgy (P/M) principles and techniques are presented in this laboratory experiment. A copper based system is used since it is relatively easy to work with and is commercially important. In addition to standard solid state sintering, small quantities of low melting metals such as tin, zinc, lead, and aluminum can be added to demonstrate *liquid phase sintering and alloy formation. The Taguchi Method of experi*mental design was used to study the effect of particle size, pressing force, sintering temperature, and sintering time. These parameters can be easily changed to incorporate liquid phase sintering effects and some guidelines for such substitutions are presented. The experiment is typically carried out over a period of three weeks. Author (revised)

N93-32365*# Sverdrup Technology, Inc., Huntsville, AL.
OPTIMIZATION OF 15 PARAMETERS INFLUENCING THE LONG-TERM SURVIVAL OF BACTERIA IN AQUATIC SYSTEMS
D. C. OBENHUBER Jul. 1993 21 p
(Contract NAS8-37814)
(NASA-CR-192571; NAS 1.26:192571) Avail: CASI HC A03/MF A01

NASA is presently engaged in the design and development of a water reclamation system for the future space station. A major concern in processing water is the control of microbial contamination. As a means of developing an optimal microbial control strategy, studies were undertaken to determine the type and amount of contamination which could be expected in these systems under a variety of changing environmental conditions. A laboratory-based Taguchi optimization experiment was conducted to determine the ideal settings for 15 parameters which influence the survival of six bacterial species in aquatic systems. The experiment demonstrated that the bacterial survival period could be decreased significantly by optimizing environmental conditions. Author

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APPLICATIONS

A93-49105
COMPOSITE AIRFRAME STRUCTURES. PRACTICAL DESIGN INFORMATION AND DATA
MICHAEL C.-Y. NIU (Lockheed Aeronautical Systems Co., Burbank, CA) Hong Kong Conmilit Press, Ltd. 1992 687 p. refs
(ISBN 962-7128-06-6) Copyright

A comprehensive survey is conducted of advanced composite structural component design and manufacture in the aerospace industry. Attention is given to organic resin and metal-matrix composites, laminated and sandwich structures, metallic and nonmetallic tooling, thermoforming and pultrusion, and mechanical fastening and bonding methods. Also discussed are laminate strength analyses and fatigue and impact damage characteristics, structural testing practices, NDI methods for composite quality assurance, and composite airframe component applications to military and commercial aircraft. Innovative design approaches are noted. AIAA

N92-29808# Federal Aviation Administration, Cambridge, MA. National Transportation Systems Center.

HIGH-SPEED MAGLEV TRAINS: GERMAN SAFETY REQUIREMENTS RW-MSB

Jan. 1992 261 p Transl. into ENGLISH of Magnetschnellbannen: Sicherheitstechnische Anforderungen (Fed. Republic of Germany), Mar. 1991 261 p Sponsored in part by Federal Railroad Administration, Washington DC

(PB92-167006; DOT-VNTSC-FRA-92-1; DOT/FRA/ORD-92/01) Avail: CASI HC A12/MF A03

This is a translation of technology-specific safety requirements developed for the German Transrapid Maglev technology. These requirements were developed by a working group composed of representatives of German Federal Railways (DB), Testing and Planning Company for Maglev System (MVO), industry, Institute Railway Technology (IFB), and safety experts of TUV Rheinland and TUV Hannover headed by TUV Rheinland and sponsored by the German Federal Ministry of Research and Technology. Topic areas covered include: levitation, propulsion, energy and control systems, load assumptions and vehicle and guideway stability, design, production and quality assurance of mechanical structures, switches, lighting protection, electromagnetic compatibility, electrostatic discharge, fire protection, and rescue plan. Author

N93-17325*# Pittsburgh State Univ., KS. Dept. of Engineering Technology.

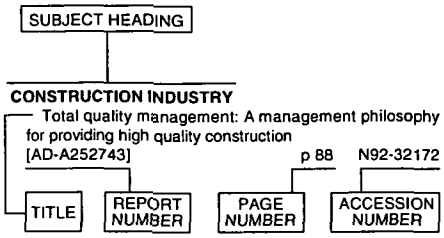
INDUSTRY SURVEY OF SPACE SYSTEM COST BENEFITS FROM NEW WAYS OF DOING BUSINESS

RUSSELL L. ROSMAIT *In* Alabama Univ., 1992 NASA/ASEE Summer Faculty Fellowship Program 3 p Dec. 1992

Avail: CASI HC A01/MF A03

The cost of designing, building and operating space system hardware has always been expensive. Small quantities of specialty parts escalate engineering design, production and operations cost. Funding cutbacks and shrinking revenues dictate aggressive cost saving programs. NASA's highest priority is providing economical transportation to and from space. Over the past three decades NASA has seen technological advances that provide grater efficiencies in designing, building, and operating of space system hardware. As future programs such as NLS, LUTE and SEI begin, these greater efficiencies and cost savings should be reflected in the cost models. There are several New Ways Of Doing Business (NWODB) which, when fully implemented will reduce space system costs. These philosophies and/or culture changes are integrated in five areas: (1) More Extensive Pre-Phase C/D & E, (2) Multi Year Funding Stability, (3) Improved Quality, Management and Procurement Processes, (4) Advanced Design Methods, and (5) Advanced Production Methods. Following is an overview of NWODB and the Cost Quantification Analysis results using an industry survey, one of the four quantification techniques used in the study. The NWODB Cost Quantification Analysis is a study performed at Marshall Space Flight Center by the Engineering Cost Group, Applied Research Incorporated and Pittsburg State University. This study took place over a period of four months in mid 1992. The purpose of the study was to identify potential NWODB which could lead to improved cost effectiveness within NASA and to quantify potential cost benefits that might accrue if these NWODB were implemented. Author

Typical Subject Index Listing



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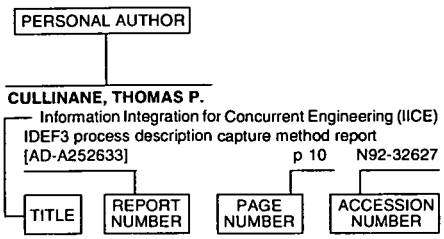

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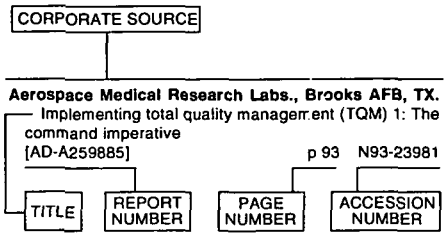
Typical Corporate Source Index Listing



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Air Force Logistics Command, Wright-Patterson AFB, OH.
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F-16 avionic systems attack control instrument and flight control communication, navigation, and penetration aids. Training requirements analysis 452X2, volume 1
[AD-A252786] p 36 N92-33540

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[NASA-TM-107834] p 87 N92-24901

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[NASA-TM-107835] p 87 N92-25559

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Human factors research in aircrew performance and training: 1986-1991
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[NASA-CR-191067] p 14 N93-24947

Analytical Services and Materials, Inc., Hampton, VA.
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Innovative life cycle management systems for composites, phase 1
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Development of methodology and technology for identifying and quantifying emission products from open burning and open detonation thermal treatment methods. Field test series A, B, and C. Volume 2, part B: Quality assurance and quality control. Appendices
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NASA technology transfer network communications and information system: TUNS user survey
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Army Materials Technology Lab., Watertown, MA.
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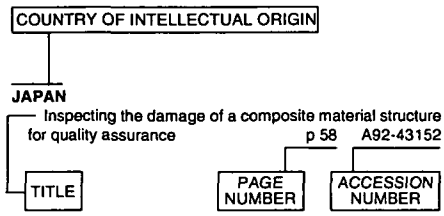

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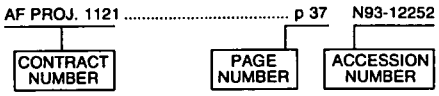

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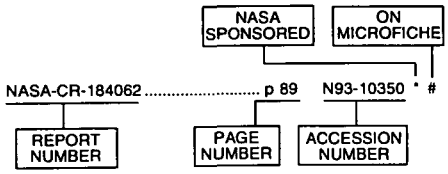

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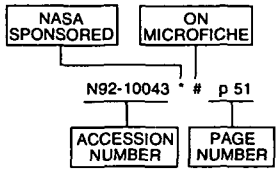

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