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MANAGEMENT

A CONTINUING LITERATURE SURVEY

– With Indexes –

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

MANAGEMENT

A CONTINUING LITERATURE SURVEY

– With Indexes –

A selection of annotated references to unclassified reports and journal articles entering the NASA Information System from 1962 through 1967

Introduction

Management is a compilation of references to unclassified reports and periodical articles on the subject of management that may be found in the NASA scientific and technical information system. The publication assembles groups of citations formerly announced in separate journals, *Scientific and Technical Aerospace Reports (STAR)* and *International Aerospace Abstracts (IAA),* to provide management with a convenient information tool.

The first issue (NASA SP-7500) covered material generated or sponsored by NASA during the period 1962 through 1967. The present issue covers the same period but the references are to material generated or sponsored by agencies other than NASA. As before, the selection of items for reannouncement was made on the basis of general interest, usefulness and applicability, but is by no means exhaustive.

For greater convenience the selected items are grouped in nine categories. These are shown in the table of contents with appropriate scope notes. The categories bear no relationship to those in *STAR* and *IAA* but have been specially chosen for this publication. Three indexes are provided—subject, personal author, and corporate source.

Items concerning management in the fields of reliability and quality assurance have for the most part been excluded. Such items appear in *Reliability Abstracts and Technical Reviews (RATR),* a monthly journal prepared for NASA by the Research Triangle Institute, Durham, North Carolina.

Many of the abstracts included in *Management* have been reproduced from those appearing in *STAR* and *IAA*. This procedure, adopted in the interests of economy, has introduced some variation in size, style, and intensity of type.

AVAILABILITY OF DOCUMENTS

STAR Entries

Department of Defense documents (identified by the "AD" number in the citation) are available without charge to U.S. Government-sponsored research and development activities from the Defense Documentation Center (DDC), Cameron Station, Alexandria, Virginia 22314. Department of Defense documents are not available from NASA.

Other non-NASA documents are provided by NASA without charge only to NASA Offices, Centers, contractors, subcontractors, grantees, and consultants. Foreign non-copyrighted documents will be provided to U.S. Government Agencies and their contractors.

Documents that have been placed on microfiche (a transparent sheet of film, approximately 4×6" in size, capable of containing an orderly arrangement of 60 or more pages of information reduced to micro images) are identified with the symbol #. Microfiche are available on the same basis as hard copy.

The public may purchase many of the documents listed from either of the following sales agencies, as specifically identified in the citations.

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and Technical Information (CFSTI),   U.S. Government Printing Office (GPO)
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Documents available from CFSTI are sold in hard copy and microfiche form. If a printed hard copy is not available, a facsimile copy is provided. The symbols "HC" and "MF" are used in the abstract section to designate the copy available: "HC" (hard copy) for full size or facsimile; "MF" for microfiche. A unit price policy has been established by CFSTI: $3.00 for printed hard copy or facsimile copy; $0.65 for microfiche.

Documents not available from either of the sales agencies identified above may be requested by writing to the source or other information systems. Bibliographic information, e.g., report number, etc., rather than the NASA accession number (i.e., N67-12345) should always be provided when requesting such a document from its source.

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All cited documents are available from the AIAA Technical Information Service as follows:

Paper copies are available at $3.00 per document up to a maximum of 20 pages. The charge for each additional page is $0.25.

Microfiche are available at the rate of $0.50 per microfiche for documents identified by the symbol # following the accession number.

A number of publications, because of their special characteristics, are available only for reference in the AIAA Technical Information Service Library.

Minimum air-mail postage to foreign countries is $1.00.

Please refer to the accession number, e.g., A67-12345, when requesting documents. Address all inquiries and requests to:

Technical Information Service
American Institute of Aeronautics and Astronautics, Inc.
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AVAILABILITY OF THIS SURVEY

Copies of *Management*, NASA SP-7500 and SP-7500(02), can be obtained from NASA (Code USS-A), without charge, by NASA offices and contractors, U.S. Government agencies and their contractors, and organizations that are working in direct support of NASA programs.

Other organizations can purchase copies of the survey from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

TABLE OF CONTENTS

Subject Categories

Abstracts in the survey are grouped under the following categories:

M1 PROGRAM MANAGEMENT

Includes project management; production management; systems management; logistics management; engineering management; management planning; resource and manpower allocation; program budgeting; operations research; decision making.

M2 CONTRACT MANAGEMENT

Includes contract incentives; contract decision making; procurement; subcontracts.

M3 RESEARCH & DEVELOPMENT

Includes research environment; R & D planning; R & D management; inventions and patents; research evaluation.

M4 MANAGEMENT TOOLS & TECHNIQUES

Includes program evaluation and review techniques (PERT); planning, programming and budgeting systems (PPBS); prediction analysis techniques (PAT); planned interdependency incentive method (PIIM); program trend line analysis; cost effectiveness; simulation; computers.

M5 PERSONNEL MANAGEMENT

Includes personnel problems; motivation; environmental problems; personnel development and training; recruitment; psychological studies; communication.

M6 URBAN MANAGEMENT

Includes application of space technology and management techniques to urban problems; federal resources and urban needs.

M7 MANAGEMENT POLICY & PHILOSOPHY

Includes management concepts; policy studies; organizational studies and problems; social relationships and problems.
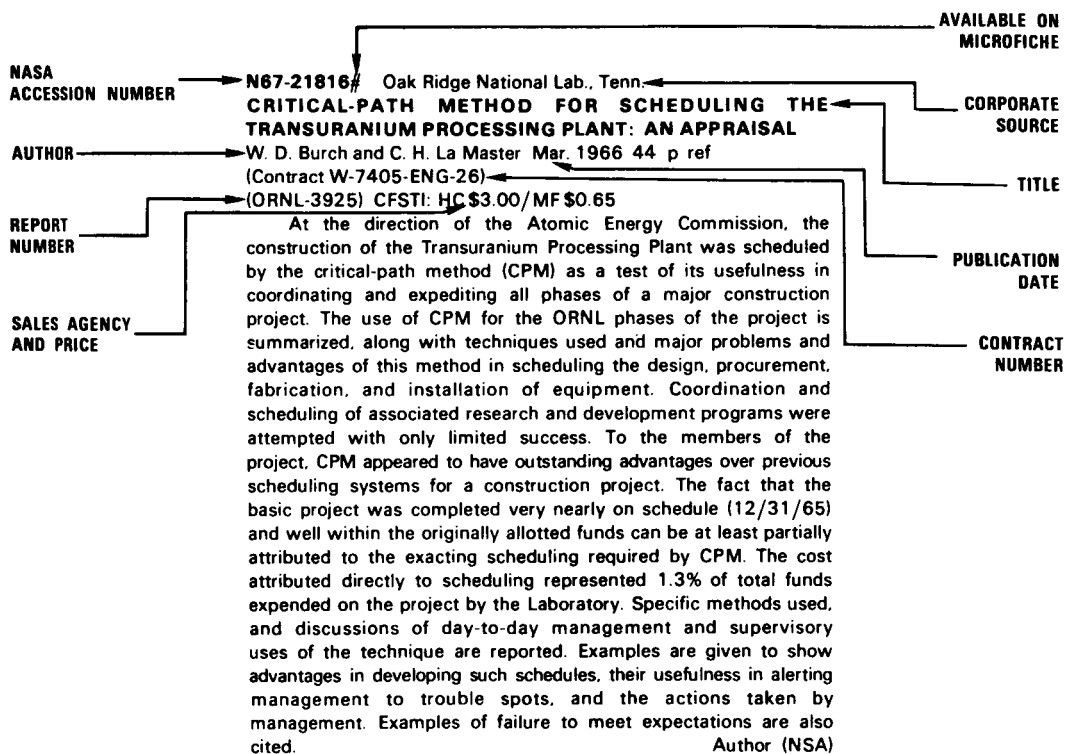
M8 ECONOMICS

Includes impact of federal expenditures and programs; government/industry relations; federal financing; federal budgeting.
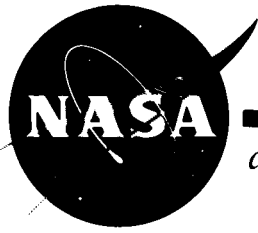
M9 GENERAL

Includes conference proceedings; reviews; patent information; speeches; bibliographies.

TYPICAL CITATION AND ABSTRACT FROM *STAR*

AVAILABLE ON MICROFICHE

NASA ACCESSION NUMBER → N67-21816# Oak Ridge National Lab., Tenn. ← CORPORATE SOURCE

CRITICAL-PATH METHOD FOR SCHEDULING THE ← TITLE
TRANSURANIUM PROCESSING PLANT: AN APPRAISAL

AUTHOR → W. D. Burch and C. H. La Master Mar. 1966 44 p ref

(Contract W-7405-ENG-26) ← CONTRACT NUMBER

REPORT NUMBER → (ORNL-3925) CFSTI: HC $3.00/MF $0.65

SALES AGENCY AND PRICE

PUBLICATION DATE

At the direction of the Atomic Energy Commission, the construction of the Transuranium Processing Plant was scheduled by the critical-path method (CPM) as a test of its usefulness in coordinating and expediting all phases of a major construction project. The use of CPM for the ORNL phases of the project is summarized, along with techniques used and major problems and advantages of this method in scheduling the design, procurement, fabrication, and installation of equipment. Coordination and scheduling of associated research and development programs were attempted with only limited success. To the members of the project, CPM appeared to have outstanding advantages over previous scheduling systems for a construction project. The fact that the basic project was completed very nearly on schedule (12/31/65) and well within the originally allotted funds can be at least partially attributed to the exacting scheduling required by CPM. The cost attributed directly to scheduling represented 1.3% of total funds expended on the project by the Laboratory. Specific methods used, and discussions of day-to-day management and supervisory uses of the technique are reported. Examples are given to show advantages in developing such schedules, their usefulness in alerting management to trouble spots, and the actions taken by management. Examples of failure to meet expectations are also cited. Author (NSA)

STAR ENTRIES

M1 PROGRAM MANAGEMENT

N67-85872 General Dynamics/Fort Worth, Tex.
USE OF OPERATIONS RESEARCH IN THE EFFECTIVE PLANNING OF SPACE MISSIONS AND SPACE PROGRAMS
C. B. Moore and T. E. Peace 3 Nov. 1965 89 p refs Presented at the 28th Natl. Meeting of Operations Soc. of Am., Houston, Tex., 4–5 Nov. 1965
(MR-0-120)

This paper deals with space program planning from the selection of spacecraft systems to the delineation of long-range space programs. Specific topics include the optimization of spacecraft operational and scientific payloads, the selection of mission vehicles the results of these suboptimizations and interim decisions into space program plans. The role of Operations Research techniques and the use of "expertise" and mathematical models within the analytical framework are particularly emphasized. Effectiveness criteria are discussed and used in terms of the evaluation process; these include cost, information yield, value, cost/effectiveness, timeliness, development risk, and probability of mission and program success. **Author**

N67-84813 Systems Development Corp., Santa Monica, Calif.
MANAGEMENT HANDBOOK FOR THE ESTIMATION OF COMPUTER PROGRAMMING COSTS
E. A. Nelson 20 Mar. 1967 149 p refs
(Contract F19628-67-C-0132)
(TM-3225/000/01; AD-648750)

Guidelines are presented to help managers estimate the costs of computer programming. The guidelines summarize a statistical analysis of 169 computer programming efforts with equations to estimate man months, computer hours, and months elapsed, and also planning factors such as man months per thousand instructions. Opinions, rules of thumb, and experience data based upon literature search and experience supplement the statistical results. Forms with the guidelines are organized into six sections corresponding to a six-step division of the computer programming process. Advice is given on the integration of cost estimates into a cost analysis to justify and plan ADP projects. **TAB**

N67-84744 System Development Corp., Santa Monica, Calif.
CLASSIFICATION MANAGEMENT AT SYSTEM DEVELOPMENT CORPORATION

L. F. McConnell 10 Mar. 1966 28 p
(SP-2388; AD-650664)

The classification management function at SDC is the responsibility of a staff office, 'classification management and editorial liaison.' The CM ane EL office functions include providing classification guidance, reviewing group assignment, establishing control stations, providing accountability control procedures, conducting downgrading reviews, handling disposition of classified information upon termination of contracts, clearing documents for public release, approving release, providing publication procedures, and developing statistics. **Author (TAB)**

N65-83225 American Univ., Washington, D. C.
INCEPTION, DESIGN AND IMPLEMENTATION OF A MANAGEMENT INFORMATION SYSTEM
David Alfred Lewis (M.S. Thesis) Jun. 1967 54 p refs
(AD-646851)

The purpose of this paper is to develop a uniform systematic approach to the design and implementation of a management information system. In recent years there has been published reams of literature about various aspects of management information systems, and, some specific design considerations of these systems. However, nowhere during the course of this author's research could there be found a comprehensive guide or instructive document directed towards the design of a management information system. To this end—the creation of such a document—is this paper dedicated. The procedures developed in this paper dedicated. The procedures developed in this paper are, as most similar procedures in general, designed to guide the manager and analyst through all phases from initial inception to successful implementation of a management information system. Many factors must be considered while applying this procedure, e.g., complexity and scope of the information system. These factors are discussed throughout this paper in terms of their impact on each phase of the design process. **TAB**

N67-83219 System Development corp., Santa Monica, Calif.
THE ANALYSIS AND DESIGN OF INFORMATION SYSTEMS
H. Borko 10 Nov. 1966 25 p refs Presented at the Drexel Inst. of Tech. Symp. on Tech. Info. Center Admin., 29 Aug.–1 Sep. 1966
(SP-2655)

This paper provides an orientation to the procedures used in systems analysis and in the design of information systems. An information system is an organized procedure for collecting, processing, storing, and retrieving documentary information. Its structure is illustrated by means of a block diagram. The principles used in the analysis and design are derived from information science which provides a conceptual basis for understanding the functioning of information handling systems. **Author**

N67-82721 General Precision, Inc., Little Falls, N. J.
MANAGING A DEVELOPMENT PROGRAM
George T. Mundorff and William Bloom 1960 177 p refs
Prepared for Bur. of Res. and Develop., FAA

A guide prepared for Federal Aviation Agency personnel, especially those concerned with the conduct and direction of major development programs, was designed as a reference text for persons interested in the development of analytical and orderly management programs. Details are included for the specific methodologies used to test and evaluate a data processing central facility, and for the line of balance technique used during this evaluation. Following details on the evolution and application of this technique, organizing for optimum effect is discussed. Collection and display of information, gathering the facts to establish feasibility and practicability, the mechanics of preparation and flow diagrams, and the appraisal and presentation of the analysis are described. Details are included for the program as used at the data processing facility, including manpower requirements, costs, and management of the program. M.W.R.

N67-81516 Atomic Energy Commission, Washington, D. C.
Div. of Nuclear Materials Management.
MATHEMATICAL APPROACHES TO INVENTORY MANAGE-MENT—A SURVEY
[1964] 160 p refs 10th Ann. Conf. held at Gatlinburg, Tenn., 19–21 Oct. 1964; Sponsored by AEC

Mathematical approaches to inventory management and production control were surveyed from the viewpoint of managing the use of nuclear materials. The nature and quantity of input data were considered, including both cost and noncost parameters; and the effects of inaccuracies and insufficient data were treated. Classical problems and marginal utility were investigated for single period models; and a single probability system was discussed in terms of (1) variable reorder point and constant lot size, (2) constant reorder point and variable lot size, and (3) production smoothing. Dynamic inventory models were investigated, as were parallel and series stations. M.W.R.

N67-40062# Carnegie Inst. of Tech., Pittsburgh, Pa. Management Sciences Research Group.
ON THE APPLICATION OF THE THEORY OF MAXIMUM PRINCIPLE TO A PRODUCTION CONTROL PROBLEM
R. Jagannathan Aug. 1967 14 p refs
(Contract Nonr-760(24))
(RR-108; AD-657430)

The purpose of this paper is to solve a simple production control problem using the maximum principle theory as put forward by L. S. Pontryagin and his students. In the first section entitled Introduction, a brief description of maximum principle theory as relevant to our purpose is given. In the second section the production scheduling problem under probabilistic demand (which occurs periodically) is developed. The problem is a fairly realistic one resulting in a somewhat complicated analysis. In the final section the possibilities of relaxation of some of the underlying assumptions are indicated. Author (TAB)

N67-39492# System Development Corp., Santa Monica, Calif.
COST REPORTING FOR DEVELOPMENT OF INFORMATION PROCESSING SYSTEMS
Edward A. Nelson and Thomas Fleishman Bedford, Mass., AFSC, Electron. Systems Div., 11 Apr. 1967 83 p refs
(Contract AF 19(628-67-C-0132)
(TM-3411/000/00; ESD-TR-67-452; AD-657793)

The report describes a system for the collecting and reporting on data on the resources expended in the production of computer programs. The system is intended to: (1) provide information to facilitate management control during the progress of a computer programming effort; (2) build a data bank from which better cost-estimating relationships and planning tools can be developed; (3) accomplish the above with a minimum of interference with operating personnel. The report was designed to provide sample materials necessary for the implementation of cost reporting in any organization in which computer programming is performed; it includes a description of the steps that constitute the computer programming process, the kinds of personnel who would be involved in the cost-collection and -reporting system, a recommended work flow and suggested forms for use in data collection and reporting, a work breakdown structure for associating costs with activities, and a brief discussion of the relationship of this system with several existing Department of Defense management procedures. TAB

N67-39410# Herner and Co., Washington, D. C.
SYSTEM DESIGN, EVALUATION AND COSTING—IN PLAIN ENGLISH
Saul Herner 1 Mar. 1967 17 p Presented at the ADI Inst. on Inform. Sci., Ohio, 15 Dec. 1966
(Contract AF 49(638)-1424)
(AFOSR-67-1998; AD-657788)

The concepts of system design, evaluation, and costing are among the most often discussed and widely misunderstood in the information field. This report attempts, via case illustrations, to describe and explain the steps and processes involved, so as to take some of the mystery and witchcraft out of systems and to facilitate the return of design and operation of information services to where they rightfully belong: to the people who have the day-to-day job of making them go and perform. Author (TAB)

N67-28911# Electronic Systems Div., Bedford, Mass.
A SYSTEMS APPROACH TO COMPUTER PROGRAMS
Joseph L. Pokorney and Wallace E. Mitchell Feb. 1967 24 p refs
(ESD-TR-67-205; AD-650216) CFSTI: HC $3.00/MF $0.65

Recent experience at ESD in acquiring complex computer based systems has identified a deficiency in existing systems management techniques in the area of computer programs. The systems management techniques generally in use were designed for equipment systems and need to be expanded to include computer programs. This paper describes an ESD approach to adapting existing AFSC system management techniques to computer programs. Procedures for insuring system compatibility, design integrity and technical control are discussed and a method for achieving design verification and qualification is presented. Particular emphasis is placed on the relationship of these techniques to computer programs as elements of large computer based systems. The application of these techniques is illustrated through selected examples taken from current ESD system procurements. TAB

N67-25119# Planning Research Corp., Los Angeles, Calif.
Information Systems Div.
USE OF AIR FORCE ADP EXPERIENCE TO ASSIST AIR FORCE ADP MANAGEMENT, VOLUME II. PHASE II—ACTIVITIES Final Report, 16 Feb.–15 Dec. 1966
Alan J. Gradwohl, George S. Beckwith, and Stanton H. Wong Bedford, Mass., ESD, Dec. 1966 144 p refs
(Contract AF 19(628)-5988)
(PRC-R-932, Vol. II; ESD-TR-66-671, Vol. II; AD-646870) CFSTI: HC $3.00/MF $0.65

Volume II of the three-volume final report on Phase II of a three-phase project on the Use of Air Force ADP Experience to Assist Air Force ADP Management is presented. The design of the data collection questionnaire was based on the ADPS model (a concept of a total ADPS) and the workload model representing attributes of an ADPS. Data were collected on a stratified 18-ADPS sample, and the statistical analysis of these data produced five cost estimation equations. In addition, the data were used to produce

a seven-page system description of each ADPS, which became the core of the ADP Experience Handbook. A Phase III operational concept and development plan was also synthesized.

Author (TAB)

N67-25118# Planning Research Corp., Los Angeles, Calif. Information Systems Div.

USE OF AIR FORCE ADP EXPERIENCE TO ASSIST AIR FORCE ADP MANAGEMENT, VOLUME III. PHASE III—CONCEPT AND PLAN Final Report, 16 Feb.–15 Dec. 1966

Alan J. Gradwohl and Wolford O. Wootan, Jr. Bedford, Mass., ESD, Dec. 1966 124 p

(Contract AF 19(628)-5988)

(PRC-R-932, Vol. III; ESD-TR-66-671, Vol. III; AD-646868) CFSTI: HC $3.00/MF $0.65

Volume III of the three-volume final report on Phase II of a three-phase project on the Use of Air Force ADP Experience to Assist Air Force ADP Management, presents the concept and plan for Phase III. The operational concept for Phase III includes revised procedures for ADPS proposal submission, experience reporting, and asset reporting to an information storage and retrieval system. This system is the nucleus of a management information system that could be operational by June 1968. The major benefits will accrue from improved cost effectiveness and quality of ADP development· and operations in the Air Force, from cost and time savings in large system programs that involve ADP.

Author (TAB)

N67-24975# Planning Research Corp., Los Angeles, Calif. Information Systems Div.

USE OF AIR FORCE ADP EXPERIENCE TO ASSIST AIR FORCE ADP MANAGEMENT, PHASE II. VOLUME I: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS Final Report, 16 Feb.–15 Dec. 1966

Alan J. Gradwohl, George S. Beckwith, Stanton H. Wong, and Wolford O. Wootan, Jr. Bedford, Mass., AFSC, Electron. Systems Div., Dec. 1966 30 p

(Contract AF 19(628)-5988)

(PRC-R-932, ESD-TR-66-671, Vol. I; AD-646867) CFSTI: HC $3.00/MF $0.65

Volume I of the three-volume final report summarizes Phase II of a three-phase project on the Use of Air Force ADP Experience to Assist Air Force ADP Management. The history of the project is traced and the objectives, findings, conclusions, and recommendations are summarized and tabulated. The conclusions are as follows: that sufficient data can be collected to permit macrodescription of an ADPS; relationships do exist between workload descriptors and costs; the information can be distilled and organized into an indexed ADP Experience Handbook; and, for Phase III, an Air Force ADP Management Information System is necessary, feasible, and cost effective. The implementation of Phase III is recommended.

Author (TAB)

N67-10583# RAND Corp., Santa Monica, Calif.

OPTIMAL LINEAR INVENTORY CONTROL AND FIRST ORDER EXPONENTIAL SMOOTHING

Dale M. Landi and B. Mc K. Johnson (Connecticut Univ.) Aug. 1966 13 p refs

(P-3264-1; AD-638026) CFSTI: HC $1.00/MF $0.50

A linear, fixed-interval stock replenishment policy that achieves an optimal cost balance between inventory and order-level variances is derived in this paper. The reorder rule relies on first order exponential smoothing to predict random components of the demand sequence, which are assumed to be pairwise uncorrelated with mean zero and variance that either grows or decays geometrically, or remains constant in time

Author (TAB)

N66-87919 Committee on Post Office and Civil Service, (U. S. House). Subcommittee on Manpower.

IMPROVED MANPOWER MANAGEMENT IN THE FEDERAL GOVERNMENT. EXAMPLES FOR THE PERIOD JANUARY–JUNE 1966

Washington, GPO, Oct. 1966 24 p

Examples of improved manpower management plans, programs, and accomplishments developed by various departments and agencies of the Federal Government between January and June 1966 are presented. This summary, based on the semiannual reports submitted by the 26 largest departments and agencies, shows employment data and trends, manpower problems, and management improvement accomplishments. The work of main functional areas, including personnel, fiscal management, management analysis, and training, is reflected in this subcommittee report.

M.W.R.

N66-87320 Litton Systems, Inc., Woodland Hills, Calif. Guidance and Control Systems Div.

CONFIGURATION MANAGEMENT OPERATING PROCEDURES

W. G. Bennett, N. P. White, and F. W. O'Green 17 Jun. 1963 206 p

(PUBL-2758)

Interim procedures are outlined for a uniform specifications program, serialization, and configuration acceptance inspection as related to configuration management operations within a guidance and control systems division. Configuration control is concerned with engineering, vendor, and other control aspects; and procedures used at the various levels are included. Terms and definitions are spelled out in a glossary.

M.W.R.

N66-85827 System Development Corp., Santa Monica, Calif.

DEVELOPMENT OF AN OPERATIONAL MANAGEMENT SYSTEM

Ramon J. Rhine 16 Apr. 1963 27 p refs Presented at the Systems Symp., Washington, D. C., 22 Apr. 1966; Sponsored by Defense Supply Agency

(SP-1175; AD-410972)

This paper describes the development of a management system which provides for a single, integrated semiautomatic system that supports top- and middle-management decision making as well as the administrative, accounting and personnel functions.

Author

N66-82755 Arimc Research Corp., Washington, D. C.

SPECIAL INTERIM REPORT ON COST STUDIES

D. E. Van Tijn 14 Jul. 1961 4 p *Its* Publ. No. 159-1-250

(Contract AF 33(600)-42462)

(AD-261062)

The cost to the Air Force resulting from the failure equipment is considered in a model that encompasses loss of manpower, time, and missions as well of money. Methodology used in the study is to partition functions or to assign tasks to every man and every unit in the maintenance organization, and to assign weights to various discrepancies or failures that occur at each of the functions. Methods of performance of these functions and their classifications and units involved are tabulated; and time distributions for each function are considered.

M.W.R.

N66-36541# Brown Engineering Co., Inc., Huntsville, Ala.

THE COMPATIBILITY OF VALUE ENGINEERING AND CONFIGURATION MANAGEMENT

Marvin Wasserman *L n* Canaveral Council of Tech. Soc. 3d Space Congr. 1966 p 437–451 refs (See N66-36506 22-30)

This report is aimed at management levels responsible for ensuring system compatibility and mission success. The report provides a familiarization with the philosophies of system management and the interrelationships of program management, system engineering, and management tools. Value engineering and configuration management are discussed as the catalysts to be integrated into the management network, thus assuring system compatibility and mission success at the lowest overall cost.

Author

N66-33837# RAND Corp., Santa Monica, Calif.
PROCEDURES FOR ESTIMATING THE RESOURCE RE-QUIREMENTS OF MANNED SPACE FLIGHTS
Joseph String   Jun. 1966   30 p   Presented at the Spring Meeting of JSGOMRAM, Boston, 27 Apr. 1966
(P-3382; AD-634085) CFSTI: HC $2.00/MF $0.50

The paper is addressed to three principal topics: (1) what a typical manned space flight plan looks like; (2) procedures employed in evaluating the resource impact of alternative space flight proposals, either projects or plans; (3) the resource implications of some of the major types of activities currently being considered in NASA's long-range planning.

TAB

N66-33635# System Development Corp., Santa Monica, Calif.
COMPUTERIZATION: SOME IMPLICATIONS FOR DECISION MAKING
G. H. Perry 30 May 1966 17 p refs
(SP-2487; AD-633908) CFSTI: HC $1.00/MF $0.50

Decision making is discussed both in a broad economic context and in a specific definitional sense, and is then related to the information revolution, or computerization. The directional and dimensional changes in the decision making process that appear to be imminent or already underway are described, and predictions are made of the effects these changes will have upon managers' jobs in the near-term future.

Author (TAB)

N66-24515 Joint Publications Research Service, Washington, D. C.
AUTOMATIC OPERATIONAL MANAGEMENT OF PROCESSES OF PRODUCTION
A. B. Chelyustkin, ed. 8 Apr. 1966 331 p refs Transl. into ENGLISH of the Book "Avtomaticheskoye Operativnoye Upravleyiye Proizvodstvennymi Protessami" Moscow, 1965 p 1–247

Reports presented at a conference on technical cybernetics cover problems arising in the development of operational management systems in various branches of industry as well as problems that arise during manufacturing procedure. Mathematical models of complex production processes and other aspects of industrial concern are presented, as are methods and programs for determining optimal solutions via general and specialized computers. Technical means of collection, transmission, and processing of information are considered; as are other aspects of automation and control processes related to mass production industries. Several contributions deal with the role of the human operator and the relationships between man and machine. M.W.R.

N66-11547# System Development Corp., Santa Monica, Calif.
FACTORS THAT AFFECT THE COST OF COMPUTER PROGRAMMING
Leonard Farr and Burt Nanus Bedford, Mass., AFSC, Electron. Systems Div., Jul. 1964 63 p refs
(Contract AF 19(628)-1648)
(ESD-TDR-64-448; AD-603707)

Although accurate estimation of computer programming costs is an important prerequisite for effective programming management, such estimates have historically been very unreliable. Some of the underlying causes of this problem are discussed, and about fifty factors that appear to contribute to the cost of computer programs are identified. Data concerning the effects of a few of these factors upon cost are presented by way of illustration. Recommendations are made for more detailed cost collection, cost analysis, and experimentation.

Author (TAB)

N65-88396 Columbia Univ., New York. Statistical Engineering Group.
SOME FURTHER RESULTS ON INVENTORY DEPLETION MANAGEMENT
Gerald J. Lieberman 15 Jan. 1958 10 p refs
(Contract DA-18-108-CML-1625)
(TR-3)

An alternate set of sufficient conditions on L(S), the field life of an item, is presented under which a LIFO (last in, first out) policy is optimal for inventory management. Two sets of conditions on L(S) are also given under which a FIFO (first in, first out) policy is optimal. As with the LIFO policy, only the relative age of the items must be known for FIFO; and, under the second set of conditions, it is not necessary to verify the results for the case of two items. It is noted that the problem of determining whether LIFO or FIFO is an optimal policy resolves itself into determining which is optimal for the case of $n = 2$. M.W.R.

N65-88394 Columbia Univ., New York. Statistical Engineering Group.
INVENTORY DEPLETION MANAGEMENT
Cyrus Derman and Morton Klein 15 Oct. 1957 16 p refs
(Contract DA-18-108-CML-1625)
(TR-2)

Finding the order of item issue which maximizes the total field life obtained from a stockpile is considered, as is the order of stock issue which maximizes the total expected utility obtainable from a specified number of items while meeting the given demand schedule. Sufficient conditions are given in each case under which a LIFO (last in, first out) use policy will be optimum. Brief mention is also made of FIFO (first in, first out) inventory depletion policies. M.W.R.

N65-32701# Army Missile Command, Huntsville, Ala.
VALUE ENGINEERING SYMPOSIUM, ADVANCEMENT IN THE STATE OF THE ART
[1964] 448 p Symp. Held at Redstone Arsenal, Ala., 18–19 Nov. 1964
(AD-616516)

Papers accepted in connection with the Army Missile Command's value engineering symposium are presented under 11 major categories concerned with decision making, cost analysis, statistical applications, and program management. Papers on design tradeoffs, game theory and checkout, and costs are included under value decision techniques. Various cost effectiveness approaches are described; and charts, nomographs and other estimating techniques are included. Attention is given to the mathematical analysis of value, target cost programs, and value engineering research. Various program management experiences are reported; including an approach for electronics research and development laboratory, the Air Force Logistics Command efforts, and dynamic management via PERT. Value engineering is considered in terms of paperwork operations, research and development, applications, and contracts and economics. M.W.R.

N64-83865 System Development Corp., Santa Monica, Calif.
COMMAND-AND-CONTROL AND MANAGEMENT DECISION MAKING
Ramon J. Rhine 20 May 1963 24 p
(SP-1174)

Management concepts are found to be the major concepts underlying the development of command and control systems in support of decision making and action taken by military organizations. The command and control type system for top management decision making is a man–machine system having at its core an ongoing, dynamic operation. Growth of military command and control and basic functions of such systems are discussed; and special attention is given to the meaning of both control and command in this context. Plans, monitoring, and dynamic operations are stressed. M.W.R.

N63-81003 George Washington Univ., Washington, D. C.
EXPERIENCE IN DATA COLLECTION. 1: ADMINISTRATION AND ORGANIZATION FOR DATA COLLECTION
J. E. Hamilton 8 Sep. 1960 76 p refs
(Contract NR-047001)
(AD-242853)

The Project was organized as a Naval Task Force and established task groups to visit the more than 120 ships and shore stations which contributed data to the program. The experience of these task groups is presented in a way which is intended to be of assistance to either a Navy task force or a contracting group acting under naval sponsorship if assigned the task of data collection. It is indicated in the paper that the mere act of collecting data is not very expensive. For the regular part of the program with data pertaining to 65 ships being collected, the cost averaged about $530.00 per ship-year. The program described is unique among Navy programs in the following respects: it was carried out for the purpose of empirical research in logistics; it covered a large sample (65) of ships; it covered support activities as well as ships themselves; it covered all kinds of material; it was continued for a long time; it included three years of quasi-war (Korea) and two to six years of quasi-peace (post-Korea); it was conducted by a contractor; and raw documents, not reduced or aggregated data were collected. Author

N63-21721 Stanford U., Calif. Applied Mathematics and Statistics Labs.
SOME ECONOMIC ASPECTS OF RELIABILITY AND PROJECT MANAGEMENT
David C. Dellinger May 31, 1963 199 p 52 refs
(Contract Nonr-225(53))
(Tech. Rept. 67)

An attempt is made to emphasize the dangers of indiscriminate use of mathematical models in reliability and project management. To utilize the results of theoretical models, one must find or develop a model which fits the particular problem. In the application of reliability test models, the practitioner must either make a judgment relative to the underlying distribution of time to failure or utilize the more expensive nonparametric tests, if realistic results are to be obtained. To utilize the decision theory model for selecting the most economical test procedure, the problem of determining the appropriate a prioiri distribution and the relevant costs must be faced. The true value of management science can only be measured in terms of its contribution toward the solution of practical management problems. Unless the gap between the model builder and the practitioner is reduced, its full value cannot be realized. P.V.E.

N63-17425 Minneapolis-Honeywell Regulator Co. Military Products Group, Minn.
COMMAND AND CONTROL SYSTEMS ANALYSIS Final Report
R. C. Kiene, A. R. Butz, and L. B. Winrich Griffiss AFB, N.Y., Intelligence Lab., Dec. 1962 144 p 20 refs
(Contract AF 30(602)-2752)
(R-RD-1539-TRI; RADC-TDR-62-612)

This report presents the steps of a generalized systems-analysis procedure for command and control systems. The steps are then followed, utilizing an existing SAGE Direction Control system as a vehicle for the study. Emphasis is placed upon modeling the human organization as a whole. Author

N63-12833 General Electric Co. Technical Military Planning Operation, Santa Barbara, Calif.
COST-BENEFIT ANALYSIS AS AN AID TO SYSTEM SELECTION
Harry P. Hatry [1962] 29 p 16 refs Presentation at the General Electric Systems Engineering Symp., Schenectady, N.Y., Nov. 15, 1962
(SP-201)

A method of analyzing systems is presented as an aid in the selection of a system to perform some given mission. The method considers both the cost and effectiveness criteria, jointly. The method is illustrated by the following missions: system to repair orbiting satellites; weather and reconnaissance satellites; tactical bombing aircraft; and nuclear detection system. R.C.M.

N63-11798 California U., Berkeley. Lawrence Radiation Lab.
INTRODUCTION TO PROJECT LOGIC PLANNING
William C. Bagot Oct. 1962 19 p
(Contract W-7405-eng-48)
(UCRL-1049) OTS: $0.50

A computer program, PROLOG, has been developed for the management of large-scale projects. In this variation of the critical path method, activities are first diagramed in their logical sequence, and only after this planning phase are times associated with the activities. The shortest possible duration of the project is the time required for the longest chain of sequential activities. Once the project duration has been calculated, the duration of each activity along the network can be obtained, and a time interval for completion of this activity can be established. This technique permits the use of more and randomly numbered node points and also provides for an exact relationship of working time with calendar time. Further, it provides a means by which those persons responsible for getting a task done can do their own planning after receiving information on how their task relates to the rest of the project. M.P.G.

N63-11217 Congress. House. Committee on Government Operations
SYSTEMS DEVELOPMENT AND MANAGEMENT (PART V)
Hearings before a Subcommittee of the Committee on Government Operations, U.S. House of Representatives, August 28, 29, 30, and 31, 1962 For abstract see N63-11213 03-01
Washington, GPO, 1962 360 p
(87th Cong. 2nd Sess. Committee Print)

N63-11216 Congress. House. Committee on Government Operations
SYSTEMS DEVELOPMENT AND MANAGEMENT (PART IV)
Hearings before a Subcommittee of the Committee on Government Operations, U.S. House of Representatives, August 13, 14, 15, 16, 20, and 21, 1962 For abstract see N63-11213 03-01
Washington, GPO, 1962 280 p
(87th Cong. 2nd Sess. Committee Print)

N63-11215 Congress. House. Committee on Government Operations
SYSTEMS DEVELOPMENT AND MANAGEMENT (PART III)
Hearings before a Subcommittee of the Committee on Government Operations, U.S. House of Representatives, August 1, 2, 3, 6, 7, 9, 10, and 13, 1962 For abstract see N63-11213 03-01
Washington, GPO, 1962 570 p
(87th Cong. 2nd Sess. Committee Print)

N63-11214 Congress. House. Committee on Government Operations
SYSTEMS DEVELOPMENT AND MANAGEMENT (PART II)
Hearings before a Subcommittee of the Committee on Government Operations, U.S. House of Representatives, July 23, 24, 25, 26, and 27, 1962 For abstract see N63-11213 03-01
Washington, GPO, 1962 378 p
(87th Cong. 2nd Sess. Committee Print)

N63-11213 Congress. House. Committee on Government Operations
SYSTEMS DEVELOPMENT AND MANAGEMENT (PART I)
Hearings before a Subcommittee of the Committee on Government Operations, U.S. House of Representatives, June 21, 22, 27, 29, and Aug. 15, 1962 For Part 2, see N63-11214 03-01; Part 3, see N63-11215 03-01; Part 4, see N63-11216 03-01
Washington, GPO, 1962 437 p
(87th Cong. 2nd Sess. Committee Print)

The text of the hearings before the Military Operations Subcommittee of the U.S. House of Representatives is presented in five volumes. The basis for the hearings was the report to the President on "Government Contracting for Research and Development," known as the Bell report. This report presents the policy guidelines for (1) deciding how vital research and development programs will be apportioned between Government and non-Government operations; (2) improving the Government's ability to review contractor operations and perform scientific and technical work; and (3) obtaining better contractor performance and lower costs. Witnesses representing Government Agencies, the Military Departments, the nonprofit corporations, assisting the Department of Defense with specialized technical services, and the industrial organizations were heard in an effort to clarify the major issues presented in the Bell report.   M.P.G.

N63-10094 Republic Aviation Corp., Farmingdale, N. Y.
A STUDY OF THE AIR FORCE MAINTENANCE TECHNICAL DATA SYSTEM [Final Report]
J. W. Losee, R. H. Allen, J. W. Stroud, and J. Ver Hulst Wright-Patterson AFB, Ohio, Behavioral Sciences Lab., Aug. 1962 199 p 5 refs
(Contract AF 33(616)-8193)
(AMRL-TDR-62-85) OTS: $5.00
This report details the research on preparation, production, distribution, evaluation, and verification of Air Force maintenance technical data. It highlights the impact of management on the procurement of accurate, timely, and economical data and identifies the areas in which management was found to be deficient. It points out the specific shortcomings in the data, in its preparation, distribution, and use. Finally, the report recommends actions considered necessary to first, improve the overall technical order system of management, and second, to enhance the quality, usefulness, and timeliness of the data produced.   Author

M2 CONTRACT MANAGEMENT

N67-40547# Congress. House. Committee on Government Operations.
BETTER MANAGEMENT OF RESEARCH EQUIPMENT PROCUREMENT AND UTILIZATION IN FEDERAL LABORATORIES
Washington, GPO, 1967 20 p refs 15th Report by the Comm. on Govt. Operations, 90th Congr., 1st Sess., 30 Oct. 1967
Attention is given to the huge scale and rising costs of Federal laboratory operations that require special management and continued improvement in a report by the Committee on Government Operations for the Committee of the Whole on the State of the Union to the 90th Congress. Both the difficulty in controlling the costs of laboratory equipment and inefficient management are noted, and emphasis is placed on the fact that greater economy and efficiency can be attained. The Brookhaven offer-of-sale procurement method, the U.S. Army Natick Laboratories' use of elapsed-time meters to establish equipment utilization, Goddard Space Flight Center's walk-through technique for identifying idle equipment, and equipment pools are mentioned as means to achieve better utilization.   M.W.R.

N67-40140# Logistics Management Inst., Washington, D. C.
TOTAL PACKAGE PROCUREMENT CONCEPT, SYNTHESIS OF FINDINGS
Jun. 1967 121 p ref
(Contract ARPA SD-271)
(AD-655814)
The Total Package method of procurement offers significant advantages over development-only type contracts for both the Government and industry. Advantages include cost savings, shorter development schedules, design for producibility, long range planning, and from the Government's point of view, increased competition. Disadvantages include greater financial risk, premature program definition, and severe competition and increased proposal expenses from the contractor's point of view. TPP should be applied to operational systems development programs and to smaller programs below the DoD Directive 3200.9 threshold criteria. TPP should not be applied to systems where the technology is rapidly changing and responsive to changing military needs or to systems which require an interface application. There is a greater need for an integrated management information system for TPP programs than there is for development-only programs. The Government should disengage from the contractor in TPP programs, and retain visibility but not control unless program redirection is necessary. On balance, the influential factors of cost, schedule, and system performance in the TPP programs studied tend to support rather than constrain technical innovation.   Author (TAB)

N67-39769# Logistics Management Inst., Washington, D. C.
MULTI-YEAR PROCUREMENT AT THE SUBCONTRACTOR LEVEL
Jun. 1967 37 p refs
(Contract ARPA SD-271)
(AD-655815)
The increasing use of multi-year and total package procurement has given rise to the possibility of achieving greater economies by the use of multi-year subcontracts. In addition, prime contracts placed on an annual funding basis, and sole source prime contracts may provide opportunities for price reductions through multi-year subcontracting. The purpose of this task is to (1) investigate industry policies and practices in using multi-year procurement techniques at the subcontract level; (2) identify and analyze DoD policy, fiscal, and contractual impediments, if any, to the use of multi-year subcontracts for both multi-year and non-multi-year prime contracts; (3) identify and analyze any extraordinary risks to both the Government and contractors inherent in multi-year subcontracting; (4) develop criteria for selection and conduct of procurements to test the practicability, and to determine the benefits to the Government of multi-year subcontracting.   Author (TAB)

N66-87880 Air Force Systems Command, Andrews AFB, Md.
MANAGEMENT OF CONTRACTOR DATA REPORTS, VOL-UME 1
18 Nov. 1963 21 p Prepared with AF Logistics Command, Wright-Patterson AFB
(AFSCM-310-I; AFLCM-310-1)

Policies, procedures, and general information for management of data by contractors are included in this first volume of a manual for Air Force contractors. Policy and responsibilities with regard to data acauisition are detailed; as are instructions for compliance with federal reports and various required data reviews. Logic flow network, time phased milestones, and specific acquisition flow are presented for a typical system acquisition flow. The policies, responsibilities, and management procedures described herein are those established by the Air Force Systems Command and Air Force Logistics Command headquarters. M.W.R.

N66-36538# Radiation, Inc., Melbourne, Fla.
COMBINING R AND D AND FOLLOW-ON PRODUCTION IN A SINGLE CONTRACT
John W. Simmons *In* Canaveral Council of Tech. Soc. 3d Space Congr. 1966 p 420–426 (See N66-36506 22-30)

The combined contract, designed to reduce or eliminate problems which have caused concern to the government and still not go to the extreme and require the contractor excessive risk, is discussed. It is pointed out that considerations should be given to the specific type of procurement. The cost plus fixed fee, cost plus incentive fee, fixed price incentive, and fixed price contracts are compared. Examples are included, and additional conditions are mentioned. N.E.N.

M3 RESEARCH & DEVELOPMENT

N67-81120 Wisconsin Univ., Madison. Center for Advanced Study in Organization Science.
ORGANIZATIONAL FACTORS IN SCIENTIFIC PERFORM-ANCE IN AN INDUSTRIAL RESEARCH LABORATORY Final Technical Report
Clagett G. Smith Oct. 1966 203 p refs
(Contract Nonr-4743(00))
(AD-641423)

The research constituted an investigation of organizational factors in scientific performance. A number of hypotheses were tested within a theoretical framework whose major premise states that outstanding achievement in science requires an 'essential tension' between an orientation toward tradition or wisdom and toward innovation or novelty. Work of highest significance is believed to occur in the simultaneous presence of conditions emphasizing wisdom and of those emphasizing novelty. Specifically, several sources of wisdom and novelty were examined as they arose from individual patterns of consultation, from processes occurring within the work group, and from certain aspects of organizational structure. These variables provided substantial predictions of scientific performance, particularly at the work group and organizational level. Thus, the findings partially substantiate the theory while at the same time suggesting certain modifications applicable in the administration of industrial research laboratories. Author (TAB)

N67-33183# Oak Ridge National Lab., Tenn.
CRITICAL PATH TIME-COST SCHEDULING FOR MANAGEMENT OF RESEARCH AND DEVELOPMENT PROJECTS

W. W. Goolsby and F. T. Snyder May 1967 85 p refs
(Contract W-7405-ENG-26)
(ORNL-4112) CFSTI: HC $3.00/MF $0.65

A method of managing research and development projects that incorporates a system of cost control with critical path scheduling has been developed at Oak Ridge National Laboratory, and the method is currently being used on selected projects at the Laboratory. This method serves the needs of the project managers in planning, analyzing, and controlling projects from their inception through their completion. Designed as a general-purpose system that makes maximum use of the automated processing of information, the scheduling system permits management to obtain a coordinated set of time and resource schedules with the option of resource leveling. The cost system uses the information generated by the scheduling system to collect and report detailed costs for labor, material, and equipment. The actual expenditures of time, manpower, and dollars are then compared with the estimated expenditures and the scheduled progress. The development of this time-cost method of project management at Oak Ridge National Laboratory is discussed in this report, and the functions of the scheduling and cost systems, the input requirements for the computer programs, the computer reports, and the options available are described. Author (NSA)

N66-84247 Stanford Research Inst., Menlo Park, Calif.
APPLICATIONS OF THE BEHAVIORAL SCIENCES TO RE-SEARCH MANAGEMENT: AN INITIAL STUDY IN THE OF-FICE OF AEROSPACE RESEARCH
Howard M. Vollmer Nov. 1964 93 p refs
(Contract AF 49(638)-1028)

Organization of research activities; evaluation of research productivity; and recruitment, retention, and utilization of scientists are considered in a program dealing with applications of the behavioral sciences to research management. The program was conducted by having a behavioral scientist work for a period of several weeks in close association with the members of an Office of Aerospace Research (OAR) headquarters or laboratory staff in order to build a communications bridge in OAR between the practical world of management and the theoretical world of behavioral sciences research. The OAR practices are compared to behavioral sciences findings in the areas of organization, productivity, and personnel management; and problems encountered by OAR are presented. M.W.R.

N66-36539# International Business Machines Corp., Bethesda, Md. Federal Systems Div.
CAPABILITY MANAGEMENT: AN APPROACH TO SELLING RESEARCH AND DEVELOPMENT
Salvatore F. Divita *In* Canaveral Council of Tech. Soc. 3d Space Congr. 1966 p 427–432 (See N66-36506 22-30)

This paper contains a new concept in the approach to marketing R&D capabilities to the defense/space market. The concept is based primarily on establishing capability managers as the focal point of the marketing function. It suggests that this is only one of the several new concepts that are needed to meet the challenges of this unique marketplace. The paper reviews the current approach to selling R&D and tries to relate it to the workings of the marketplace. It points out some of the fundamental shortcomings of the current practice and, in building upon this examination, it goes on to suggest a new approach to the problem. Author

N66-32852# Sandia Corp., Albuquerque, N. Mex.
ORGANIZATION AND MANAGEMENT OF A STANDARDS AND CALIBRATION PROGRAM FOR A RESEARCH AND DEVELOPMENT LABORATORY

R. L. Schneider Apr. 1966 10 p Presented at the Natl. Conf. of Std. Labs., Ann. Meeting, Gaithersburg, Md.
(Contract AT(29-1)-789)
(SC-DC-66-1491; CONF-660522-1) CFSTI: HC $1.00/MF $0.50

A measurement standards and instrument calibration program for a research and development laboratory is described. The description of this program deals primarily with the organizational philosophy of the system and does not delve into the technical aspects of standards or instrument calibration.
<div align="right">NSA</div>

N66-13617# Massachusetts Inst. of Tech., Cambridge. Alfred P. Sloan School of Management.
RESEARCH PROGRAM ON THE MANAGEMENT OF SCIENCE AND TECHNOLOGY. TIME ALLOCATION AMONG THREE TECHNICAL INFORMATION CHANNELS BY R & D ENGINEERS
Thomas J. Allen and Maurice P. Andrien, Jr. Aug. 1965 25 p refs
(Grants NSF GN-233; NSF GN-353)
(Rept.-131-65)

Four parallel research and development projects are examined to determine the manner in which engineers and scientists allocate their time, and the effect of this allocation on the outcome of the projects. The use of matched pairs of projects allows the relative evaluation of outcomes by technical monitors in the customer agencies. It is seen that the percent of total time spent in three categories of information gathering (outside consultation, staff consultation, literature search) varies significantly over the life of a project. Higher rated teams are relatively stable in all phases of information gathering while lower rated teams initially spend far more time gathering information than they do in the later stages, and fluctuate more throughout the project. It is also seen that subsystems characterized by greater uncertainty receive a higher percent of information gathering time than subsystems where uncertainty is lower.
<div align="right">C.T.C.</div>

N65-86414 Air Force Systems Command, Edwards AFB, Fla. Directorate of Armament Development.
A STUDY OF R & D EFFECTIVENESS OF A SMALL USAF ORGANIZATION EMPLOYING TIME, COST, AND PERFORMANCE FACTORS OF CONTRACTED EFFORT
William W. Metz (M. A. Thesis—Fla State Univ.) Oct. 1964 33 p refs
(ATL-TR-64-70; AD-454536)

Effectiveness of research and development procurement in the field of airborne targetry was studied in terms of performance, development time, and development cost. Case studies were a representative sample of 25 contracts completed during a six-year period; and a decided bias was evidenced toward over-optimism and the consequent understatement of development time and cost of targetry equipment. In addition to competitive optimism, major factors contributing to development cost increases were technical difficulty, additional scope, and change in overhead rates. The more ambitious the targetry project, the less accurate were the development time predictions; although the end item performance was usually realized as the result of increased development costs and time. It is hypothesized that in-house research and development efforts have definite advantages over contracted efforts.
<div align="right">M.W.R.</div>

N65-18294# Stanford Research Inst., Menlo Park, Calif.
APPLICATIONS OF THE BEHAVIORAL SCIENCES TO RESEARCH MANAGEMENT: AN INITIAL STUDY IN THE OFFICE OF AEROSPACE RESEARCH

Howard M. Vollmer Washington, AFOAR, Nov. 1964 94 p refs
(Contract AF 49(638)-1028)
(IMU-3580; AFOSR-64-2555; AD-609356)

The method of study included collection of data by use of personal interviews, a standard written questionnaire, and review of management records. It also included inputs of information from the behavioral sciences to management during the 12-month period covered by the study. Findings on research organization substantiate the importance of protecting the integrity of research activities and of differentiating them from development, to maintain a participatory style of leadership, to support methods to translate research findings into rapid utilization, and to assure a sense of continuity in laboratory structure and research programs. Findings on the evaluation of research productivity point out methods to measure the quality of research products, as well as quantity, through examining subsequent citations of publications and the source of original publication. Findings on the recruitment, retention, and utilization of scientists suggest the importance of freedom in the conduct of research as a general incentive, and also indicate the importance of further research to analyze effectiveness of different incentives for different types of civilian and military scientists identified in this study.
<div align="right">Author</div>

N64-32217 Office of Naval Research, Washington, D.C.
AN EXPLORATORY STUDY IN RESEARCH PLANNING METHODOLOGY
Herman I. Shaller Sep. 1963 19 p ref
(ONR-ACR/NAR-27)

A quantitative methodology for use as an aid to research program planning is sought. An operations research approach to the problem is described, and a generalized systems concept of the research planning process is outlined as background material for the analytical techniques proposed. There are three basic ingredients to the proposed research planning system. The first is the concept of a category-attribute matrix, which describes numerical relationships between desired attributes of a research program and categories of research. The matrix yields a numerical output called "effectiveness." The second ingredient is a predetermined collection of classification systems, which suggests a set of constraints for a balanced program. The third ingredient is a perturbation technique that is used to answer questions posed to the system. Five theorems are proved, and a model consisting of numerical arrays has been formulated to characterize the state of a program.
<div align="right">Author</div>

N64-27208 National Science Foundation, Washington, D.C.
COUNTRY REPORTS ON THE ORGANIZATION OF SCIENTIFIC RESEARCH: UNITED STATES
Mary E. Corning Organisation for Econ. Co-operation and Develop. [1963] 92 p refs

Because of the lack of concise and reliable information on the organization of sciences in member countries of the Organization for Economic Co-operation and Development, it was decided that reports should be prepared by the countries themselves, but that a uniform pattern in subject material and terminology should be followed. The subject of the survey is the mechanism of research, including information on the establishments organizing and promoting scientific research. The reports concentrate on the natural sciences (pure and applied science and technology); educational matters are included only insofar as they pertain to a country's research efforts.
<div align="right">D.S.G.</div>

M4 MANAGEMENT TOOLS & TECHNIQUES

N67-80945   Naval Postgraduate School, Monterey, Calif.

A MATHEMATICAL MODEL OF LONG-RANGE PLANNING

Thomas E. Oberbeck *In its* Fac. and Staff Reprints [1964] 16 p refs Presented at the 10th Intern. Meeting of the Inst. of Management Sci., Tokyo, 21–24 Aug. 1963 (See N67-80915)

Thirty-four publications by faculty and staff of the United States Naval Postgraduate School are reprinted that deal with a variety of subjects in the biological and physical sciences. Some of the papers consider optimal determinations of ship routes, various aspects of automatic control theory, and theoretical mathematical presentations. Management related contributions are concerned with cross disciplinary education in control engineering, a mathematical model of long range planning, and optimum control.

M.W.R.

N67-80496   Mitre Corp., Bedford, Mass.

INFORMATION SYSTEM SIMULATION AND MODELING TECHNIQUES

[1962] 125 p refs Presented at 1st Congr. on the Inform. System Sci., Bedford, Mass., 14 Nov. 1962; Sponsored by Mitre Corp. and AF Electron. Systems Div.

Three reports presented at an information system sciences conference session deal with information systems simulation and modeling techniques. Leviathan, an approach to an experimental study of large organizations with the aid of computers is detailed, including the .conceptual model, command language, hierarchal diversity, automatic mode and live simulation, and simulation in a combined live and artificial mode. Another paper presents a methological spectrum, considers experimental design in empirical systems research, and makes a functional task analysis of the information systems research project. A third presentation deals with an environmental simulation as a technique for studying human behavior.

M.W.R.

N67-38062   California Univ., Berkeley.   Operations Research Center.

A NOTE ON DIVISIBILITY ACTIVITIES IN CRITICAL PATH ANALYSIS

Lawrence D. Bodin *In its* Notes on Operations Res.—6   May 1967 6 p refs (See N67-38061 23-19)

An alternate method of solving the divisible activity problem is discussed. Constraints are added to make the original alternate primal formulation a special case of the cost–time project scheduling problem. This redefinition permits the divisible activity problem to be solved by an algorithm already developed for solving the cost–time project scheduling problem.

N.E.N.

N67-33913#   Frankford Arsenal, Philadelphia, Pa.

A NUMERICAL TAXONOMY METHOD TO EVALUATE AND PREDICT EQUIPMENT PERFORMANCE AND ENVIRONMENTAL ENGINEERING DATA

Maurice H. Simpson Apr. 1967 64 p refs
(FA-R-1847; AD-653621) CFSTI: HC $3.00/MF $0.65

Environmental engineering seeks solutions to particularized problems about equipment compatability with natural and man-made environments. Since World War II environmental engineering has become costly, time consuming and a big consumer of lead time in product development. However, since World War II considerable environmental effects data about equipment performance has been painstakingly obtained and stored. These data are pertinent and relevant to present day equipment. It is accessible—yet, it isn't being used. The engineering community continues to design and test rather than 'search' the literature for these environmental effects data. As an element of engineering, information is meaningful only in terms of decision making, and decision making patterns related to physical systems. Raw description doesn't adequately fit this

pattern, so the engineer cannot use it. Information retrieval system effectiveness is now measured by the number of hits vs misses of relevant documents retrieved. This is not enough for the engineer, he needs information, not data or some documents that might contain what he is looking for. The proposed method developed herein corrects this situation by converting the raw documental data into usable information directly applicable to the engineer's decision process in terms related to performance of physical systems. It does so by introducing into the information retrieval process a system of numerical taxonomies that are clinically diagnostic of equipment performance characteristics. These taxonomies are descriptive throughout the range from failure to oversuccess and are called 'environmental predictors.'   Author (TAB)

N67-21816#   Oak Ridge National Lab., Tenn.

CRITICAL-PATH METHOD FOR SCHEDULING THE TRANSURANIUM PROCESSING PLANT: AN APPRAISAL

W. D. Burch and C. H. La Master Mar. 1966 44 p ref
(Contract W-7405-ENG-26)
(ORNL-3925) CFSTI: HC $3.00/MF $0.65

At the direction of the Atomic Energy Commission, the construction of the Transuranium Processing Plant was scheduled by the critical-path method (CPM) as a test of its usefulness in coordinating and expediting all phases of a major construction project. The use of CPM for the ORNL phases of the project is summarized, along with techniques used and major problems and advantages of this method in scheduling the design, procurement, fabrication, and installation of equipment. Coordination and scheduling of associated research and development programs were attempted with only limited success. To the members of the project, CPM appeared to have outstanding advantages over previous scheduling systems for a construction project. The fact that the basic project was completed very nearly on schedule (12/31/65) and well within the originally allotted funds can be at least partially attributed to the exacting scheduling required by CPM. The cost attributed directly to scheduling represented 1.3% of total funds expended on the project by the Laboratory. Specific methods used, and discussions of day-to-day management and supervisory uses of the technique are reported. Examples are given to show advantages in developing such schedules, their usefulness in alerting management to trouble spots, and the actions taken by management. Examples of failure to meet expectations are also cited.   Author (NSA)

N67-15410#   System Development Corp., Santa Monica, Calif.

INFORMATION PROCESSING POTENTIALS IN LARGE-SCALE OPERATIONS   Summary Report, Oct. 1962–Jun. 1966

Beatrice K. Rome and Sydney C. Rome   18 Jul. 1966   42 p refs
(Contract AF 19(638)-5166)
(TM-1128/100/00; AD-640591) CFSTI: HC $3.00/MF $0.65

In the study of large organizations, the information, communication, and governing processes have been extremely difficult to formulate. Towards such a formulation, the strategy of the Leviathan studies has been to pursue two lines of attack--theoretical formlization and computer-based simulation. By these means, Leviathan research has studied the interrelationships between (1) executive policy making and control and (2) system performance of large organizations, within (3) experimentally controlled laboratory environments. In answer to the challenge of markedly enhanced computer capabilities just now being made available, practical and theoretical advances have been made in formalizing the communication and governing process in large organizations. These advanced formulations and their significance are explained.   Author (TAB)

N67-13766# Deutsche Forschungsanstalt fur Luft- und Raumfahrt, Brunswick (West Germany).
NETWORK PLANNING TECHNIQUE. A SURVEY ON THE METHODS OF CPM AND PERT [NETZPLANTECHNIK. EINE UBERSICHT UBER DIE VERFAHREN CPM UND PERT]
A. Papendieck Mar. 1966 46 p refs *In* GERMAN; ENGLISH summary
(DLR-MITT.-66-12) CFSTI: HC $2.00/MF $0.50

During the last years the field of time scheduling for large projects has seen the fast expansion of a new planning method know by many different names. The most frequently used names are Network Planning Technique, Network Analysis, PERT (Program Evaluation and Review Technique), and CPM (Critical Path Method). The number of different names has been estimated to approximately fifty. The methods, however, are only slightly different from each other, the essential principles are inherent to all of them. This report considers the main ideas. Finally, a computer program is described.　　　　　Author

N67-12014 Joint Publications Research Service, Washington, D. C.
APPLICATION OF ORGANIZATION CONTROL SYSTEMS
V. Yu. Nevrayev et al 23 Nov. 1966 13 p Transl. into ENGLISH of a Report Originally Entitled "Metodicheskiye Materialy Po Sozdaniyu i Primeneniyu Sistem Organizatsionnogo Upravleniya, Vyp 1 Printsipy Postroyeniya Setevykh Modeley Kompleksov Operatsii" Moscow, Inst. of Automation and Telemechanics, 1964
(JPRS-38762; TT-66-35186) CFSTI: $1.00

Presented is a discussion of basic concepts and methods used in the development and application of organization control systems for handling complex operations.　　　　　S.C.W.

N67-10520# Texas A&M Research Foundation, College Station.
SIMULATION OF PERT PROJECT COMPLETION TIMES BY STRATIFIED SAMPLING METHODS Technical Report No. 3
Larry J. Ringer [1966] 11 p refs
(Contract DA-31-124-ARO(D)-282)
(AROD-4721-4; AD-637830) CFSTI: HC $1.00/MF $0.50

The algorithms for computing the cumulative distribution of the completion times of PERT networks proposed by Hartley and Worthan (AD-626 486) and Ringer (AD-630 841) will in general only reduce the original network to a network with fewer activities. The c.d.f. of the project completion time for the reduced network will then be computed by some other method, such as Monte Carlo simulation. In this note sampling schemes for estimating this c.d.f. are discussed. A completely random sampling scheme and a sampling procedure based on stratification of activity completion times are described and compared.　　　　　Author (TAB)

N66-87830 Information Dynamics Corp., Wakefield, Mass.
A METHODOLOGY FOR THE ANALYSIS OF INFORMATION SYSTEMS Final Report
David E. Sparks, Mark M. Chodrow, and Gail M. Walsh May 1965
112 p refs
(Contract NSF-C-370)
(R-4003-1)

Management problems in information network design and mathematical modeling techniques as management tools are considered in a study dealing with the representation and economic evaluation of various possible scientific and technical information systems. Elaboration of the mathematical framework was followed by the writing and debugging of a computer program and the development of test case data. Schemata of organization, organizational dimensions, and structure and allocation are detailed for

the test cases; and these cases are considered according to user communities, interdisciplinary bias of the communities, information input types and their transformation within the system, processes to carry out the transformations, and cost factors related to information types and processes. The presented methodology is considered to have a high degree of usefulness for testing information system configurations and for general management planning.　　　　　M.W.R.

N66-80779 Operations Research, Inc., Silver Spring, Md.
A GENERALIZED NETWORK APPROACH TO THE PLANNING AND SCHEDULING OF A RESEARCH PROJECT
Howard Eisner Repr. from Operations Res., v. 10, no. 1, Feb. 1962 p 115–125 refs

This paper describes a configurational and mathematical tool that may be used in the planning and scheduling of a research program. The configuration, termed a decision box (*db*) network, is a generalization of the PERT network and allows alternative procedures for accomplishing research tasks to be considered. The probability of following each alternative is estimated, leading to a ranking, in terms of probability of occurrence, of the possible outcomes of the research program. The entropy of the process is calculated using classical information theory concepts. Standard PERT techniques for time estimating and scheduling, superimposed upon the *db* network structure, complete the description of this research management tool.　　　　　Author

N66-80359 Army Electronics Logistics Research Office, Philadelphia, Pa.
AN EXTENSION OF PERT TO MULTI-PROJECT AND FUNCTIONAL MANAGEMENT: PERT-C
Jan. 1963 43 p Repr. of "A Signal Corps Concept for Multi-Project Management" May 1962
(AD-417333)

This paper describes a management information system and evaluation technique which has been designed for use by the U. S. Army Electronics Command in planning, scheduling, and monitoring the acquisition of communications-electronic equipments. The technique is designed to be a response to the general problem of "project" or "systems" management across functionally oriented field operating agencies. One of its primary objectives is to provide data, in varying detail and format, for use at all levels of management—at local operating levels as well as at command levels.　　　　　Author

N66-39602#. System Development Corp., Santa Monica, Calif.
DEVELOPMENT OF EQUATION FOR ESTIMATING THE COSTS OF COMPUTER PROGRAM PRODUCTION
V. La Bolle Bedford, Mass., AFSC, Electron. Systems Div., Jun. 1966 57 p
(Contract AF 19(628)-5166)
(TM-2918/000/00; ESD-TR-66-350; AD-637760) CFSTI: HC $3.00/MF $0.50

The report summarizes System Development Corporation (SDC) Technical Memorandum TM-2712 (AD-631 259). Additional sets of equations are given. Each set contains four equations; each equation shows how to form an estimate for one of the cost measures--number of man months, computer hours, new machine language instructions, months elapsed--by combining numerical values for selected factors that influence these costs. This report reviews the development of these equations including the application of statistical methods such as correlation and multivariate regression to experience data that characterize 74 computer programming efforts completed at SDC. The earlier work in the first cycle, a similar analysis of data for 27 SDC computer

programming efforts, is also described. After the publication of TM-2712, the second cycle was continued by additional analysis of the same SDC data for 74 computer programming efforts. The aim of the additional work was to improve the estimating precision of the equations presented in TM-2712. The improvements reported were achieved by deriving new cost equations, one set based upon a truncated sample and then three sets based upon three subsamples of the data. An interim evaluation of the work completed in the first and second cycles presents proposed improvements in approach and research methods.   Author (TAB)

N66-35641#   Mitre Corp., Bedford, Mass.
AESOP: A GENERAL PURPOSE APPROACH TO REAL-TIME, DIRECT ACCESS MANAGEMENT INFORMATION SYSTEMS
Joseph Spiegel, John K. Summers, and Edward M. Bennett
Bedford, Mass. AFSC, Electron, Systems Div., Jun. 1966 38 p
Presented at the Am. Management Assoc. Meeting, New York, Feb. 1966
(Contract AF 19(628)-5165)
(MTP-33; ESD-TR-66-289; AD-634371) CFSTI: HC $2.00/MF $0.50
     AESOP, a laboratory-based prototype of a general purpose, on-line, visually-oriented information system, is used to investigate ways of handling many different types and levels of command and management problems spanning organizational levels from the executive suite down through the staff and operations analysts to the actual system designers and programmers. In particular, it deals with those organizational activities that require highly flexible, direct-access capabilities, the system is configured for easy use by the inexperienced as well as by the sophisticated, and utilizes a variety of user station devices to facilitate such flexibility, including a cathode-ray-tube display, a lightgun, a typewriter, and associated push-buttons. At each station, it is capable of generating, editing, and formatting information on-line, as well as building, executing, and debugging on-line the analytic and mathematical procedures and algorithms of both the users and the system itself, depending upon the organizational area or level of the user. Although the basic prototype system was developed for use in military command and management planning and information systems, its philosophy and concepts are applicable to industrial and academic organizations.   Author (TAB)

N66-29484#   System Development Corp., Santa Monica, Calif.
RESEARCH INTO THE MANAGEMENT OF COMPUTER PROGRAMMING: A TRANSITIONAL ANALYSIS OF COST ESTIMATION TECHNIQUES
G. F. Weinwurm and H. J. Zagorski Nov. 1965 221 p refs
Includes errata sheet
(Contract AF 19(628)-5166)
(TM-2712/000/00; TM-2712/000/00A; AD-631259) CFSTI: HC $6.00/MF $1.25
     The report embodies results of a continuing research effect on development of management guidelines, standards, and techniques of computer programming. The report focuses on a statistical analysis of 74 completed computer programming jobs in terms of their resource-costs and related variables. The primary results are: indices of job difficulty, job type, development environment, and job uniqueness; a costliness factor that permits programming tasks to be ranked in this respect; weighted composites of the indices for estimating the cost of particular programming jobs; and scoring and confidence-band techniques

for blending intuitive managerial judgments with the formal cost-estimation procedures. Supplementary findings include indications of the relative sensitivity of job cost to changes in the values for the indices, and preliminary comparisons of resource usage between programs produced in machine-oriented or procedure-oriented languages. Recommendations are made for the collection of more accurate and current data on programming jobs during the production cycle, and the development of a census of computer programming, to enable the design of precise sampling experiments for subsequent analyses.   Author

N66-26411#   Texas A&M Univ., College Station. Inst. of Statistics.
INTEGRAL OPERATORS FOR PERT SUB NETWORKS
Technical Report No. 2
Larry J. Ringer 23 Mar. 1966 12 p ref
(Grant DA-31-124-ARO(D)-282)
(AROD-4721-3; AD-630841) CFSTI: HC $1.60/MF $0.50
     An algorithm was previously developed for computing the cumulative distribution of the completion time for certain PERT networks. These networks (which are termed 'multiple crossed') are composed of certain simple sub-networks: (a) two activities in series, (b) several activities arranged in parallel, and (c) five activities arranged in 'Wheatstone Bridge' configuration. In this note an extention is made to the concept of a 'multiple crossed' network by adding two additional sub-networks as building blocks to the three mentioned. Included is the development of integral operators for the 'double Wheatstone Bridge' and the 'criss-cross'.   C.T.C.

N66-22554#   Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
SCHEDULE ANALYSIS PROCEDURE
R. P. Rich Apr. 1960 34 p ref
(Contract NOrd-7386)
(TG-397; AD-627398) CFSTI: HC $2.00/MF $0.50
     The report describes a Schedule Analysis Procedure for use with the time schedule of a Research and Development (R and D) Program. The procedure is: (1) Identify certain clearly definable time points, called events, within the R and D program. (2) Identify the activities which must be carried out in order to get from each event to its immediate successors. (3) Obtain statistical estimates of the amount of time required for each of these activities. (4) Analyze the network of events and activities so defined to determine potential critical activities and chains of activities. (5) Take the necessary action—rescheduling, expediting, application of additional effort, etc.—to relieve the criticality. (6) Repeat as the needs of the program indicate. Step 4 can be carried out on a digital computer in an expeditious fashion, but clearly the results of this step will be of little value unless the inputs derived from steps 1–3 are reasonably reliable, and the corrective action in step 5 is taken.   Author (TAB)

N66-20839#   Mitre Corp., Bedford, Mass.
ESTIMATING METHODS AND DATA SOURCES USED IN COSTING MILITARY SYSTEMS
M. V. Jones Bedford, Mass., AFSC, Electron. Systems Div., Dec. 1965 129 p refs
(Contract AF 19(628)-2390)
(TM-04263; ESD-TR-65-396; AD-626153) CFSTI: HC $4.00/MF $1.00
     The choice of estimating methods and the selection of data sources are two important, closely allied decisions that

a cost analyst makes in estimating the costs of a military system. This report discusses five basic estimating methods, examines the advantages and disadvantages of each, and identifies the types of data required to use each method. The 5 methods are (1) per unit catalog price or planning factor, (2) cost-to-cost estimating relationship, (3) noncost-to-cost estimating relationship, (4) specific analogy, and (5) expert estimate.) Two basic data sources, documented historical evidence and projected expert opinion, are discussed as a means of carrying out these estimating methods. The report also briefly reviews existing data base systems that have been organized to make these data sources available to the cost analyst.

Author (TAB)

N66-20637# Research Analysis Corp., McLean, Va.
APPLICATION OF CHANCE-CONSTRAINED PROGRAMMING TO SOLUTION OF THE SO-CALLED "SAVINGS AND LOAN ASSOCIATION" TYPE OF PROBLEM
Ye. K. Degtyarev *In its* News of the Acad. of Sci. USSR, Dept. of Tech. Sci., Tech. Cybernetics, No. 6 11 Mar. 1966 p 96-112 refs (See N66-20606 10-10) CFSTI: $6.00

An algorithm for planning the fulfillment of a finite series of commands on asynchronous digital computer (ADC) is proposed if the commands consist of operations of known length which belong to a finite set of operations, and each operation may be fulfilled on a unique circuit from a finite set of circuits making up the ADC. As a result of application of the algorithm to a series of commands a linear graph is constructed with the vertex of the functions the critical path of which equals the time of fulfillment of the series of commands. A theorem is proved about the applicability of the algorithm. Author

N66-17591# David Taylor Model Basin, Washington, D. C. Applied Mathematics Lab.
MODERN MISER: A CRITICAL PATH AND RESOURCE ALLOCATION METHOD FOR THE UNIVAC LARC
Abel William Camara and Natalie Tarter Goldberg May 1964 142 p refs
(DTMB-1796; AD-602827) CFSTI: HC $5.00/MF $1.00

The MODERN MISER System is a planning and scheduling tool developed on the Remington-Rand UNIVAC LARC Computer. It is designed to assist management in comprehending the logical restrictions on a series of activities pertaining to one or many projects. The system includes a basic critical path method, a cost optimization routine, a float allocation procedure, the facility for manpower leveling, and the resource planning and scheduling method. Various algorithms used in the development of the system are discussed. The machine procedure used to adapt these formulas to the LARC are shown. Author (TAB)

N66-15196# Joint Publications Research Service, Washington, D. C.
MATHEMATICAL FORMULATION OF A SIMPLIFIED MODEL OF PRODUCTION PLANNING
Yu. N. Tyurin 6 Jan. 1966 36 p refs Transl. into ENGLISH from Ekon. i Mat. Metody (Moscow), v. 1, no. 3, May/Jun. 1965 p 391-409
(JPRS-33613; TT-65-30057) CFSTI: $2.00

A production model is considered in which consumption during the planning period is given, and a production plan to satisfy this consumption is selected. A system of objectively conditioned evaluations of commodities and production capacities was studied. Commodity is the term used to describe everything produced by the economic system, and the amounts of commodities are measured in continuously changing quantities. Each individual enterprise or economic unit is described by

its economic possibilities; that is, at identical expenditures of labor, power, raw materials, semi-finished products, etc., the same enterprise has the possibility of manufacturing different finished products. Each enterprise is put into relationship with a production map. The mathematical details and the concept of a differentiable map are given, and the conditions for the differentiability are formulated. The overall production possibilities of the entire economy are also described for a time period by the production map. The criteria of optimality are considered for the aims of the economy, and formulas are derived to define management by means of evaluation, and the income and outlay structure. M.G.J.

N66-15167# Stanford Univ., Calif. Inst. for Mathematical Studies in the Social Sciences.
THE NONSUBSTITUTION AND NONSWITCHING THEOREMS IN A MODEL WITH FIXED CAPITAL
Eytan Sheshinski and Edwin Burmeister 20 Aug. 1965 28 p refs
(Contract Nonr-225(50)))
(TR-135; AD-622793) CFSTI: HC $2.00/MF $0.50

Let a competitive economy produce commodities of varying durabilities, such that (a) production processes exhibit constant returns to scale; (b) there is one exogenous nonproductible factor; (c) there are alternative techniques to produce each good; (d) it is possible to define conversion coefficients for old durable goods in terms of new goods of the same kind. Theorem: Let (A)–(d) hold. Then I: A long-run equilibrium of input-output coefficients and of prices in terms of wage units in uniquely determined for any preassigned value of the rate of interest. II: It is impossible to have identical techniques at different interest rates. This theorem generalizes Samuelson's static and dynamic nonsubstitution theorem.

Author (TAB)

N66-11335# Pennsylvania Univ., Philadelphia.
INVENTORY CONTROL UNDER STOCHASTIC LEAD TIME AND STOCHASTIC DEMAND
Kenneth R. Rand, Jr. (M.B.A. Thesis) 1965 111 p refs
(AD-620921)

An attempt is made to investigate the behavior of an inventory system in which lead time, the size of the demand order, and the time between successive demand orders are all random variables with known probability distributions. Since adequate analytical mathematical models are not existent, a computer-based simulation model is used to study the inventory system. An introduction to the inventory problem and a description of inventory systems currently in use are provided. The formulation of the model is described. Results are presented as graphs of stockout time as a function of reorder point. TAB

N66-10809# Northwestern Technological Inst., Evanston, Ill.
DATA, MODELING AND DECISION
A. Charnes and W. W. Cooper Jun. 1965 12 p refs Prepared jointly with Carnegie Inst. of Tech. *Its* Systems Res. Memo-127
(Contracts Nonr-1228(10); Nonr-760(24))
(AD-620172)

Past experience with models—and related methods of analysis—may be an inadequate guide for managers considering a use of new tools now available. The latter, viewed as multiple-variable systems models, may differ in their data requirements and decision possibilities in comparison with predecessors that could handle only a few variables at a time. In approaching these new tools it is desirable to consider using the models as guides to data collection as well as decisions. This refers

not only to data variety but also to data quality as judged by reference to the model itself. It may then be possible to eliminate needless expenditures of time and money on collecting or refining data. It is also desirable to consider integrating the modelling and decision making. Evaluations may then be secured which can guide alterations to the model and also open new decision possibilities which would otherwise not be apparent. The value of such a joint approach to data, models and decisions is examined and illustrated in the following article with special reference to media mix and new products marketing applications.   Author (TAB)

time management. These tools are initiated and reviewed by pure management organizations, and actually detailed and completed by the functional organizations. Integration tools of work management consist of event logic networks for work definition; program plans for agreement on how work will be done; systems requirements analysis for identifying and quantifying equipment, manning, and procedures; and interface control for responsibility assignment to insure compatible mating hardware. Integration tools of system schedule management consist of establishing schedules; keeping track of progress; and taking corrective action in system management.   G.G.

N65-82741   System Development Corp., Santa Monica, Calif.
MANAGEMENT OF COMPUTER PROGRAMMING FOR COMMAND AND CONTROL SYSTEMS
K. Heinze, N. Claussen, and V. La Bolle 8 May 1963 43 p refs
(Contract ARPA SD-97)
(SDC-TM-903/000/02; AD-415721)
    Programming managers, the Department of Defense, and the Air Force Systems Command are becoming increasingly concerned with improving programming and reducing costs. Thus, a study of management techniques for computer programming in command and control systems is being conducted at the System Development Corporation. In this document, the Computer Program Implementation Process (CPIP) project reports the findings of this study. Seven computer programming efforts were surveyed to reveal the characteristics of computer programming, including growth, military use, and staffing. In a section titled "Program Development Problems," such management difficulties as computer unavilability and the effects of customer delay in design decisions are discussed. The CPIP project recommends improving: (1) the identification of programming activities and products by, among other means, establishing a common technical language and, (2) customer relations, by recognition and understanding of customer needs (including his working environment), and the need for the customer to understand the developer's approach to the program. Managers have difficulty in controlling and planning programming efforts without precise and detailed cost data, standard performance measures, and definitions of tasks and products. Knowledge of managing and developing computer programming systems must be extended and detailed, and programming must be formalized.   Author

N65-29233#   United Kingdom Atomic Energy Authority, Harwell (England). Theoretical Physics Div.
A WORKSHOP SCHEDULING PROCEDURE
T. A. J. Nicholson Mar. 1965 30 p refs
(AERE-M-1568) HMSO: 4s
    A procedure is described to schedule jobs through a workshop. Each of the jobs consists of a specified sequence of operations, and the procedure is designed to order these operations through the machines efficiently in terms of a management objective. The usual objective is to complete the work in the minimum time, but in this paper three objectives are distinguished. The procedure does not necessarily provide an optimal scheduling, but it should be near optimal. It is essentially simple and easy to implement.   Author

N65-23971#   Boeing Co., Seattle, Wash.
THE INTEGRATION TOOLS OF SYSTEM MANAGEMENT
H. K. Hebeler Paris, Eurospace, [1964] 46 p Presented at the U. S.–European Conf., Rome, 22–24 Jun. 1964
    Discussed are the major tools of system management which relate to the integration of the work of one contractor with the work of another, with emphasis in the areas of work and

N65-23854#   Union Carbide Nuclear Co., Oak Ridge, Tenn.
AN APPLICATION OF CRITICAL PATH SCHEDULING TO DESIGN ENGINEERING (SANS COMPUTER)
J. H. Boyd, Jr. (M.S. Thesis–Tennessee Univ.) 1 Mar. 1965
105 p refs
(Contract W-7405-ENG-26)
(Y-1480) CFSTI: $4.00
    A method is presented for the planning and scheduling of design engineering projects by applying the fundamentals of critical path scheduling, sans computer. An actual case history is used, and the detailed mechanics of installing the project on critical path is presented. This method is suitable for design engineering organizations that range in size up to 200 engineers and draftsmen. The experience of 2 1/2 years of applying critical path scheduling to design engineering projects is summarized.   Author

N65-23231#   United Kingdom Atomic Energy Authority, Harwell (England). Engineering Div.
INTRODUCTION TO CRITICAL PATH PLANNING
G. T. Sneddon Sep. 1963 34 p
(AERE-M-1280)
    This paper describes techniques to produce a network showing the activities relating to any particular project, the emphasis being upon the practical problems encountered in preparing the network to suit the facts of the case. A simplified example is used to demonstrate the pitfalls and the method of analysis.   Author

N65-23091#   Tufts Univ., Medford, Mass.
COMPUTER SIMULATION MODEL FOR ORGANIZATION THEORY
Thornton B. Roby [1964] 78 p refs
(Contracts Nonr-494(15); AF 19(628)-2450)
(TR-8; AD-611870)
    A theoretical discussion is presented on the utilization of computers in analyzing organization theory. The computer simulation model is considered a novel and unique theoretical tool. Three aspects of the model are considered: the structure of the initial nucleus from which the model is refined and elaborated; the substantive elements or building blocks of which the model is constructed; and the language in which the model is couched. The process of testing and revising the computer model, and its relationship to empirical data, are discussed. A four-stage testing process is outlined; internal testing, initial tests of ad hoc validity, tests of extended validity or generalizability, and process evaluation.   TAB

N64-84874   Army Signal Corps., Philadelphia, Pa.   Logistics Evaluation Committee.
A SIGNAL CORPS CONCEPT FOR MULTI-PROJECT MANAGEMENT
William K. Kreamer   May 1962   54 p
(Proj. Comet)
(AD-276938)

This paper describes a management information system and evaluation technique which has been designed for use by the U. S. Army Signal Corps in planning, scheduling, and monitoring the acquisition of communications-electronic equipments. The technique is designed to be a response to the general problem of "project" or "systems" management across functionally oriented field operating agencies. One of its primary objectives is to provide data, in varying detail and format, for use at all levels of management—at local operating levels as well as at command levels.   Author

N64-82220   Society of Automative Engineers, Inc., New York.
PERT—A TECHNIQUE FOR MANAGEMENT
K. M. Tebo (Gen. Motors Corp., Flint, Mich.) [1962] 8 p Presented at the Natl. Farm, Construct. and Ind. Machinery Meeting, Milwaukee, 10-13 Sep. 1962
(Rept.-5570)

The history PERT, its theory, and PERT in action, including methods of installing and operating the system both in the Polaris Program and at AC Spark Plug, Milwaukee Operations are covered. The effectiveness of the system is demonstrated. Actual computer output charts and methods of displaying PERT outlook data to management are highlighted.   Author

N64-82043   Mitre Corp., Bedford, Mass.
FIRST CONGRESS ON THE INFORMATION SYSTEM SCIENCES. SESSION 7: INFORMATION SYSTEM SIMULATION AND MODELLING TECHNIQUES
William W. Haythorn Dec. 1963 114 p refs Conf. Cong. held at Hot Springs, Va., 19-20 Nov. 1962
(Contract AF 33(600)-39852)
(MITRE-SS-7; ESD-TDR-63-474-7; AD-426985)

Three broad aspects of information system simulation and modelling are discussed: a methodological spectrum that has proved to be useful in understanding the role of various techniques in systems research; experimental design in empirical systems research, illustrated by a recently completed simulation study; functional task analysis of the information research project at the "microscopic" level to facilitate the growth of an information systems science. Also discussed is the Leviathan project which is a unique, experimental approach to studying the structure and social dynamics of large-scale organizations such as a military command, a government bureau, or an industrial organization. Three simulations are discussed: a automatic-mode simulation, a live simulation, and a dual-mode simulation.   Author

N64-12319   Raytheon Co., Waltham, Mass.
PERTeach. THE DEVELOPMENT OF EXPERIMENTAL PROGRAMS FOR AUTOMATED TRAINING IN DECISION MAKING
G. J. Rath, R. E. Hannan, and M. L. Weiss L. G. Hanscom Fld., Bedford, Mass., Decision Sci. Lab., Aug. 1963 40 p refs
(Contract AF 19(628)-365)
(ESD-TDR-63-608; AD-421735)

This report discusses the concepts and techniques employed in the preparation of the programed instruction courses for training management and support personnel in PERT. The applicability of PERT to decision making is also discussed.
                                                       Author

N63-19347   RAND Corp., Santa Monica, Calif.
A BRIEF REVIEW OF SIMSCRIPT AS A SIMULATING TECHNIQUE
M. A. Geisler and H. M. Markowitz Aug. 1963 27 p 3 refs
(Contract AF 49(638)-700; Proj. RAND)
(RM-3778-PRI)

The underlying concepts, structure, and current status of SIMSCRIPT are reviewed. SIMSCRIPT is a way of designing and writing down a simulation model, and has been developed with the following objectives: (1) to produce a generalized structure for designing simulation models; (2) to provide a rapid way of converting a simulation model into a computer program; (3) to provide a rapid way of making changes in the simulation model which can be readily reflected in the machine program; and (4) to provide a flexible way of obtaining useful outputs for analysis. The method is not only an abridged language, but also a structure with the help of which a wide class of management problems can be programed to a computer. It is so designed that whole areas of a problem can be changed without reprograming the entire model. SIMSCRIPT streamlines programing and makes it faster and more economical to use.   N.E.A.

N63-15702   RAND Corp., Santa Monica, Calif.
USES OF MONTE CARLO IN PERT
Richard Van Slyke Feb. 1963 28 p 9 refs
(Contract AF 49(638)-700; Proj. RAND)
(RM-3367-PR)

The mathematical assumptions underlying the PERT (Program Evaluation and Review Technique) management system are of doubtful validity, and, even granting these assumptions, there are still serious computational difficulties involved in getting the desired answers. This report outlines some of the weaknesses of the present system, and suggests how the use of Monte Carlo methods can lead to improvement, first in allowing less restrictive mathematical assumptions to be made, and second in extending the kinds of computational results that can be obtained. Moreover, the method can be used to check the validity of the commonly used approximations. A "criticality index" for an activity is defined; it is the probability that an activity will lie on a critical path. This is an example of a quantity that can be calculated by Monte Carlo methods, but not by presently used methods. An experimental computer program for Monte Carlo treatment of PERT networks has been coded for the IBM-7090 computer. The program is discussed, and some shortcuts are suggested for reducing the time of computation.   Author

N63-13146   Matrix Corp., Arlington, Va.
DEVELOPMENT OF QUALITATIVE AND QUANTITATIVE PERSONNEL REQUIREMENTS INFORMATION [Final Report]
Walter L. Smith, Melvin T. Snyder (Behavioral Sciences Lab.) Robert G. Demaree, and Melvin R. Marks Wright-Patterson AFB, Ohio, Aerospace Med. Res. Labs. (6570th), Dec. 1962 88 p 211 refs
(Contract AF 33(616)-7464)
(MRL-TDR-62-4) OTS: $2.25

This report describes the nature of, purpose, and method for developing Qualitative and Quantitative Personnel Requirements Information (QQPRI). The nature and scope of QQPRI and the relationship of QQPRI to system development are covered. The general constraints within which QQPRI is developed are described. Such constraints include technical weapon system constraints, as well as policies on Air Force Personnel, Training, and Manning. Emphasis is placed on QQPRI development techniques such as task analyses, estimation of performance time, establishing Air Force positions, and determining the relation of these to existing Air Force specialties.   Author

N62-17220   Applied Mathematics and Statistics Labs., Stanford U., Calif.
ECONOMIC MODELS FOR INDUSTRIAL WAITING LINE PROBLEMS
Federick S. Hillier Aug. 27, 1962 36 p 17 refs
(Contract Nonr-225(53))
(Tech. Rept. 62)

This paper provides useful applications for queueing theories by introducing a basic framework of economic models and accompanying procedures for solving industrial waiting line problems. The first model presented is for the simple case where the arrival rate and service rate are fixed and the number of servers (service channels) must be determined. Model 2 is for the case where both the arrival rate and the number of servers must be determined, i.e., where both the number of service facilities to distribute among the entire population and the number of servers to assign to each facility must be determined. This model is inclusive of travel time costs. Model 3 is for the case where both the service rate and the number of servers must be determined. Several special cases of both Model 2 and Model 3 are analyzed. The models presented, while perhaps the most basic and most generally applicable ones, are far from exhaustive. In particular, models designed especially for specific types of industrial waiting line problems need to be developed.   P.F.E.

N62-13353   Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
PERT IN DYNA-SOAR.
Theodore L. Senecal and Raymond M. Sadow. N.Y., Inst. of the Aerospace Sciences, 1962. Presented at the IAS National Summer Meeting, Los Angeles, June 19-22, 1962.
(IAS Paper 62-160) IAS: $0.50 members, $1.00 nonmembers.

This paper covers the first Air Force application of PERT (Program Evaluation and Review Technique) to a space program—the Dyna-Soar Piloted Glider System. The PERT technique is a working tool for management and engineers when coupled with valid reporting networks and electronic data processing.   (R.C.M.)

M5 PERSONNEL MANAGEMENT

N67-85689   Union Carbide Corp., Oak Ridge, Tenn. Y-12 Plant
FACTORS AFFECTING THE MORALE AND PRODUCTIVITY OF ENGINEERING PERSONNEL
H. C. Beeson (M.S. Thesis—Tenn. Univ.) and J. W. Hodes (M.S. Thesis—Tenn. Univ.) 27 Apr. 1967 190 p refs
(Contract W-7405-ENG-26)
(Y-1575)

Based on results obtained from questionnaires filled out by 188 engineering personnel, it was found that morale and productivity increased when the employee's job was considered interesting and challenging; the employee received consistent consideration from his supervisor, immediate and long range reward for doing a good job, and sufficient responsibility and freedom; and the employee was made to feel part of a team and kept informed of his progress. Decreased morale and productivity resulted from lack of salary increase with insufficient explanation, the supervisor taking credit for his employee's efforts and subjecting the employee to pressure and inconsideration, and inconsistent behavior on the part of the supervisor and his failure to give adequate performance reviews. The study group consisted of first-line supervisors, engineers, and draftsmen in a large industrial complex. Copies of the preliminary and final job questionnaires are appended.   M.W.R.

N68-84525   Pittsburgh Univ., Pa.   Management Research Center.
THE INTERFACE BETWEEN PERSONNEL AND ORGANIZATIONAL PSYCHOLOGY
Bernard M. Bass 15 Mar. 1967 27 p refs
(Contract Nonr-624(14))
(TR-13; AD-649918)

The first part of this report delineates the importance of organizational considerations to the personnel psychologist as he concentrates on recruiting, selection, training, job design and so forth. The second part deals with the converse: the importance of personnel considerations to the organizational psychologist as he deals with problems of morale, supervision, teamwork, organizational design and conflict resolution.   TAB

N67-82994   Case Inst. of Tech., Cleveland, Ohio.
PROFESSIONAL MEN AND WOMEN AT WORK: A COMPARATIVE STUDY IN A RESEARCH AND DEVELOPMENT ORGANIZATION
Evelyn Glatt (Ph.D. Thesis) Jun. 1966 321 p refs
(AD-645016)

A comparative investigation was made of professional women and men at work in a large, defense-based research and development organization. The women are the major focus, and the men provide a base-line for comparison. The study asked: (1) whether professional men and women shared work motivations and were equally involved in their jobs; (2) whether they were equally rewarded by the organization in terms of advancement; (3) whether they attributed equal value to, were equally satisfied by and experienced similar or differing degrees of conflict between, work and home demands; (4) whether their actual job mobility and mobility values were the same or different; and (5) whether they experienced similar or differing degrees of job satisfactions. The results pointed overwhelmingly to the underlying similarities between the professional men and women within an organizational culture which provided essentially equal opportunities to both sexes. The major differences arose from the residential immobility of the married professional woman. Other differences were attributable to ocupational group or marital status rather than to sex.   Author (TAB)

N67-36016#   Melbourne Univ., Parkville (Australia).
DYNAMICS OF A ROLE THEORY FOR THE WORKER'S JUDGEMENT
Richard C. S. Trahair Jul. 1967 46 p refs
(Contract Nonr-2296(02))
(TR-18; AD-654894)

Specific illustrations are presented to show that the worker seeks a degree of control over the physical demands and intrinsic satisfaction of task performance; authority, pay and security of positions; task competence and the mateship relation of persons. The extent to which the worker seeks control over additional benefits and promotion features of positions is limited by the kind of benefit under consideration, and the success ideology which characterize the lives of men at the lower levels of industrial administration.   TAB

N67-32656#   Tufts Univ., Medford, Mass. Inst. for Psychological Research.
RESEARCH INVOLVING COMMUNICATION PROCESSES IN TASK ORIENTED GROUPS **Final Report**
16 May 1967 30 p
(Contract Nonr-494(15))
(AD-652390) CFSTI: HC $3.00/MF $0.65

Several theoretical articles which examine various aspects of the small group performance problem are discussed. These include: (1) An analysis of the executive process, based on the distribution of information in a group which relates to particular decisions. The general notion was that the information bearing on any action decision can be determined or estimated and that an effective executive structure is one that maximizes the amount of relevant information brought to bear on each decision. (2) An examination of phasing relationships among action units with particular emphasis on measurement. (3) A discussion of the use of computer simulation models with special reference to organization theory. (4) A survey of the possibly appropriate mathematical models for a variety of group performance subfunctions.   Author (TAB)

N67-29665# Utah Univ., Salt Lake City. Dept. of Psychology.
RESULTS FOR AN ADDITIONAL FOLLOW-UP CRITERION ON A SAMPLE OF AIR FORCE SCIENTISTS
Calvin W. Taylor and Kan Yagi Dec. 1966 16 p refs
(Grant AF-AFOSR-144-63)
(AFOSR-67-0896; AD-651119) CFSTI: HC $3.00/MF $0.65
      The report supplements an earlier study (AD-267 832) in which 17 measures of contributions of scientists were used as criteria for validating 130 predictor scores for measuring psychological characteristics of the scientists. This report relates to an additional over-all criterion that was obtained for 80 of the original 107 subjects. The criterion was a 6-man committee rating of the scientist. The Biographical Information Blank was again the best single predictor instrument of the new criterion. Aptitude test scores ranked more significantly than previously. T-test comparisons are given for 30 empirically keyed Biographical scores. None of the scores based on a criterion of status-seeking, organization-man tendencies was significant with respect to the over-all criterion. Likeableness as a member of the research team was the most important criterion dimension with respect to the over-all criterion. Current organizational status also ranked high. Criterion dimensions of quality of product, originality of product, and creativity ratings had little effect on the over-all criterion rating. Some discussion of these findings and of the explanatory power of the profiles of a scientist's contributions is presented. An analysis of criterion intercorrelations by different sources is presented that shows the complexity of the criterion problem and differences that arise in scores of a scientist's performance dependent on the scorer (the individual himself, immediate supervisors, higher level supervisors, peers).   Author (TAB)

N66-86457   System Research, Ltd., Richmond (England).
THE LOGIC AND BEHAVIOUR OF SELF ORGANISING SYSTEM AS ILLUSTRATED BY THE INTERACTION BETWEEN MEN AND ADAPTIVE MACHINES
Gordon Pask 1962 35 p refs Presented at Intern. Symp. on Inform. Theory, Brussels, 1962
(AF 61(052)-402)
(AD-633003)
      In this paper we discuss the interaction between a human being and an adaptive machine. It is argued that a stable, coupled system is necessarily a self organizing system. Practical and theoretical considerations are reviewed in terms of those adaptive machines used in a specific application: namely, the automatic instruction of skills. A simple laboratory system is described in detail. Finally, we consider the behavior of larger and more realistic systems.   Author

N66-82383   Texas Christian Univ., Fort Worth. Dept. of Psychology.
MILITARY SMALL GROUP PERFORMANCE UNDER ISOLATION AND STRESS. 5: PSYCHOLOGICAL PRINCIPLES OF MANAGEMENT AND LEADERSHIP Critical Review

S. B. Sells Ft. Wainwright, Alaska, Arctic Aeromed. Lab., Jun. 1962
26 p refs
(Contract AF 41(657)-323)
(AAL-TDR-62-35)
      This presents a critical discussion and interpretation of principles of leadership and management with particular reference to the problems of AC&W sites in Alaska. It is based on a review of scientific research in the fields of psychology, sociology and management science, primarily. The major topics covered include relations of management and leadership, group-centered vs. production-centered management, organizational relations, organizational control, and leadership in formal organizations. Selected references are cited and reference is made to an annotated bibliography containing abstracts of significant studies.   Author

N66-39799# School of Aerospace Medicine, Brooks AFB, Tex.
FACTORS IN JOB-SATISFACTION
George K. Cantrell, Bryce O. Hartman, and Lewis S. Sims, Jr. (Mil. Airlift Command, Scott AFB, Ill.) May 1966 41 p ref
(SAM-TR-66-46; AD-637861) CFSTI: HC $2.00/MF $0.50
      A 44-item questionnaire, covering twenty-eight management problem areas, was administered to personnel at twenty different maintenance units in the Far East, Europe, and the Continental United States. Completed questionnaires from 2122 airmen were used to evaluate the relationship between each problem area and job-satisfaction. The analysis showed that job-satisfaction is most affected by those problems that could be controlled or corrected by the immediate supervisors and least affected by those problems which have to be solved at levels farther up the chain of command. Supporting evidence was obtained from interviews and a special psychiatric study.   Author (TAB)

N66-39790# School of Aerospace Medicine, Brooks AFB, Tex.
FACTORS IN JOB-SATISFACTION: ANALYSIS OF SPONTANEOUS COMMENTS
George K. Cantrell, Bryce O. Hartman, and Lewis S. Sims, Jr. (Mil. Airlift Command, Scott AFB, Ill.) Jun. 1966 18 p ref
(SAM-TR-66-57; AD-637862) CFSTI: HC $1.00/MF $0.50
      Comments, spontaneously entered on 2122 questionnaires administered to maintenance airmen in 20 different military units in the Far East, Europe, and the Continental United States, were analyzed. The 4941 comments were assigned to one of 32 different categories and to one of three different levels of emphasis. The analysis supported an earlier finding that an airman's immediate supervisor has a greater capacity to affect his level of job-satisfaction than any other single factor. The more significant problems, including promotion, pay, duty time–time off, duty assignments, poor supervision, management, recognition, living conditions, and supply, are discussed in reference to airmen and to NCO's. The analysis revealed that as an airman changed his level of emphasis in making a comment, his ranking of the comment areas also changed.   Author (TAB)

N66-38220# Aerospace Medical Div. Personnel Research Lab. (6570th). Lackland AFB, Tex.
ABSTRACTS OF PERSONNEL RESEARCH REPORTS. VI: 1954-1965
Jo Ann Elson, comp. Dec. 1965 107 p refs
(PRL-TR-65-23; AD-636607) CFSTI: HC $4.00/MF $0.75
      The volume includes abstracts of the 374 technical reports issued by the Personnel Research Laboratory January 1954 through December 1965. They cover studies in selection, classification, and utilization of Air Force personnel; systematizing information flow in support of personnel planning; methods of describing, evaluating, and structuring Air Force jobs; and development of procedures for improving the quality of Air Force personnel.   Author (TAB)

N66-37529# California Univ., Los Angeles. Div. of Research.
AN EVALUATION OF BARRIERS TO THE DELEGATION OF AUTHORITY IN FORMAL ORGANIZATIONS
Patrick Meacham Williams (San Jose State Coll.)   Jul. 1966
20 p refs
(NASA-RP-13)

A number of "barriers" to effective authority delegation were grouped into categories associated with the manager, his subordinates, and his organization. Sixty-five managers were then asked to evaluate the importance of each of these obstacles by means of numerical ratings, open-end written responses, and individual interviews. The major results of this survey established the following reasons for the inability to delegate decision making: (1) The manager viewed his subordinate as the principle barrier to delegation; (2) the manager remained basically confident in himself as a decision maker and rated his own ability higher than any other barrier to delegation; (3) the manager's impatience to develop the decision making ability in others.   G.G.

N66-37074# Massachusetts Inst. of Tech., Cambridge.
FREEDOM AND CONTROL: THE DILEMMA OF CREATIVITY IN THE ORGANIZATIONAL ENVIRONMENT
Harper Brown Keeler (Ph.D. Thesis) Jun. 1966 271 p refs
(AD-635261) CFSTI: HC $1.50/MF $1.50

The purpose of this study is the analysis of creativity in the context of organizations found in an advanced modern social system. The report deals with a critique of the literature related to the problems of creativity in organizations, with these criticisms in mind, the second part compares different organizations ranked by levels of creativity. Different factors of the environments (especially those relating to organizational control and feelings of individual freedom) which influence creativity levels are analyzed. Eight environments were chosen for study to include industrial labs, government labs, and academic labs. The first case study analyses the severe constraints on creativity which can occur in an organization operated under public health regulation. Four labs that exhibit different levels of creativity are compared. Propositions are generated to explain these differences. These propositions are tested in three academic labs which are assumed to have more creative environments. The conclusions include recommendations for altering the theoretical framework offered by the literature, and recommendations for organizations wishing to foster creativity in their participants.   TAB

N66-12122# Applied Science Associates, Inc., Valencia, Pa.
GUIDELINES FOR TRAINING SITUATION ANALYSIS (TSA) Final Report
Andrew P. Chenzoff and John D. Folley, Jr. Port Washington, N. Y., Naval Training Device Center, Jul. 1965 199 p
(Contract N61339-1218)
(NAVTRADEVCEN-1218-4; AD-472155)

These guidelines represent a textbook for instruction in three phases of Training Situation Analysis (TSA), a standardized procedure, developed by NTDC, for systematically gathering and interpreting the information which is relevant to the planning of training and training devices. Three phases of TSA are described in detail: System Familiarization, Task Analysis Method (TAM) and Training Analysis Procedure (TAP). System Familiarization provides an orientation to the training problem, the system structure and flow, and the equipment. Task Analysis Method produces a set of task descriptions containing the information necessary for making training device decisions. Training Analysis Procedure produces a ranking of tasks based upon the potential benefit

to system performance as a result of training and the cost of that training. Recommendations for the conduct of these three phases and suggested working forms are presented.
Author (TAB)

N64-83423   New England Consultants, Inc., Boston, Mass.
THE ENGINEER TODAY: THE SUPPLY, HIS DEVELOPMENT, NEEDS, STATUS AND TREATMENT
Edward J. Robinson and Otto Lerbinger [1962] 101 p refs
Prepared for ESSO Res. and Eng. Co.

Status and shortage of engineers in American industry and government institutions are surveyed, and comparisons are made with demand and supply of technically trained personnel in China and Russia. A section on becoming an engineer deals with parental attitudes, high school and college influences, mass media, career literature, and extracurricular activities of students. Industrial recruitment and selection is discussed; and attitudes of engineers toward their profession, jobs, and management are considered. Evidence of the status of the engineer and engineering in general is presented, and studies on the public understanding of the roles of the engineer and engineering are included. A bibliography of pertinent references is appended.   M.W.R.

N64-21601   Federal Council for Science and Technology, Washington, D. C.
CURRENT PROBLEMS IN THE MANAGEMENT OF SCIENTIFIC PERSONNEL
[1963] 125 p Proc. of the First Symp., 17–18 Oct. 1963

Carreer development of federal scientists and engineers, controversies in scientific personnel administration, and conflict of interest and the federal scientist were discussed at a conference designed to exchange management experiences among laboratory directors of various federal agencies. Administration problems that are common to all agencies as well as those specific to certain facilities were discussed at the various sessions.   M.W.R.

N62-16582   Institute for Social Research, U. of Mich., Ann Arbor.
TIME AND INFLUENCE FACTORS IN LABORATORY MANAGEMENT, AS RELATED TO PERFORMANCE. Interim Technical Report, Analysis memo #18
Donald C. Plez. Sept. 1962. 53 p. refs.
(Grant DA-ORO(D)-31-124-G160)
(AROD-0010-6)

The Multiple Classification Analysis (MCA) program was applied to study the relationships of 34 questionnaire measures to five performance scores. Because of certain flaws in procedure, only part of the MCA output is meaningful, but the raw data for all measures can legitimately be examined. The data tentatively suggest that scientists perform better when they devote about two-thirds of their time (not more) to technical work, and the rest to teaching or administration. Performance also tends to be high when some time is spent in research, some in development, and a little in technical services—in short, when time is balanced among several technical functions. Better performance occurs when influence on important decisions does not rest solely with the scientist nor any other individual, but is shared with several persons at various levels.   (Author Abstract)

M6 URBAN MANAGEMENT

No abstracts in this issue

M7 MANAGEMENT POLICY & PHILOSOPHY

N67-19717# Texas Christian Univ., Fort Worth. Inst. of Behavioral Research.
GENERAL THEORETICAL PROBLEMS RELATED TO ORGANIZATIONAL TAXONOMY: A MODEL SOLUTION AND ITS ASSUMPTIONS
S. B. Sells 30 Sep. 1966 36 p refs Presented at the Symp. on People, Groups, and Organ., An Effective Integration of Knowledge; Sponsored by ONR and Rutgers Univ.
(Contract Nonr-3436(00))
(AD-642496) CFSTI: HC $3.00/MF $0.65

The report discusses the development of a social system model. Recognition that organizational functioning reflects the interdependence of organizations and their members with the total, physical, social, and cultural environment has been amply demonstrated. The emphasis on this principle is a sign of progress in organizational theory. **TAB**

N66-16001# Army Missile Command, Huntsville, Ala. Management Science and Data Systems Office.
THE IMPACT OF ADP ON THE FUTURE MANAGERIAL ENVIRONMENT
Bruce L. Garrett 15 Jun. 1965 82 p refs
(RSIC-438; AD-472768)

A synthesis of predicted Automatic Data Processing (ADP) developments in terms of their relationships to the total management of an organization, directed primarily to managers faced with a growing demand for better ADP utilization. ADP equipment capabilities likely to be available during the next decade are outlined in detail. Current techniques for the use of ADP systems and problems involved in installing improved future applications are discussed. A timetable is shown predicting the general acceptance and use of applications leading to maximum economical computer utilization. The ADP displaced worker situation is portrayed and actions for its alleviation are suggested. Statistics covering situations where ADP actually displaced workers are shown in graphic form. Managerial approaches to coping with systems integration, personnel training, and organizational structure evolving from an ADP influenced society are presented. **Author (TAB)**

N65-80491 RAND Corp., Santa Monica, Calif.
SPACE LOGISTICS: TECHNOLOGY VERSUS MANAGEMENT
Chauncy F. Bell Aug. 1962 6 p refs Presented at the IAS Large Booster Symp., Sacramento, Calif., 29–30 Oct. 1962
(P-2613; AD-604809)

It is postulated that space logistics poses few new factors or elements, but rather places increased importance on improved management of existing procedures such as fault-isolation, test, checkout, and data reduction. The potential of improved logistics management is stressed, and improved management techniques developed or planned for aircraft or missiles are discussed. Applications to space logistics are then considered; and it is emphasized that space logistics support must begin in the design phase and that increased attention must be given to the improvement of logistics processes. **M.W.R.**

N63-13737 Northwestern Technological Inst., Evanston, Ill.
MANAGEMENT SCIENCE AND MANAGING
A. Charnes and W. W. Cooper Mar. 1962 27 p 23 refs
(Contracts Nonr-1228(10) and Nonr-760(01))
(ONR Res. Memo-53)

The history of management is reviewed to point out the current status of management science and some of the possible future developments in management. The areas covered include: contribution to management by military leaders; management engineering; management concepts of Charles Babbage; current developments in methodology; and social and managerial implications for the future. **R.C.M.**

M8 ECONOMICS

N67-85937 Joint Publications Research Service, Washington, D. C.
DISCUSSION OF THE ECONOMICS OF SCIENTIFIC RESEARCH—USSR
29 May 1967 23 p Transl. into ENGLISH from Ekon. Gaz. (Moscow), no. 10 and 18, Mar.–May 1967
(JPRS-41188; TT-67-31-31829)

An overview of the economics of scientific research and an evaluation of the complex problems that arise is presented. Financing of scientific research in communist and capitalistic societies is treated briefly, characteristics of scientific activity are mentioned, and management and organization planning are considered. Attention is given to the evaluation of scientific research results from an economic viewpoint, and a so-called optimal parameter is presented in this regard. **M.W.R.**

N67-20591# Carnegie Inst. of Tech., Pittsburgh, Pa. Management Sciences Research Group.
ECONOMIC PROGRAMMING AND THE VON NEUMANN MODEL: SOME PLANNING TECHNIQUES
Roman L. Weil, Jr. Jun. 1966 149 p refs
(Contract Nonr-760(24))
(Rept.-78; AD-640478) CFSTI: HC $3.00/MF $0.65

The essays are concerned with generalizations, extensions, and applications of the von Neumann model. The essays all have in common a how to approach: Chapter II shows how to decompose a von Neumann model or an input-output model and how von Neumann expansion rates can be easily found once the decomposition is known; Chapter III shows how to find the von Neumann path and expansion rate; Chapter IV shows how to get onto the von Neumann path on an optimal way given a fixed-time constraint; and Chapter V shows how to introduce consumption into the closed von Neumann model or at least one way of attempting to do so. **Author (TAB)**

N66-29268# California Univ., Berkeley. Operations Research Center.
ON OPTIMAL DEVELOPMENT IN A MULTI-SECTOR ECONOMY
David Gale Apr. 1966 44 p refs
(Contract Nonr-222(83))
(ORC-66-11; AD-632495) CFSTI: HC $2.00/MF $0.50

An economy is considered that has n goods and k types of labor, each of which is growing at the same constant rate. Goods are produced from labor and other goods by a set of specified activities. Given an initial supply of goods and amounts of labor. All possible production programs running from the present time to infinity through discrete time periods are considered. With each program is associated a utility sequence measuring the satisfaction achieved by the program

at each period of time. A program is optimal if its utility sequence overtakes all other such sequences. The paper is devoted to proving the existence of optimal programs for a wide class of economies and to deriving the properties of such programs. In particular it is shown that the optimal program approaches a certain balanced program. Essential use is made of the existence of an infinite sequence of optimal prices with respect to which the optimal program is one which maximizes the sum of profit and utility at each time period.

Author (TAB)

N64-28816 RAND Corp., Santa Monica, Calif.
THE USEFULNESS OF AEROSPACE MANAGEMENT TECHNIQUES IN OTHER SECTORS OF THE ECONOMY
Thomas K. Glennan, Jr. Jun. 1964 9 p Presented at the NASA-UCLA Symp. and Workshop on the Transformation of Knowledge and its Utilization, Los Angeles, 2 Jun. 1964
(P-2921; AD-601619)

The managerial techniques used in the aerospace industries have been shaped by the unique conditions surrounding these industries. The demands of their most important customer (the Government), the frequent combination of large state-of-the-art advances with great development urgency, and the large size of many projects have combined to shape management techniques and systems. It is suggested that these techniques cannot be translated or transferred into other industries without extensive modifications, and yet many similar qualities to processes, which appear in other industries, exist. Thus, a selective utilization of some parts of the managerial techniques is likely to have a very profound effect upon other industries. It is up to the managers of industries to seek out those components of the aerospace managerial systems that make sense to them.

I.v.L.

M9 GENERAL

N67-85833 Commerce Dept., Washington, D. C.
TECHNOLOGICAL INNOVATION: ITS ENVIRONMENT AND MANAGEMENT
Jan. 1967 91 p refs

Taxation, finance, and competition were considered as three main factors affecting invention and innovation by an advisory citizen committee convened by and reporting to the Secretary of Commerce. While no major changes were recommended with regard to present laws governing these three areas, 17 recommendations were made regarding sharing of innovation losses, stock options, acquired technological assets, communication of venture capital opportunities, various types of tax relief for inventors, and the antitrust and regulatory agencies. Emphasis was on the need for promoting a basic understanding of the innovative process in all sectors of our society; and a White House conference on understanding and improving the overall environment for technological innovation was recommended, to be followed by regional conferences through the country. Major federal policies regulating competitive activities and practices are reviewed, and examples are included of possible conflicts between federal policies on competition and various practices involving innovation.

M.W.R.

N67-37187# Analytic Services Inc., Baileys Crossroads, Va.
INDUSTRIAL-LOCATION THEORY IN THE ERA OF SUPER-CARGO AIRCRAFT
Irving Casey Aug. 1967 29 p refs
(AD-655695)

The report surveys classical theories of industry location and appraises their applicability in the 1970s, when very large cargo aircraft are expected to be introduced. Modifications of existing theory are considered toward the development of an extended general theory of location. Some preliminary observations are made on the effects of super-cargo aircraft on industry location. The study is one product of a program of private, self-sponsored research. The program has the objective of examining changes in industry location that could result from introduction of super-cargo aircraft such as the planned Boeing 747 subsonic jet transport.

Author (TAB)

N67-22969# Technisch Documentatie en Informatie Centrum voor de Krijgsmacht, The Hague (Netherlands).
NETWORK PLANNING—SCANS/PERT–CPM/RAMPS. BIBLIOGRAPHY [NETWERKPLANNING—SCANS/PERT/CPM/RAMPS. BIBLIOGRAPHIE]
F. P. van Eck Nov. 1966 62 p refs
(TDCK-46624) CFSTI: HC $3.00/MF $0.65

A bibliography with abstracts is presented of works on network analysis, its application in general, and its specific application in the construction of ships, aircraft, spacecraft, buildings, and in military operations. Included are the systems SCANS, PERT, CPM, and RAMPS. Works published from 1964 through 1966 are represented.

Transl. by K.W.

N67-21172 Joint Publications Research Service, Washington, D. C.
ADMINISTRATIVE EFFICIENCY AND COMPUTERS
E. A. Isayev 14 Feb., 1967 33 p Transl. into ENGLISH of the book "Effektivnost' Upravleniya i Elektronnyye Mashiny" Moscow, Znaniye Publishing House, 1966 p 3-32
(JPRS-3985; TT-67-30543) CFSTI: HC $3.00

A journalistic account of using digital control computers in systems capable of automating the administration of enterprises is presented. Types of industrial systems, and the gathering, transmitting, and processing of information are outlined. The details of production within the plant and prediction of market needs are mentioned. Computers are briefly described and flexibility in decision making is considered. Examples are discussed using a parts machining plant and a bakery as illustrations.

N.E.N.

N66-87784 National Science Foundation, Washington, D. C.
CURRENT PROJECTS ON ECONOMIC AND SOCIAL IMPLICATIONS OF SCIENCE AND TECHNOLOGY, 1965
May 1966 196 p refs
(NSF-66-21)

Summaries are presented for projects dealing with the economic and social implications of science and technology that were underway during 1965. These are presented alphabetically according to authour under the following general headings: (1) administration, organization, and management; (2) agriculture and rural sociology; (3) automation and impact on labor; (4) decision making; (5) economic development; (6) economic analysis; (7) history and philosophy of science and technology; (8) impact on selected industries; (9) innovations in and impacts of specific inventions and processes; (10) international and foreign studies; (11) patents and trademarks; (12) public policy, government, and national defense; (13) scientific and engineering manpower performance, education, and creativity; and (14) sociology and psychology. Cross references are included for projects dealing with science information, space, and state and regional studies; and contributing authors and institutions are indexed.

M.W.R.

N66-87127 Stanford Univ., Calif.

QUALITY COST ANALYSIS IMPLEMENTATION HANDBOOK

Donald E. Morgan and W. Grant Ireson 15 Sep. 1964 51 p refs

(Contract AF 18(600)-2021)

(AD-631090)

The QUICO system covers the planning, installation, and use of quality cost data analysis. The basic idea is simply to operate a manufacturing unit or complex so that the total of quality related costs is a minimum. Quality related costs are made up of (1) expenses incurred because of not producing the highest possible quality (resultant costs), (2) expenditures made to create conditions resulting in high quality products (quality creation costs), and (3) expenditures made to measure quality levels being produced and causes of deficiencies (quality and defect inference costs). Analysis of quality cost data provides direct pay-offs in reduction of resultant costs and the major sources are discussed. Secondary benefits come from use of the data as a measurement of the effectiveness of the quality assurance effort, as a motivant to workers who must produce the high quality, and as a management guidance tool. Suggested cost accounts are given along with suggested methods of summarizing and displaying data in the most meaningful way for all levels of use. Almost all companies now have sufficient cost data to estimate cost reductions to be expected from the QUICO system. Author

N66-82369 Texas Christian Univ., Fort Worth. Dept. of Psychology.

MILITARY SMALL GROUP PERFORMANCE UNDER ISOLATION AND STRESS. 5: ORGANIZATIONAL MANAGEMENT AND LEADERSHIP An Annotated Bibliography

S. B. Sells Ft. Wainwright, Alaska, Artic Aeromed. Lab., Oct. 1961 84 p refs

(Contract AF 41(657)-323)

(AAL-TR-61-23)

An annotated bibliography on organizational management and leadership is one of a series dealing with military small group performance under isolation and stress. Arranged alphabetically according to author, the references deal with missions, locations, and personnel problems primarily in the areas of social psychology, sociology, and management. M.W.R.

N66-82368 Texas Christian Univ., Fort Worth. Dept. of Psychology.

MILITARY SMALL GROUP PERFORMANCE UNDER ISOLATION AND STRESS. 4: ORGANIZATIONAL STAFFING An Annotated Bibliography

S. B. Sells Ft. Wainwright, Alaska, Artic Aeromed. Lab., Oct. 1961 53 p refs

(Contract AF 41(657)-323)

(AAL-TR-61-62)

An annotated bibliography on organizational staffing is one of a series on military small group performance under isolation and stress. Entries are presented alphabetically according to author under the categories of (1) selection and assignment, (2) indoctrination and training, and (3) methodology and background. M.W.R.

N66-80867 Carnegie Inst. of Tech., Pittsburgh, Pa. Graduate School of Industrial Administration.

A RESUME OF MATHEMATICAL RESEARCH ON INFORMATION SYSTEMS

Charles H. Kriebel Apr. 1965 18 p refs Revised *Its* Management Sci. Res. Rept. No. 33

(Contract Nonr-760(24))

(AD-616113)

This paper presents a cross-referenced bibliography on research employing mathematical models in the study of information systems. Although the listing is intended primarily as a representative introduction to the literature, the entries contain more than ten thousand secondary references. Author

N66-30520# RAND Corp., Santa Monica, Calif.

SOME ASPECTS OF THE ALLOCATION OF SCIENTIFIC EFFORT BETWEEN TEACHING AND RESEARCH

Michael D. Intriligator and Bruce L. R. Smith Mar. 1966 28 p refs

(Contract AF 49(638)-1700; Proj. RAND)

(RM-4339-PR; AD-632155) CFSTI: HC $2.60/MF $0.50

The study considers some aspects of the allocation of scientific effort by means of an analytic framework consisting of specified policy objectives and a model for the allocation of new Ph.D.s in science between teaching and research. Some simplifying assumptions lead to a general welfare function for this aspect of a national science policy. The production of new scientists is determined in the model by a production function, dependent on teaching scientists and on time. For any of the special cases of the welfare function and for a production function with a constant ratio of new scientists to teaching scientists, an initial allocation of a maximum proportion of new scientists to teaching is preferred, followed by a switch to a minimum proportion of new scientists to teaching. Similar 'switching' solutions also apply to a wider class of objectives and production functions. The analytic framework and preferred allocations are briefly examined with respect to 'real world' considerations and to their possible implications for national policy. Several policy initiatives are discussed in light of the model and some possible changes are suggested in government policies on R and D support and aid to science education. Author (TAB)

N66-22445# Analytic Services, Inc., Baileys Crossroads, Va.

TRANSFERABILITY OF RESEARCH AND DEVELOPMENT SKILLS IN THE AEROSPACE INDUSTRY Final Report

Ronald P. Black and Charles W. Foreman Sep. 1965 145 p refs

(Contract AF 49(638)-1259)

(R12860; AD-628544) CFSTI: HC $4.00/MF $1.00

The report treats the possibility that the aerospace industry could apply its capabilities to the solution of large-scale public problems, thus offsetting any significant reductions in the military budget. It includes discussion of what this action would imply in relation to the transferability of industry scientists and engineers. Studies performed by four aerospace contractors for the State of California are used as case examples of the industry's attempt to transfer some of its R and D skills to civilian and public projects. Conclusions are reached that (1) as indicators of the transferability of industry scientists and engineers, the four California studies are inconclusive; (2) the largest group of scientists and engineers in the industry, those engaged in design and development, may well be the least transferable; and (3) civilian-public projects are unlikely to become in the next 5 years or so a significant part of the industry's business. Author (TAB)

N66-21177# Technisch Documentatie en Informatie Centrum voor de Krijgsmacht, The Hague (Netherlands).

SURVEY OF LITERATURE ON INDUSTRIAL TECHNOLOGY [LITERATUUROVERZICHT BEDRIJFS WETENSCHAPPEN]

13 Jan. 1966 32 p refs In DUTCH, ENGLISH, FRENCH, and GERMAN *Its* Vol. 5, No. EM-94 CFSTI: HC $2.00/MF $0.50

Contains abstracts and bibliographic notes on general and industrial economy, (including internal organization, cost considerations, financing, administration, and statistics), personnel, logistics (including general, acquiring, storing and transporting, material planning and control, and quality control), normalization, industrial sociology and psychology, and technical news. Transl. by J.O.

N66-19673# Technisch Documentatie en Informatie Centrum voor de Krijgsmacht, The Hague (Netherlands).
BIBLIOGRAPHY OF FACTORY TECHNOLOGY [LITERA-TUUROVERZICHT WERKPLAATSTECHNIEK]
Jan. 1966 32 p refs In DUTCH, GERMAN, ENGLISH, and FRENCH *Its* Vol. 11, Pt. 1
(W-94) CFSTI: HC $2.00/MF $0.50
This bibliography on industrial technology contains brief summaries on: (1) factory management and production engineering; (2) measurements and controls in production processes; (3) overall reliability aspects of machine tooling; (4) technology of drilling and abrasion; (5) electrochemical grinding, shaped-electrode machining and twinning; (6) welding and forming processes; and (7) production and economic considerations in industrial metal working operations.
Transl. by G.G.

N66-15783# Technisch Documentatie en Informatie Centrum voor de Krijgsmacht, The Hague (Netherlands).
REVIEW OF LITERATURE ON THE INDUSTRIAL SCIENCES [BEDRIJFSWETENSCHAPPEN LITERATUUROVERZICHT]
13 Sep. 1965 29 p refs In DUTCH and ENGLISH *Its* Vol. 4, No. EM-86
CFSTI: HC $2.00/MF $0.50
An annotated bibliography on management systems, financial control, economizing, cost estimation, logistics, psychology, sociology and personnel training techniques in military, industrial, and research facilities is presented.
M.R.W.

N66-15779# Technisch Documentatie en Informatie Centrum voor de Krijgsmacht, The Hague (Netherlands).
REVIEW OF LITERATURE ON OPERATIONS RESEARCH
24 Sep. 1965 34 p refs In DUTCH, ENGLISH, FRENCH, and GERMAN *Its* Vol. 9, No. OR-74 CFSTI: HC $2.00/MF $0.50
Presented is a compilation of report literature on developments in operations research, linear programming, game theory, information theory, management, economics of system analysis, war gaming as a technique in the study of operational research problems, cost-effectiveness for military systems analysis, mathematical statistics, and reliability of electronic parts. A program, initiated by the NATO Science Committee, of graduate apprenticeships in operational research is described.
M.R.W.

N66-15402# Technisch Documentatie en Informatie Centrum voor de Krijgsmacht, The Hague (Netherlands).
OPERATIONS RESEARCH V, TITLE INDEX
1964 55 p refs
(TDCK-40683) CFSTI: HC $3.00/MF $0.50
Titles of publications and reports announced in the abstract bulletin, *Operations Research,* are presented. The index is divided into sections on *Theory,* which include queuing, programming, game, information, and inventory theories, and the theory of the optimum distribution of effort; *Applications,* which covers management, military applications, quality control, accountancy, and medical problems; *Book Reviews;* and *News.* M.G.J.

N66-12088# RAND Corp., Santa Monica, Calif.
RESEARCH ON SOCIAL CONSEQUENCES OF SPACE ACTIVITIES
Joseph M. Goldsen Aug. 1965 10 p Presented at the Am. Astronautical Soc. Natl. Meeting on the Impact of Space Exploration on Soc., San Francisco, 18 Aug. 1965
(P-3220; AD-621325)
The argument is made that there needs to be comprehensive study of the social and economic implications of explorations into space. These include international political and legal complications and those arising from possibilities of utilizing communication satellites. The belief is expressed that the national space agencies and major contractors should study their own operations and the economic and social implications of their products; they should learn to mobilize techniques of organization and achievement to the nonspace needs of human environment. TAB

N65-82345 Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MANAGEMENT, PLANNING AND ECONOMICS OF AIRCRAFT PRODUCTION
D. P. Andrianov, M. Z. Gendel'man et al 1 Dec. 1964 983 p refs
Transl. into ENGLISH of the book "Organizatsiya, Planirovaniye i Ekonomika Aviatsionnogo Proizvodstva" Moscow, Gos. Nauchno-Tekhn. Izd. Oborongiz, 1963 G94 p
(FTD-TT-63-1121/1+2)
This book presents an integrated analysis of problems relating to the economics of the aircraft industry and the organization and planning of production at [individual] enterprises. Specific problems of production organization at these enterprises are considered for the various individual types of aircraft plants, i.e., aircraft-construction, engine-building, instrument-making, etc. Organizational and planning features of production at series-production and experimental plants are presented. Author

N65-30279 Joint Publications Research Service, Washington, D. C.
PROBLEMS OF THE MECHANIZATION OF MANAGEMENT WORK
L. G. Petrova *In its* Cybernetic Principles Appl. in Educ. and Econ. 26 Jul. 1965 p 10–15 (See N65-30278 19-05)
CFSTI: $1.00
A textbook on the mechanization problems of management in industry is reviewed. The book was written especially for students specializing in the mechanization of accounting and planning enterprises of modern industry. The first part of the book relates to the mechanization and automation of management. It examines the process of algorithmic description and measuring of information. The second section of the book treats the problems of organization, technological normalization, and wages at computer establishments. It is observed that the introduction of modern computing techniques together with modern mathematical methods in the field of managerial work in industry cuts down the cost of manufactured products, increases labor productivity, and the more efficient use of productive capacity. It is noted that the book is written on a high scientific, theoretical and methodical level. Tables are well prepared, showing data obtained from the practice of existing industrial enterprises. E.E.B.

N65-21145# Technisch Documentatie en Informatie Centrum voor de Krijgsmacht, The Hague (Netherlands).
A REVIEW OF LITERATURE ON OPERATIONS RESEARCH
24 Dec. 1964 32 p refs In DUTCH *Its* 8th Yearly Issue, No. OR-65

This review contains several abstracted summaries of research papers pertaining to complex problems in management science and operations research. Mathematical programing techniques are proposed for control system design and optimization, with the application of linear, nonlinear, stochastic, integer, and dynamic programing to various types of control problems. The principal subject areas covered are: (1) mathematical programing techniques for solution of control problems; (2) advances in control theory for mathematical programing in optimal control and related areas; (3) advances in mathematical programing techniques relevant to control applications, and (4) computers and computer programing in control systems.　　　　　　　　　Trans. by G.G.

N65-19831# Lockheed Missiles and Space Co., Sunnyvale, Calif.
LONG-RANGE PLANNING AND TECHNOLOGICAL FORE-CASTING: AN ANNOTATED BIBLIOGRAPHY, SUPPLE-MENT I
Peter R. Stromer. comp. Feb. 1965 40 p refs
(LMSC-5-10-65-3; SRB-65-1)
　　Emphasis is on planning within the aerospace and defense industry. During the past year both industry and government conducted introspective studies on such topics as potential convertibility of admitted industry overcapacity to peaceful pursuits and the economic impact of reductions in defense spending. Desirable diversification strategies and goals were rigorously assessed. While general conclusions may be lacking, sufficient data are available to aid in the decision-making process.　　　　　　　　　　　　　　　　Author

N64-32816 Joint Publications Research Service, Washington, D.C.
CYBERNETICS AND ECONOMIC MANAGEMENT
Vladimir Kadlec 7 Oct. 1964 12 p Transl. into ENGLISH from Zivot Strany (Prague), no. 15, Aug. 1964 p 953-958
(JPRS 26773; TT-64-51030) OTS: $1.00
　　The distinct roles of the scientist-researcher and the economist in applying cybernetics to economic management are stressed. The task of the economist is primarily the correct and singular formulation of the initial conditions, the important constraints, the objective of the computations, and economic analysis of the computed results. The search for new mathematical models should be left to scientists and mathematicians because of the twin dangers of overestimating or underestimating the practical usefulness of the model in the management of the national economy.　　　　　　M.P.G.

N64-31033 System Development Corp., Santa Monica, Calif.
PROCEEDINGS OF THE SYMPOSIUM [ON] DEVELOP-MENT AND MANAGEMENT OF A COMPUTER-CENTERED DATA BASE
A. Walker, ed. 6 Jan. 1964 140 p Conf. held on 10-11 Jun. 1963; sponsored by ARPA
　　Subjects discussed include military decision-making and data requirements, data retrieval for the Strategic Air Command Control System (SACCS), experience in managing data-base operations, a computer-centered data base for military personnel managers, automated data management, and adaptation of mass storage equipment for handling of a data base. Various work sessions are reported on, and a summary of unsolved problems is appended.　　　　　　　　D.E.W.

N64-28451 Lockheed Missiles and Space Co., Sunnyvale, Calif.
CREATIVITY, INNOVATION, AND INVENTION: AN AN-NOTATED BIBLIOGRAPHY
George R. Evans and Peter R. Stromer, comp. Aug. 1964 18 p
　　The recent business management literature has been surveyed to assess the current trends and developments in the field of creativity, innovation, and invention. The literature reveals that some tentative yardsticks are now available to identify creative talent and the means for optimizing its usage in industry. The importance of innovation and its successful implementation by both the military and the aerospace industry is stressed as companies seek to adapt their work force and facilities to new markets.　　　　　　Author

N64-22200 Lockheed Missiles and Space Co., Sunnyvale, Calif. Technical Information Center
LONG-RANGE PLANNING AND TECHNOLOGICAL FORE-CASTING: AN ANNOTATED BIBLIOGRAPHY
Peter R. Stromer, comp. Nov. 1963 46 p refs
(SRB-63-12; Rept.-5-47-63-1)
　　A survey was made of the recent aerospace and business management literature covering the broad spectrum of long-range planning and technological forecasting. While emphasis was placed on applicability to the aerospace and defense industry, additional inputs detailing the general philosophy and techniques of industrial and government planning and related subject fields of economic projections, resource allocations, and cost analyses have been included. A subject index facilitates use of this material.　　　　　　　　　　　Author

N64-15674 Hughes Aircraft Co., Culver City, Calif.
CONTRACT PROPOSALS: A SELECTED BIBLIOGRAPHY, 1961-1963
H. D. Hennesy Dec. 1963 8 p refs
(LS-BIB-63-6)
　　This selected bibliography of contract proposals contains references to periodicals and books.　　　　　　R.T.K.

N63-15733 RAND Corp., Santa Monica, Calif.
NETWORK-TYPE MANAGEMENT CONTROL SYSTEMS BIB-LIOGRAPHY
B. L. Fry Feb. 1963 204 p 417 refs
(Contract AF 49(638)-700; Proj. RAND)
(RM-3074-PR)
　　This bibliography contains listings of documents indexed by title and author and covering the literature on network-type management control systems.　　　　　　　　R.C.M.

N62-16407 Atomic Energy Commission. Div. of Technical Information, Washington, D.C.
CRITICAL PATH SCHEDULING: A PRELIMINARY LITERA-TURE SEARCH.
Hugh E. Voress, Elmer A. Houser, Jr., and Fred E. Marsh, Jr., comps. July 1962. 36 p. 305 refs.
(TID-3568(Rev. 1)) OTS: $0.75
　　This report is a revised bibliography of 305 references concerning the Critical Path Scheduling planning technique (also known as PERT, PEP, and LESS).　　　　　　　　(V.D.S.)

IAA ENTRIES

M1 PROGRAM MANAGEMENT

A67-42981 #

A SYSTEMS ANALYSIS APPROACH TO COMMUTER AIRLINE PLANNING.

Robert P. Hudock (Mitre Corp., Bailey's Crossroad, Va.) and Philip F. Hudock (Galland, Kharasch, Calkins and Lippman, Washington, D.C.).

American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 4th, Anaheim, Calif., Oct. 23-27, 1967, Paper 67-843. 15 p. 16 refs.

Members, $1.00; nonmembers, $1.50.

An integrated systems analysis approach to the major problems of planning a commuter airline is developed. A brief background of these carriers is presented, and their present minimal-restriction regulatory status is discussed. A general approach to structuring the system is taken to make the analysis technique applicable to a variety of geographic locations. Each of the system aspects and their interactions are analyzed from a combined technical/managerial/legal viewpoint. The function and purpose of the commuter airline are considered, including the carrier's relationship with the rest of the airline industry. Aspects of the system considered include the relevant market, route and fare structure, passenger profile, aircraft selection, facilities, personnel and operating problems.

(Author)

A67-35879

THE MANAGEMENT OF AEROSPACE PROGRAMS.

Walter L. Johnson (Duke University, Durham, N.C.).

Business and Government Review, Jan.-Feb. 1967. 8 p. 9 refs.

Discussion of two aspects of the management of aerospace programs - program budgeting and the contracting procedures. The different budgeting steps are outlined. It is pointed out that realistic program estimates must be established within the constraints of existing cost parameters and that realistic performance requirements must be determined and linked with incentives. The relation between cost and program progress must be determined. Control over change orders is necessary and can be accomplished through a disciplined procedure which allows for their timely implementation.

M.F.

A67-33636

CONTROL - A SYSTEMS MANAGEMENT PROBLEM [REGELUNG - EIN SYSTEMFÜHRUNGSPROBLEM].

Norbert Klamka (Bölkow GmbH, Ottobrunn, West Germany).

Bölkow-WMD/SIAT Report, May 1967, p. 20-25. In German.

Application, in systems management, of control engineering in two different senses. The use of control engineering to guide and control a missile results in the equipment and components of flight and guidance control and the mathematical model of the system. It can also be used as an aid in planning missile systems. The results in this case are the development-control loops which indicate the feedback, cross connections, and intermeshing in the flow of a system development. The basic possibilities for using control engineering as a systems-management planning aid are outlined and explained, taking as an example the development control loops for the system component of a flight-control system. Analogous development-control loops can be set up for other system components.

F.R.L.

A67-33494

AFSCM 375-5 AS A METHODOLOGY FOR SYSTEM ENGINEERING.

Norman L. Gelbwaks (Aerospace Corp., Electronics Div., El Segundo, Calif.).

(Institute of Electrical and Electronics Engineers, Systems Science and Cybernetics Conference, Washington, D.C., Oct. 17, 18, 1966, Paper.)

IEEE Transactions on Systems Science and Cybernetics, vol. SSC-3, June 1967, p. 6-10.

Contract No. AF 04(695)-1001.

Description of the life cycle of systems requiring Air Force Systems Command Manual 375-5 (AFSCM 375-5) implementation, with detailed discussion of the prescribed system-engineering management process and significant documentation tools. Possible implementation problems and solutions associated with the application of the manual are also considered. The manual prescribes the management policies and procedures to be followed in the design, development, test, operation, and maintenance of future Air Force systems.

F.R.L.

A67-31630 #

ON THE MANAGEMENT OF SPACE PROJECTS.

P. J. de Fries (TRW Systems Group, Redondo Beach, Calif.).

Deutsche Gesellschaft für Raketentechnik und Raumfahrt, Fortschrittliche Systemtechnik Symposion, Munich, West Germany, June 9, 1967, Paper. 15 p.

General outline of procedures employed by the directors of present-day space projects for the optimization of outputs. Two areas of importance concerning the avoidance of over-runs in cost and time are studied - namely, defining the job at hand and organizing for implementation and control. The reasons for over-run in early space projects are discussed. A typical work breakdown structure is shown, where one final end item is subdivided into its next lower tiers of subsystems. Various levels of project management - and the changing nature of this management in relation to a change in the project itself - are examined. The construction of the MOLAB, a proposed lunar ground locomotion machine, is used to illustrate a typical space project.

R.B.S.

A67-29833

ADVANCED SPACE VEHICLE PLANNING - AN ANALYSIS OF THE FIRST DECADE.

Carl H. Builder (United Aircraft Corp., East Hartford, Conn.).

IN: SPACE TECHNOLOGY CONFERENCE, PALO ALTO, CALIF., MAY 9-12, 1967, PROCEEDINGS. [A67-29828 15-31]

Conference sponsored by the Society of Automotive Engineers, the British Interplanetary Society, the Société Française d'Astronautique, the Deutsche Gesellschaft für Raketentechnik und Raumfahrt, and the Associazione Italiana Razzi.

New York, Society of Automotive Engineers, Inc. (SAE Conference Proceedings P-16), 1967, p. 49-56.

Analysis of advanced space-vehicle planning, from the economic approach to decision making. Optimum cost of program is found to decrease with time, despite rising launch traffic. Mathematical models are constructed with parameters based on earlier launch vehicle data. The effects of discounting on optimum investment are presented.

R.B.S.

A67-29669

THE STATE OF THE ART IN MANAGEMENT STUDIES APPLICABLE TO AEROSPACE ACTIVITIES.

G. P. Dollimore (Hunting Engineering, Ltd., Luton, Beds., England).

(Royal Aeronautical Society, Management Studies in the Field of Aeronautics, Symposium, London, England, Feb. 27, 1967, Paper.)

Royal Aeronautical Society, Journal, vol. 71, May 1967, p. 338-340; Discussion, p. 340-342.

Discussion of management methods which are applicable to the aerospace industry. The application of mathematical methods used in large industrial complexes to aerospace organizations is discussed, and the introduction of integrated information systems into aerospace companies is considered. Problems which arise in project and production management are reviewed. The need for the development of new techniques in the aerospace management field is emphasized in a discussion, and the use of critical path analysis is discussed.

M.F.

A67-29668

THE MANAGEMENT OF PROJECTS.

B. B. Mungo (Ministry of Technology, London, England).

(Royal Aeronautical Society, Management Studies in the Field of Aeronautics, Symposium, London, England, Feb. 27, 1967, Paper.)

Royal Aeronautical Society, Journal, vol. 71, May 1967, p. 334-336; Discussion, p. 336-338.

Outline of the existing procedures employed in the field of defense procurement and study of some new ones which may be used in the near future. It is pointed out that the task of the project manager is to maintain the right balance between quality, cost, and time. The objects of "Project Definition" consist of defining the development task and making a realistic estimate of the cost. The main task of the project team (government and industry together) is to control the development against the realistic estimates, specifications and programs prepared in Project Definition. As well as monitoring technical progress, the project manager must also be able to monitor cost in order to detect divergences from the cost plan at their inception. A comparison of project managements in the UK and the U.S. is presented in a discussion.   M.F.

A67-28697 #

THE PROFITABLE NURSING OF NEW TECHNOLOGIES IN A LARGE HARDWARE SYSTEMS BUSINESS.

Herbert Popper (General Electric Co., Missile and Space Div., Re-Entry Systems Dept., Philadelphia, Pa.).

IN: NTC 67; PROCEEDINGS OF THE 1967 NATIONAL TELEMETER-ING CONFERENCE, SAN FRANCISCO, CALIF., MAY 16-18, 1967. [A67-28679 14-07]

Conference sponsored by the American Institute of Aeronautics and Astronautics, the Instrument Society of America, and the Institute of Electrical and Electronics Engineers.

New York, American Institute of Aeronautics and Astronautics, Inc., 1967, p. 312-316. 15 refs.

Consideration of the management aspects of providing at a profit, and when required, a necessary technological capability within a large hardware systems business. This small business within the large one is described first in terms of its position on the scale of a number of parameters which are common to all such institutionalized undertakings. These measures are grouped into financial, technological, and human factors.   F.R.L.

A67-27545

THE MANAGEMENT OF AEROSPACE PROGRAMS; AMERICAN ASTRONAUTICAL SOCIETY, NATIONAL CONFERENCE, UNIVERSITY OF MISSOURI, COLUMBIA, MO., NOVEMBER 16-18, 1966, PROCEEDINGS.

Edited by W. L. Johnson (Missouri, University, Columbia, Mo.).

Tarzana, Calif., American Astronautical Society (AAS Science and Technology Series. Volume 12), 1967. 390 p.

Members, $12.94; nonmembers, $17.25.

This book is a collection of studies dealing with the various aspects of aerospace program management on the basis of practical experience gained in actual situations. Particular studies treated fall in the general categories of overall management concepts, bidding and development procedures, problems encountered in actual production, and efficient data utilization. Cost systems used to analyze complex programs are described, and the role of program budgeting in management procedures is outlined. References are made to specific situations encountered in the Gemini, Titan III, and Apollo projects. Trends in incentive contracting are examined with opinions presented by contractors and customers. The increasing complexity of interface requirements is outlined along with the current industrial and governmental practices used to meet this expanding management problem. Operational phases and management of engineering practices are analyzed in terms of problems involving technical support to depots, site operation, spares, and reliability performance. An approach is given for avoiding the systems deficiencies that can result from improper treatment of engineering changes. The use of data collected from continuous studies to determine the system capability, optimum tactics, maintenance procedures, and possible modifications is discussed.   T.M.

A67-24656

IMPROVEMENTS IN MANAGEMENT CONTROL OF COMPLEX PROJECTS.

D. Rowley (British Aircraft Corp. /Operating/, Ltd., Guided Weapons Div., Bristol, England).

Royal Aeronautical Society, Journal, vol. 71, Mar. 1967, p. 201-204.

Consideration of network analysis, the generalized approach of which is to break a whole work project down into definable small tasks with defined interrelationships. The job itself must be defined in terms of development costs, time and performance, and interfaces with other tasks and equipment, and the authority for altering it must be clearly stated.   B. B.

A67-21049 #

CONFIGURATION MANAGEMENT.

Walter Veith (Pan American World Airways, Inc., Patrick AFB, Fla.).

Mechanical Engineering, vol. 89, Feb. 1967, p. 20-25. 6 refs.

Discussion of the managing of engineering changes to prevent any design or systems deficiencies which could result from a poor control of the changes. This new discipline insures that the effects of changes on the total system are considered before their implementation. The result is a repetitive manufacturing process producing identical hardware end items and documentation fully representative of the configuration at all times.   F.R.L.

A67-20976 #

INTERFACE MANAGEMENT OF AEROSPACE SYSTEMS.

John M. Schmissrauter (Douglas Aircraft Co., Inc., Missile and Space Systems Div., Santa Monica, Calif.).

American Astronautical Society, National Conference on the Management of Aerospace Programs, University of Missouri, Columbia, Mo., Nov. 16-18, 1966, Paper AAS 66-159. 26 p.

Outline of the growth and increasing complexity of interface requirements and description of the current industrial and governmental practices used to meet this expanding management problem. The more pertinent aspects of the associated disciplines, required documentation, and the intricacies of the interrelationships between contractors, the procuring agencies, and other government agencies are covered.   (Author)

A67-20975 #

GEMINI PROGRAM MANAGEMENT.

Harry W. Oldeg (McDonnell Aircraft Corp., Dept. 19, St. Louis, Mo.).

American Astronautical Society, National Conference on the Management of Aerospace Programs, University of Missouri, Columbia, Mo., Nov. 16-18, 1966, Paper AAS 66-158. 10 p.

Discussion of management aspects of the design and development of the Gemini spacecraft. Three key aspects of the management task are program organization, management techniques, and personnel motivation. The operation of a joint project/functional organizational matrix is outlined; certain management techniques such as the assignment of individual spacecraft managers and the utilization of dual control rooms are set forth, and methods of obtaining maximum personnel motivation are cited. The technical accomplishments of the Gemini program, achieved within schedule constraints and well within budgeted resources, attest to the effectiveness of these management concepts.   F.R.L.

A67-20968 #

COST ANALYSIS FOR LARGE SCALE DEVELOPMENT/PRODUCTION PROGRAMS.

Arnold F. Klick (NUS Corp., Consultec Div., Washington, D.C.).

American Astronautical Society, National Conference on the Management of Aerospace Programs, University of Missouri, Columbia, Mo., Nov. 16-18, 1966, Paper AAS 66-148. 17 p.

Discussion of the requirements of, and a concept for, product-oriented cost analysis to support the full range of demands for program costs. Particular emphasis is given to three program facets which control or force costs (product characteristics, schedule, and quantity), and to means of expressing these in a meaningful manner for use in product-oriented cost analysis.   F.R.L.

A67-20967 #

APOLLO APPLICATIONS PROGRAM - EXPERIMENT SELECTION PROCESS.

John K. Hancock (Martin Marietta Corp., Martin Co., Dept. 1680, Denver, Colo.).

American Astronautical Society, National Conference on the Management of Aerospace Programs, University of Missouri, Columbia, Mo., Nov. 16-18, 1966, Paper AAS 66-142. 21 p. 6 refs.

Process for the selection of experiments for specific flights. Selection should not be made before this detailed, analytical process has been performed. Experiment selection is divided into three work areas, which are described in detail. (Author)

A67-14424

CONFIGURATION MANAGEMENT.

Morton J. Laine and E. C. Spevak (Teledyne Systems Co., Control Systems Div., El Segundo, Calif.).

Space/Aeronautics, vol. 46, Nov. 1966, p. 74-81.

Discussion of configuration management, a method for current and precise documentation which attempts to assure the customer and builder that the final hardware is what they agreed on, in spite of the thousands of engineering changes normally experienced in the development of a complex system. The formal definition of configuration management is defined as "the management of technical requirements which define systems, system equipment, or individual equipment and changes thereto. It is implemented through procedures by which uniform and mutually supporting methods of configuration identification, control and accounting are established and maintained for systems and equipment and for components of systems and equipment." The object of the policy is to enable the contractor to prove there is no contradiction at any level among the contract, the internal authorizations, the specifications and drawings, the hardware, the inspection documents, and the handbooks and manuals. M.M.

A67-14221

AN ENGINEERING APPROACH TO SOFTWARE CONFIGURATION MANAGEMENT.

B. L. Ryle (Planning Research Corp., Huntsville, Ala.).

IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, 1966 AUTOMATIC SUPPORT SYSTEMS SYMPOSIUM FOR ADVANCED MAINTAINABILITY, CLAYTON, MO., NOVEMBER 7-9, 1966, PROCEEDINGS. [A67-14201 03-11]

New York, Institute of Electrical and Electronics Engineers, Inc., St. Louis Section, 1966, p. 6A-1 to 6A-5.

Discussion of some practical problems which have arisen in past systems development efforts, including the development of software. Some of the practical benefits of adopting configuration management are considered, along with associated implications. The necessity of treating Automatic Support Equipment (ASE) software development as an engineering task is emphasized. It is concluded that the development of ASE software must be planned, organized, managed, and controlled as any other element of the system, to prevent the software from continuing to lag behind the hardware and from plaguing the schedule. S.Z.

A67-10631

ADMINISTRATIVE CONSIDERATIONS IN SYSTEMS EFFECTIVENESS PROGRAMS.

William H. Statler (Lockheed Aircraft Corp., Lockheed-California Co., Burbank, Calif.).

Society of Automotive Engineers, Aeronautic and Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 3-7, 1966, Paper 660731. 5 p.

Members, $0.75; nonmembers, $1.00.

Discussion of some principal administrative aspects of management of systems effectiveness programs. The problem of achieving credibility in the results and with the need for the identification of the point of diminishing returns in each investigation is discussed. An example analysis is diagramed, and the administrative task is shown to be that of providing the control, the guidance, and the environment of understanding among all of the technical disciplines involved. B.B.

A67-10590

PROBLEMS IN MANAGEMENT OF AEROSPACE GROUND EQUIPMENT.

C. J. Compton (Lockheed Aircraft Corp., Lockheed-Georgia Co., Marietta, Ga.).

Society of Automotive Engineers, Aeronautic and Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 3-7, 1966, Paper 660686. 14 p.

Members, $0.75; nonmembers, $1.00.

Consideration of the possibility of solving the problems associated with the management of aerospace ground equipment (AGE) by a program designed to ensure proper recognition by contractor and customer management. Such a program requires extensive changes in administration, engineering, configuration management, contracts, and data. Implementation will ensure an adequate appreciation of AGE requirements by management and furnish effective guidance to the design engineer. M.M.

A66-41777

A GENERALISED SYSTEM FOR PROJECT CONTROL AND EVALUATION.

George Mitchell.

Royal Aeronautical Society, Journal, vol. 70, Sept. 1966, p. 884, 885.

Description of the generalized system for project control and evaluating. This is an approach to avaluating quantitative indices of value and cost effectiveness that can be optimized, possibly by operational research methods, to produce information that can be used by management in making realistic decisions. The object of the system is to control and monitor a project from initiation, through development to completed production, considering the four essential variables of cost, time, performance, and reliability. The proposed management control system uses servomechanism control principles to construct an analog of the evaluation, development and production processes that are required for efficient management. It is constructed around four initial building bricks, consisting of management systems and models, resource allocation, time scheduling, performance evaluation, and reliability assessment. M.M.

A66-38498 #

MANAGEMENT OF ENGINEERING CHANGES.

Walter Veith (Pan American World Airways, Inc., Guided Missiles Range Div., Patrick AFB, Fla.).

American Society of Mechanical Engineers, Design Engineering Conference and Show, Chicago, Ill., May 9-12, 1966, Paper 66-MD-69. 9 p. 6 refs.

Members, $0.75; nonmembers, $1.50.

This paper discusses the practical aspects of configuration management. It outlines the basic requirements for change identification, control, implementation, and accounting for typical engineering/manufacturing organizations regardless of size and specific customer requirements. It then develops criteria for implementation of an effective configuration-management framework within which through modular expansion or contraction, organizational dynamics and changing customer requirements can be accommodated. (Author)

A66-37974 #

SYSTEM EFFECTIVENESS CAN BE ACHIEVED IN A MANNED SPACE PROGRAM THROUGH CORRECT MANAGEMENT DECISIONS.

J. A. Ralph and C. Cicchetti (International Business Machines Corp., Cape Kennedy, Fla.).

IN: ANNALS OF RELIABILITY AND MAINTAINABILITY. VOLUME 5 - ACHIEVING SYSTEM EFFECTIVENESS; ANNUAL RELIABILITY AND MAINTAINABILITY CONFERENCE, 5TH, NEW YORK, N.Y., JULY 18-20, 1965, PAPERS. [A66-37879 20-15]

Conference sponsored by the American Institute of Aeronautics and Astronautics, the Society of Automotive Engineers, and the American Society of Mechanical Engineers.

New York, American Institute of Aeronautics and Astronautics, 1966, p. 951-964.

Description of an improved systems effectiveness methodology utilized for a one-week turn-around space mission. It is shown

that this technique, which involves much preplanning and analysis, enables the required response for conceivable problems to be developed in advance, so that management is free to respond to the improbable. Extrapolation of this computer-assisted technique to future programs and missions is also discussed.　　　A. B. K.

A66-30441

TESTING FACILITIES - POTENTIAL PROFITMAKERS?
K. J. Dell (Bunker-Ramo Corp., Defense Systems Div., Information Technology Laboratory, Test Facilities Dept., Canoga Park, Calif.).
IN: INSTITUTE OF ENVIRONMENTAL SCIENCES, ANNUAL TECHNICAL MEETING, SAN DIEGO, CALIF., APRIL 13-15, 1966, PROCEEDINGS. [A66-30434 16-11]
Mt. Prospect, Ill., Institute of Environmental Sciences, 1966, p. 49-54.
　　　Discussion of factors entering into the disposition of capital equipment and facilities devoted to environmental testing. It is illustrated that through analysis of existing facilities and the needs of the surrounding technical community a profitable utilization of unneeded facilities can be achieved. Some of the more frequent causes of work-load reorientation that can undermine the need for capital test facilities are discussed, and an analysis is made of the management alternatives regarding the disposition of the affected facilities. The facets of implementation that would face responsible department management are explored on the basis of a management decision to proceed with a commercial laboratory operation. An attempt is made to illustrate by example the areas in which economies can be effected so as to make the laboratory more competitive in the commercial market place.　　　A. B. K.

A66-30400

AN ANALYTICAL CONCEPT FOR THE SELECTION, FLOW, AND TRANSFERENCE OF TECHNOLOGY IN A LARGE ELECTRONICS/ AEROSPACE FIRM.
Robert R. Kley (Technology Planning Center, Inc., Ann Arbor, Mich.).
IEEE Transactions on Engineering Management, vol. EM-13, Mar. 1966, p. 21-36.
　　　The basic functions of any firm can be separated into planning, control, and operations, the time span of decision being the separating variable. In the planning sector, the three basic factors of importance are the methodologies and concepts used to relate and integrate corporate strategy, structure, and policies. As the physical size of a firm changes, possibly accompanied by shifts in customer and market orientation, the combinations of strategy, structure, and policies change. In the electronics/aerospace industry, these three factors readily translate into (1) a process for selecting market areas as well as developing a technological resource base for a firm, and (2) a process of ensuring that this technological activity is embedded in an environment which will permit an intrafirm flow and transference of technology. For the selection process, a method is presented which develops a technique for establishing a physical cross-sectoral relationship between the military and commercial markets using a unique tree diagram and matrix approach. A related concept for developing technological flow and transference is developed using a Shannon-Weaver communication model. A composite organization structure model correlating all of these factors is also developed using a small group behavior, linking pin, and decision model.　　　(Author)

A66-29801

MANAGEMENT - THE GREATEST CHANGE IN RAILROADING WITH INNOVATION ORIENTED TO THE LOGISTICS MARKET AND RETURN ON INVESTMENT.
Robert S. Reebie (Robert Reebie and Associates, Rye, N. Y.).
IN: THIRD INTERNATIONAL FORUM FOR AIR CARGO, CHICAGO, ILL., MAY 24-26, 1966. [A66-29788 15-34]
Forum sponsored by the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, and the Society of Automotive Engineers.
New York, American Institute of Aeronautics and Astronautics, 1966, p. 64-68.

Discussion of the newer concepts of railroad management, the source of developments in right-of-way, power, vehicular equipment, terminaling, intermodal exchange, schedules, and commercial considerations. Comments are made on railroad-airline relationships, with evaluation of the capabilities of each.　　　F. R. L.

A66-28436

THE COMPATIBILITY OF VALUE ENGINEERING AND CONFIGURATION MANAGEMENT.
Marvin Wasserman (Brown Engineering Co., System Engineering Dept., Huntsville, Ala.).
IN: THE CHALLENGE OF SPACE; PROCEEDINGS OF THE THIRD SPACE CONGRESS, COCOA BEACH, FLA., MARCH 7-10, 1966. [A66-28401 14-30]
Congress sponsored by the Canaveral Council of Technical Societies.
Cocoa Beach, Fla., Canaveral Council of Technical Societies, 1966, p. 437-451.
　　　Review of the philosophies of system management and of the interrelationships of program management, system engineering, and management tools, directed to management levels responsible for ensuring system compatibility and mission success. Value engineering and configuration management are discussed as the catalysts to be integrated into the management network, thus assuring system compatibility and mission success at the lowest overall cost. It is concluded that those in management should establish a configuration management and value engineering program, the objectives of which are listed.　　　B. B.

A66-26391

A PRACTICAL DATA PROCESSING APPROACH FOR ACHIEVING EFFECTIVE MANAGEMENT CONTROL OF AIRCRAFT MANUFACTURE.
Ben Gebhardt (Mooney Aircraft, Inc., Kerrville, Tex.).
Society of Automotive Engineers, Business Aircraft Conference, Wichita, Kan., Mar. 30-Apr. 1, 1966, Paper 660205. 9 p.
Members, $0.75; nonmembers, $1.00.
　　　Review of a system application of data processing for offsetting costly inefficiencies of the aircraft industry, developed from "ideal" operating concepts. The theory behind the system development is outlined, and the critical control procedures and objective operating results achieved are identified.　　　M. M.

A66-23831

MANAGEMENT PROBLEMS OF AN AEROSPACE COMPUTER CENTER.
G. A. Garrett (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Sunnyvale, Calif.).
IN: AMERICAN FEDERATION OF INFORMATION PROCESSING SOCIETIES, 1965 FALL JOINT COMPUTER CONFERENCE, LAS VEGAS, NEV., NOVEMBER 1965, PROCEEDINGS. VOLUME 27 - PART I. [A66-23824 12-08]
Washington, D. C., Spartan Books, 1965, p. 129-137.
　　　Discussion of technical facets of the direction of a large aerospace computer installation. Some of the figures available on the actual costs of change are considered, together with aspects of the turn-around problem, from the management standpoint. Remarks are offered on the reasonable future expectations of the computer center considered.　　　M. M.

A66-23445

HUMAN FACTORS AND SYSTEMS EFFECTIVENESS.
S. R. Wallace (Department of Defense, Office of Defense Research and Engineering, Behavioral and Social Sciences Branch, Washington, D. C.).
IN: ELECTRONIC INDUSTRIES ASSOCIATION, CONFERENCE ON SYSTEMS EFFECTIVENESS, 1ST, WASHINGTON, D. C., OCTOBER 19, 20, 1965, PROCEEDINGS. [A66-23434 11-34]
Washington, D. C., Electronic Industries Association, 1965, p. 206-215.
　　　Study of possible means of improving the human factors' contribution to system effectiveness. The roles of the customer project officer, the contractor engineering manager, and the human factors specialist in improving system effectiveness are discussed. It is felt that much work is required to extend the data base in the

areas of automation, decision making and problem solving, stress, and performance of men working in groups. The requirement for research which can be used to form compatible measures of human performance is also noted. M.F.

A66-23441
ACHIEVING SYSTEMS EFFECTIVENESS BY DESIGN FUNCTION MANAGEMENT.
N. I. Hall (Hughes Aircraft Co., Culver City, Calif.).
IN: ELECTRONIC INDUSTRIES ASSOCIATION, CONFERENCE ON SYSTEMS EFFECTIVENESS, 1ST, WASHINGTON, D.C., OCTOBER 19, 20, 1965, PROCEEDINGS. [A66-23434 11-34]
Washington, D.C., Electronic Industries Association, 1965, p. 97-101; Panel Discussion, p. 106-117.
Discussion of the manner in which design activity can affect systems effectiveness. In order for the design function to be programed and managed, decision guide activities - including design analysis, development tests, application of standards and checklists, and use of consultants - must be systematically identified. The steps required to ensure a proper choice of components and materials for electronic devices are outlined. The concepts of design and system review are considered. System effectiveness is defined as capability times availability times dependability. D.P.F.

A66-23436
THE NAVY CONCEPT OF SYSTEMS EFFECTIVENESS.
I. J. Galantin (U.S. Naval Material Support Establishment, Washington, D.C.).
IN: ELECTRONIC INDUSTRIES ASSOCIATION, CONFERENCE ON SYSTEMS EFFECTIVENESS, 1ST, WASHINGTON, D.C., OCTOBER 19, 20, 1965, PROCEEDINGS. [A66-23434 11-34]
Washington, D.C., Electronic Industries Association, 1965, p. 10-18.
Evaluation of the methodology of systems effectiveness based upon a combination of reliability, maintainability, value, safety, and human engineering disciplines. The concepts employed in such an evaluation include mathematical models, system synthesis, and operations research. Criteria for systems effectiveness are considered in the light of the excellent performances of the Polaris program. It is shown how the concept of systems effectiveness can resolve the apparent conflict between a number of possible optimization criteria for a given system, such as greater reliability, least cost, minimum personnel required, or minimum construction time. D.P.F.

A66-23435
RATIONALE FOR SYSTEMS EFFECTIVENESS IN AIR FORCE SYSTEMS COMMAND.
W. Austin Davis (USAF, Systems Command, Andrews AFB, Washington, D.C.).
IN: ELECTRONIC INDUSTRIES ASSOCIATION, CONFERENCE ON SYSTEMS EFFECTIVENESS, 1ST, WASHINGTON, D.C., OCTOBER 19, 20, 1965, PROCEEDINGS. [A66-23434 11-34]
Washington, D.C., Electronic Industries Association, 1965, p. 4-9.
Discussion of the criteria for a quantitative basis for expressing the effectiveness requirements of a system and the measures to provide management techniques for achievement of the required levels of effectiveness throughout all phases of the systems program. The need for developing common definitions for a variety of terms in order to overcome problems of semantics and communications is emphasized. The drawbacks and dangers inherent in the use of analytical models are considered. The need for a cost-estimating procedure for providing uniform methods in presenting estimates and tracking estimate changes is stressed. D.P.F.

A66-22050
ADVANCED DATA MANAGEMENT EXPERIMENT.
A. C. Foreman (USAF, Systems Command, Electronic Systems Div., Hanscom Field, Mass.).
IEEE Transactions on Aerospace and Electronic Systems, vol. AES-2, Jan. 1966, p. 115-120.
Account of a project to demonstrate and refine a computer programing concept known as Generalized Data Management as exemplified by the Advanced Data Management (ADAM) System developed by the MITRE Corporation for the Electronic Systems Division/MITRE Systems Design Laboratory. ADAM is designed to provide generalized routines for functions common to a large class of command and management problems. Although earlier implementations of the Generalized Data Management concept have been demonstrated, ADAM has not been demonstrated in an operational application. The Air Force Logistics Command has provided an application (category I and IIR Consumption Item Requirements Computation System) with which to test ADAM. The Requirements System provides Logistics Command managers with information concerning stock items to buy, procurement contracts to terminate, items to repair, and budgets. ADAM implementation will provide an on-line real-time information system; the present Requirements System operates in a nonreal-time batch processing mode. The usefulness of providing an on-line system, which can be easily modified, is evaluated. (Author)

A66-17487
DEVELOPMENT MANAGEMENT AND COST CONTROL.
B. D. Blackwell and A. V. N. Reed (Bristol Siddeley Engines, Ltd., Small Engine Div., Leavesden, Herts., England).
(Royal Aeronautical Society, Main Lecture, London, England, Oct. 7, 1965.)
Royal Aeronautical Society, Journal, vol. 69, Dec. 1965, p. 813-819; Discussion, p. 820-824. 7 refs.
Study of the problem of development management and cost control in a Defense setting. It is thought that progress toward a solution in this field has been retarded in the UK by the lack of publication of attempts to think about this problem. Tables show sharply contrasting views on how to conduct general procurement, feasibility studies, and the development phase of an R and D project. It is noted that the Zuckerman Committee appears to oversimplify in the important creative phase while Hitch and McKean coming much nearer the truth of the matter (although they themselves do not treat the key question of how to control the independent developing of components and the duplication of approaches which they advocate). It is recognized that these opposite views state the problem and that it is in reconciling them that the solution of the problem is to be found. M.M.

A66-13798
A SYSTEMS APPROACH TO DEVELOPING SCHEMATICS.
Herman J. Feist (Boeing Co., Aero-Space Div., Seattle, Wash.).
Machine Design, vol. 37, Nov. 11, 1965, p. 186-193.
Examination of a systematic approach to the critical element in software management - the schematic. The approach consists of three steps: developing a complete set of schematics early in a design program, controlling the size, shape, and general makeup of the diagrams to meet the requirements of multiple users; and packaging the diagrams for rapid accessibility. Electrical, hydraulic, pneumatic, mechanical, and other types of information flow are considered, and special attention is focused on diagrams that display combinations of these various types. M.L.

A66-11638
AN APPROACH TOWARD A REAL-TIME EXPERIMENT MANAGEMENT SYSTEM.
Leo C. Driscoll (Mitre Corp., Applied Mathematics Dept., Bedford, Mass.).
IN: AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, MANNED SPACE FLIGHT MEETING, 4TH, ST. LOUIS, MO., OCTOBER 11-13, 1965, TECHNICAL PAPERS. [A66-11613 02-05]
New York, American Institute of Aeronautics and Astronautics, 1965, p. 232-241.
Contract No. AF 19(628)-2390.
Description of some promising techniques that are being developed: (1) computerized tools for flight operations planning; (2) constraint-analysis; (3) heuristic models for flight plan conflict-detection and contingency-derivation; and (4) a computer program for resource-allocation in a real-time environment. As a means toward discovering the architecture of an integrated replanning/

rescheduling/reallocation program, computerized tools are being investigated and two general purpose programing systems have been adapted. One programing system provides on-line information retrieval and a second system provides advanced data management as well as a test-bed for special purpose tools. Constraint analysis deals with many-dimensional relations among resources. The application of advanced man-machine practical communication systems will be investigated in order to form a bridge between the intuitive processes of the flight planner and machine processes. Logical and computational requirements for other tools to drive the real-time planning/scheduling/resource allocation programs are being studied. These tools include on-line aids for quick-look data reduction, experiment trend-analysis, and mission success prediction.   M. F.

A66-10341

OPERATIONAL RESEARCH AND AVIATION MANAGEMENT.
II - PROCUREMENT AND CAPITAL INVESTMENT PROGRAMMES.
P. A. Longton and A. T. Williams (Business Operations Research, Ltd., London, England).
Royal Aeronautical Society, Journal, vol. 69, Sept. 1965, p. 601-610. 22 refs.

Discussion of the profitable application of operational research to problems in the different branches of the aviation industry. Concentrating on capital investment programs and the procurement of aircraft, a discussion of cost structure leads to some detailed models. Objectives and financial policy, cost structure and investment costs, and some considerations for an aircraft replacement policy are given extensive attention. Problems of air traffic control and airport runways are considered. The analysis highlights the complexity of the interactions between system parameters in affecting the operations rate of the runway when it is used for both landings and takeoffs. The operations rate is affected differently by each parameter, depending on the values of the other parameters. Under all conditions, it is considered to be advantageous that the minimum time separation required between successive landings required at the runway, runway occupancy time of a landing aircraft, minimum time separation required between successive takeoffs, and minimum distance (from the approach end of runway) of a landing aircraft to permit interposing a takeoff before the landing, be as small as possible consistent with safety limitations.   F. R. L.

A66-10075

SAFETY AND MANAGEMENT - A PANEL DISCUSSION.
Donald R. Theleman (Northrop Corp., Norair Div., Flight Safety Branch, Hawthorne, Calif.).
IN: ANNALS OF RELIABILITY AND MAINTAINABILITY; ANNUAL RELIABILITY AND MAINTAINABILITY CONFERENCE, 4TH, LOS ANGELES, CALIF., JULY 28-30, 1965. VOLUME 4 - PRACTICAL TECHNIQUES AND APPLICATION. [A66-10048 01-15]
Edited by John de S. Coutinho.
Washington, Spartan Books, Inc., 1965, p. 333-335.

Panel discussion of safety and management intended as a forum for some of the top safety personnel of aerospace industry systems to discuss the relationship of their organizations and activities with their higher managements. Observations are made relative to the evolution of the systems safety effort. The importance of military specifications which require contractors to establish systems safety engineering programs, is discussed. Recommendations are presented for the benefit of the managements of companies comprising the aerospace community to further the cause of accident prevention.   M. M.

A66-10074

SAFETY MANAGEMENT IN AIR FORCE SYSTEM DEVELOPMENTS - A PROGRESS REPORT.
Robert L. Craine (USAF, Systems Command, Office of the Inspector General, Safety Div., Andrews AFB, Washington, D.C.).
IN: ANNALS OF RELIABILITY AND MAINTAINABILITY; ANNUAL RELIABILITY AND MAINTAINABILITY CONFERENCE, 4TH, LOS ANGELES, CALIF., JULY 28-30, 1965. VOLUME 4 - PRACTICAL TECHNIQUES AND APPLICATION. [A66-10048 01-15]
Edited by John de S. Coutinho.
Washington, Spartan Books, Inc., 1965, p. 329-332.

Review of developments in the field of Air Force system safety management. A brief insight is provided into the role of the Air

Force Systems Command (AFSC). The Air Force effort in the past few years towards increasing its overall management professionalism is reflected in a series of new regulation, program-management instructions, and manuals, the subject of which is systems management. A system safety management manual has been developed to establish the system safety engineering approach to be taken within the system development network. To provide a more efficient management tool, the System Safety Task Force has undertaken the updating and revision of military specification, safety engineering of systems and associated subsystems, and equipment, MIL-S-38130 (USAF). The handbook program, which is a responsibility of AFSC, consists of seven existing, five developmental, five new, and three proposed handbooks, and a series of handbooks designated AFSCM 80-9 is presently under development. Updating requirements call for a 90-day revision cycle of handbook data.   M. M.

A66-10073

SAFETY EDUCATION AND THE MANAGEMENT PROCESS.
Carl Hancey (Southern California, University, University College and Aerospace Safety Div., Los Angeles, Calif.).
IN: ANNALS OF RELIABILITY AND MAINTAINABILITY; ANNUAL RELIABILITY AND MAINTAINABILITY CONFERENCE, 4TH, LOS ANGELES, CALIF., JULY 28-30, 1965. VOLUME 4 - PRACTICAL TECHNIQUES AND APPLICATION. [A66-10048 01-15]
Edited by John de S. Coutinho.
Washington, Spartan Books, Inc., 1965, p. 325-327.

Examination of the relations among safety, education, and management. The development of education for aerospace accident preventers is reviewed, and safety education is related to management education. The belief is expressed that safety education has been the key that has opened the door to new concepts of management education: it serves to reemphasize the role the safety practitioner can play in the total management process since much of his basic education and experience is, in concept, the same as that required for management.   M. M.

A66-10052

COST-EFFECTIVENESS MANAGEMENT.
E. S. Winlund (Douglas Aircraft Co., Inc., Missile and Space Systems Div., Santa Monica, Calif.).
IN: ANNALS OF RELIABILITY AND MAINTAINABILITY; ANNUAL RELIABILITY AND MAINTAINABILITY CONFERENCE, 4TH, LOS ANGELES, CALIF., JULY 28-30, 1965. VOLUME 4 - PRACTICAL TECHNIQUES AND APPLICATION. [A66-10048 01-15]
Edited by John de S. Coutinho.
Washington, Spartan Books, Inc., 1965, p. 87-96. 20 refs.

Brief review of developments that may lead to efficient cost-effectiveness management in the year 1980. It is pointed out that, by the year 1980, many contractors will have developed continuous analysis and reporting systems that will satisfy management needs.   M. M.

A65-33159

OPERATIONAL RESEARCH AND AVIATION MANAGEMENT. I - AN INTRODUCTION TO OPERATIONAL RESEARCH.
R. R. P. Jackson and P. A. Longton (Business Operations Research, Ltd., London, England).
Royal Aeronautical Society, Journal, vol. 69, Aug. 1965, p. 543-552.

Demonstration of the power of the operational research approach both in general and in particular, with some examples relative to the aviation industry. It is shown that the key to operational research is the scientific method, moving logically through the phases of assumption, analysis, tests, and predictions. By the intuitive development of a model, followed by the application of a Poisson distribution, a detailed operational research approach is presented.   F. R. L.

A65-31586

MANAGEMENT ASPECTS OF AERO-SPACE SYSTEM SAFETY ENGINEERING.
Harold D. Trettin (Boeing Co., Aero-Space Div., Seattle, Wash.).
IN: SYSTEM SAFETY SYMPOSIUM, SEATTLE, WASH., JUNE 8-10, 1965, PROCEEDINGS. [A65-31568 20-34]
Symposium sponsored by the University of Washington and the Boeing Co.
Seattle, Boeing Co., 1965. 13 p.

Description of a model system safety program and discussion of the role of management in aerospace system safety. To implement its tasks in this field, it is suggested that management should define the objectives for the safety field, specify the tasks to be completed, provide an organization structure and command media, and provide the resources required to implement the program. Basic objectives in the training of system safety personnel are also described.

S. H. B.

A65-29269 #

PROGRAM MANAGEMENT - IN THEORY AND IN PRACTICE.
David I. Cleland (USAF, Air University, Institute of Technology, Wright-Patterson AFB, Ohio).
IN: NATIONAL AEROSPACE ELECTRONICS CONFERENCE, 17TH, DAYTON, OHIO, MAY 10-12, 1965, PROCEEDINGS. [A65-29228 18-09]
Conference sponsored by the Professional Group on Aerospace and Navigational Electronics, Dayton Section of the Institute of Electrical and Electronics Engineers, and American Institute of Aeronautics and Astronautics.
Dayton, Institute of Electrical and Electronics Engineers, Dayton Section, 1965, p. 334-338. 13 refs.

Discussion of program management, an approach to organizational theory that has no organizational or departmental constraints. The idea of program management centers around the control and integration of large aggregations of resources which are outside the traditional flows of authority and responsibility. The role played by this philosophy in the defense industry-government complex is examined.

S. H. B.

A65-25155

METHODOLOGY OF SYSTEM ENGINEERING.
Robert E. Machol (Illinois, University, Dept. of Systems Engineering, Chicago, Ill.).
IN: SYSTEM ENGINEERING HANDBOOK.
Edited by R. E. Machol, W. P. Tanner, Jr., and S. N. Alexander.
New York, McGraw-Hill Book Co., 1965, p. 1-3 to 1-13. 11 refs.

A general survey of system engineering, its definition, structure, viewpoint, and functions. A system is defined as having the following seven characteristics: it is manmade, it is integral, large, complex, semiautomatic, competitive, and its input is stochastic - i.e., the exact load or performance at any instant cannot be predicted. The problem of system structure can be broken down into the chronological phases of system design, the logical steps involved, the mathematical and scientific tools used, the functional parts of a system, and the administratively designated subsystems of a system. The basic viewpoint relative to system engineering is optimization of the cost-effectiveness ratio of the overall system; construction of a mathematical model is of great importance in the technique of optimization, based on "operations research," which involves the necessity of establishing and defining a quantitative measure of effectiveness. The ability to examine a problem, define such a quantitative measure, and then write equations based on the parameters of the particular case being analyzed are a measure of the competence of a system engineer, whose background should be broad but also deep in either mathematics or engineering.

D. P. F.

A65-23604 #

VALUE CONTROL FOR SYSTEM DESIGN.
Ervin Leshner (Radio Corporation of America, Camden, N.J.).
IN: NEW DIMENSIONS IN SPACE TECHNOLOGY; SPACE CONGRESS, 2ND, COCOA BEACH, FLA., APRIL 5-7, 1965, PROCEEDINGS. [A65-23599 13-31]
Congress sponsored by the Canaveral Council of Technical Societies.
Cocoa Beach, Canaveral Council of Technical Societies, 1965, p. 44-52. 6 refs.

Observations on the responsibilities of designers in terms of value control and cost effectiveness. Value and cost are controlled by the designer. Design decisions made so as to balance cost and performance will yield the greatest utility value to a system. Good value may be achieved by developing a cost model and a performance requirements model in detail sufficient to permit tradeoffs to be made by the designer.

(Author) D. H.

A65-21357

ORGANIZATION AND MANAGEMENT OF SPACE PROGRAMS.
Fremont E. Kast and James E. Rosenzweig (Washington, University, College of Business Administration, Seattle, Wash.).
IN: ADVANCES IN SPACE SCIENCE AND TECHNOLOGY.
VOLUME 7.
Edited by F. I. Ordway, III.
New York, Academic Press, Inc., 1965, p. 273-364. 24 refs.

Discussion of various aspects of the management of space programs. The topics considered are: (1) science, technology, and management; (2) systems concepts; (3) program management; (4) organization of space activities; (5) critical aspects in the management of space programs; (6) tools and techniques; and (7) summary and implications for the future.

M. M.

A65-19756

TECHNICAL DATA REQUIREMENTS FOR SYSTEMS ENGINEERING AND SUPPORT.
T. F. Walton (Space Technology Laboratories, Inc., Technical Data Dept., Redondo Beach, Calif.).
Englewood Cliffs, N.J., Prentice-Hall, Inc., 1965. 494 p. $15.

A systems engineering approach for effectively correlating the total system data needed in complex system development programs is described which is intended for managerial, supervisory, and operating personnel, as well as beginners in the field of data activities. The text is concerned with all forms of technical data needed in all phases of systems engineering efforts, as well as the operational functions in system programs, but with special reference to the technical data needed for a typical military (principally Air Force) or space system. The first eight chapters describe the major technical data requirements. Data described in Chapters 2 through 7 are covered in the same sequence in which they are generally encountered under government contracts. The eighth chapter covers many other ancillary data that are needed in support of system procurement, manufacturing, installation, assembly and checkout, test, and other program functions. Chapters 9 through 12 describe principles and requirements for management and administration, development and verification, production and quality assurance, cost controls, automation, and contracting. Chapter 13 summarizes the ideas presented, and relates them all to the predominating principle of the integrated data concept. A glossary is provided for the benefit of newcomers to the field, and a bibliography provides a list of suggested reading and text references. A subject index is presented.

F. R. L.

A65-13154 #

PROBLEMS AND PITFALLS IN IMPLEMENTING MANAGEMENT INFORMATION SYSTEMS.
Russell D. Archibald (CPM Systems, Inc., Encino, Calif.) and Richard L. Villoria (Houston Fearless Corp., Los Angeles, Calif.).
American Society of Mechanical Engineers, Winter Annual Meeting, New York, N.Y., Nov. 29-Dec. 4, 1964, Paper 64 - WA/MGT-1.
8 p.
Members, $0.50; nonmembers, $1.00.

Discussion of the fundamental causes of the difficulties which prevent effective application of contemporary management information systems. These difficulties relate to the effects of change and technological system deficiencies. Methods of minimizing these problems include: (1) the adequate definition of system objectives, (2) placing responsibility in the hands of operating management rather than staff specialists, (3) using the task force approach, and (4) continual education and training of all affected persons. The PERT/COST system is used to illustrate specific examples of the problems encountered.

T. V. Y.

A65-12839

SUCCESS STRATEGY FOR TECHNICALLY ORIENTED MANAGEMENT.
James A. Broadston (North American Aviation, Inc., Rocketdyne Div., El Segundo, Calif.).
Society of Automotive Engineers, National Aeronautic and Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 5-9, 1964, Paper 926B. 8 p. 22 refs.
Members, $0.75; nonmembers, $1.00.

General discussion of the relationship between the basic skills of the economists and behavioral scientists in regard to management decisions. The purpose of the paper is to encourage technical management to realize that both technical and economic success in producing a product competitively depend upon the effective utilization of human resources through proper motivation. It is shown that this is only possible when personal goals and company goals are integrated. It is suggested that a basic responsibility of management is to create conditions such that members of the organization can achieve their own goals best by directing their efforts toward the success of the enterprise. M. G.

A65-11307

ORGANIZING FOR SPACE AGE ACCURACY - THE ROLE OF COST ANALYSIS.
John J. Riordan (Department of Defense, Washington, D. C.).
IN: INSTRUMENT SOCIETY OF AMERICA, ANNUAL CONFERENCE, 19TH, NEW YORK, N. Y., OCTOBER 12-15, 1964, PROCEEDINGS. VOLUME 19. PART I - STANDARDS LABORATORIES AND MEASUREMENT STANDARDS.
Pittsburgh, Instrument Society of America, 1964. 3 p. (Preprint 20. 2-2-64).
Review of some DOD policies and programs relevant to management decisions regarding resources applied and organizational plans devised to satisfy needs for space-age accuracy. The comments pertain primarily to industrial organizations doing business with DOD. Specific DOD policies and programs reflecting the cost-effectiveness system of analysis are discussed. It is stated that it seems evident that incentive-type contracting offers sizable opportunities for cost-oriented engineers and scientists to bring their activities into the main stream of space progress. The widespread application of cost-effectiveness analytical techniques, and the strong trend toward incentive-type contracting, have set the stage for closer collaboration between the business and the technical organizational elements within both industry and government. M. M.

A64-25355

THE LEARNING CURVE - A CASE HISTORY IN ITS APPLICATION.
Julian L. Kottler (Avco Corp., Aerospace Structures Div., Nashville, Tenn.).
Journal of Industrial Engineering, vol. 15, July-Aug. 1964, p. 176-180. 5 refs.
Description with an applied case of the use of the learning-curve principle to forecast and control direct labor cost. The learning-curve theory is said to propose that as the total quantity of units doubles, the hours/unit (which reflect cost) decline at some constant percentage. Programs of motion and time study were reportedly used to establish standard methods and work crews. An analysis of direct labor cost and performance was made. Tables are presented giving the development of plot points for the direct labor learning curve, planned cost development, and actual cost vs planned cost.

A64-25354

AN INTRODUCTION TO SYSTEMS ANALYSIS.
J. K. O'Keefe (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Sunnyvale; Santa Clara, University, Dept. of Mechanical Engineering, Santa Clara, Calif.).
Journal of Industrial Engineering, vol. 15, July-Aug. 1964, p. 163-167. 6 refs.
Discussion of the qualitative and quantitative aspects of systems analysis in terms of a step-by-step organization of the analysis effort. Concepts basic to the logical accomplishment of systems analysis in industrial engineering are examined in terms of external requirements, sectionalization, and internal systemization. Two examples are shown of conceptual tools believed to be most important: the design flow chart and the system network diagram. The systems analysis concepts advanced are believed to be applicable not only to the aerospace systems given as examples but also to other complex systems encountered in industrial engineering.

A64-23348

PROGRAM CONTROL SYSTEMS.
John F. McNeil (Gates Radio Co., Quincy, Ill.).
IEEE Transactions on Engineering Management, vol. EM-11, Mar. 1964, p. 29-42. 14 refs.
Description of an approach to program control oriented toward systems management. The following topics are discussed: total program control; systems management; program cost control; PERT network activity pricing; expenditure rate curves in cost planning and control; frequency of cost reporting; technical performance and program schedules; and project status reporting.

A64-22640

A REVIEW OF PROGRESS IN THE AREAS OF AERONAUTICAL AND AEROSPACE SPARES MANAGEMENT.
Otto F. Janssen, Jr. (Garrett Corp., Los Angeles, Calif.).
IN: ANNUAL AEROSPACE RELIABILITY AND MAINTAINABILITY CONFERENCE, 3RD, WASHINGTON, D. C., JUNE 29-JULY 1, 1964, PROCEEDINGS.
New York, N. Y., Society of Automotive Engineers, Inc., 1964, p. 536-545.
Review of the progress in aeronautical and aerospace spares management which has occurred from the mid 1940's through 1963. Areas covered include commercial airlines, Army, Navy, Air Force and NASA. It includes some of the past history of spares management and improvements gained. In each of the above areas, the range of spares management from provisioning, ordering, inventory control and distribution, through packaging and handling, is covered. It is noted that progress has been considerable over the past 20 years, and it is anticipated that more efficient spares management is imminent as refinements and improvements continue.

A64-22639

SPARES MANAGEMENT IN THE USAF.
James A. Bailey (USAF, Directorate of Supply and Services, Washington, D. C.).
IN: ANNUAL AEROSPACE RELIABILITY AND MAINTAINABILITY CONFERENCE, 3RD, WASHINGTON, D. C., JUNE 29-JULY 1, 1964, PROCEEDINGS.
New York, N. Y., Society of Automotive Engineers, Inc., 1964, p. 512-517.
Comprehensive study of the manner in which the Air Force is improving its spares management program through the use of high-speed electronic data processing equipment, improving its personnel skill level through training and higher education, and by instituting a series of management control systems to insure reliability of data output. The accomplishments of Air Force spares management resulting from critical examination of the requirements for each of the one million spare parts in the inventory are dealt with. A marked reduction in the dollars needed to support the combat capability of the Air Force is shown.

A64-22617

OPERATIONAL EMPLOYMENT CRITERIA - A SPACE AGE MANAGEMENT TOOL.
C. J. Morgan (Martin Marietta Corp., Martin Co., Denver Div., Denver, Colo.).
IN: ANNUAL AEROSPACE RELIABILITY AND MAINTAINABILITY CONFERENCE, 3RD, WASHINGTON, D. C., JUNE 29-JULY 1, 1964, PROCEEDINGS.
New York, N. Y., Society of Automotive Engineers, Inc., 1964, p. 318-324.
Presentation of the ideas that management of an ICBM or space system must be preplanned and management by reaction has no place in such systems. Martin-Denver's experience with developing Titan 2 use plans is described, and the value of this preplanning is analyzed and compared with conventional methods of management by reaction. The advantages of use plans for future programs are discussed in terms of the following three questions: (1) when in the program should use plans appear, and why, (2) how should use plans be employed during system development, and (3) what should be the final disposition of use plans.

A64-22583

THE ROLE OF EFFORT CLASSIFICATION IN SYSTEM DESIGN
AND EVALUATION.

Vernon L. Grose (Northrop Corp., Ventura Div., Newbury Park,
Calif.).

IN: ANNUAL AEROSPACE RELIABILITY AND MAINTAINABILITY
CONFERENCE, 3RD, WASHINGTON, D.C., JUNE 29-JULY 1,
1964, PROCEEDINGS.

New York, N.Y., Society of Automotive Engineers, Inc., 1964,
p. 71-81.

Description of the six categories, for various types of develop-
ment, implemented by Northrop Ventura as part of their internal
management control, similar to those in the Department of Defense.
This implementation required: (1) that the DOD development cate-
gories be expanded and interpreted in terms of Northrop Ventura's
product interests; (2) that levels of appropriate effort within each
of the development categories be defined for all functions involved
in the development process. These latter levels are said to con-
stitute what is called "effort classification." Effort classification
has been credited with reducing the time required to prepare and
negotiate proposals, simplifying program management, and
achieving product maturity.

A64-21607

PROGRAM CONTROL SYSTEMS.

John McNeil (Collins Radio Co., Cedar Rapids, Iowa).

IN: NATIONAL WINTER CONVENTION ON MILITARY ELEC-
TRONICS, 5TH, LOS ANGELES, CALIF., FEB. 5-7, 1964,
PROCEEDINGS. VOLUME 3.

Convention sponsored by the Professional Technical Group on
Military Electronics, Institute of Electrical and Electronics En-
gineers.

Edited by R. F. Lander.

North Hollywood, Western Periodicals Co., 1964, p. 12-26 to 12-42.
14 refs.

Presentation of an approach to program control which is ori-
ented to systems management. Aspects of the problem considered
include total program control, systems management, program
control, introduction to PERT network activity pricing, PERT
activity pricing and analysis in detail, use of expenditure rate
curves in cost planning and control, frequency of cost reporting,
technical performance and program schedules, and project status
reporting.

A64-21586

COST ASPECTS OF COMPUTER PROGRAMMING FOR COMMAND
AND CONTROL.

Leonard Farr and Burt Nanus (System Development Corp., Santa
Monica, Calif.).

IN: NATIONAL WINTER CONVENTION ON MILITARY ELEC-
TRONICS, 5TH, LOS ANGELES, CALIF., FEB. 5-7, 1964,
PROCEEDINGS. VOLUME 3.

Convention sponsored by the Professional Technical Group on
Military Electronics, Institute of Electrical and Electronics En-
gineers.

Edited by R. F. Lander.

North Hollywood, Western Periodicals Co., 1964, p. 1-1 to 1-12.

Discussion of the cost estimation problem studied in an ARPA-
sponsored project which was initiated to develop improved manage-
ment techniques for computer programming in command and control
systems. Some of the underlying causes of the cost estimation prob-
lem are discussed and about fifty factors that appear to contribute
to cost are identified. Data concerning the effects of some of the
cost factors are presented. Finally, some suggestions for further
work are offered.

A64-20262

PACC - A SIGNIFICANT ADVANCE IN MANAGEMENT CONTROL.

Martin J. Crean and Joseph R. Muller (Sperry Rand Corp., Sperry
Gyroscope Co., Great Neck, N.Y.).

American Institute of Aeronautics and Astronautics, Annual Meeting,
1st, Washington, D.C., June 29-July 2, 1964, Paper 64-411. 9 p.
Members, $0.50; nonmembers, $1.00.

Discussion of the management control system used at the Sperry
Gyroscope Company. Product Administration and Contract Control
(PACC) is an integrated data processing system designed to provide
management with the necessary tools for control of overall program
operations. To achieve the objective of improved management
control, PACC is designed to include both information and control
subsystems as well as operating subsystems, for complete control
of company activities.

A64-20063

THE IMPACT OF PROJECT DEFINITION ON AEROSPACE SYSTEM
MANAGEMENT.

Stanley Bernstein (Raytheon Co., Missile Systems Div., Bedford,
Mass.).

American Institute of Aeronautics and Astronautics, Annual Meeting,
1st, Washington, D.C., June 29-July 2, 1964, Paper 64-405. 8 p.
Members, $0.50; nonmembers, $1.00.

Discussion of the significance of the Department of Defense
Project (or Program) Definition Phase (PDP), required prior to the
initiation of major programs. It is stated that the introduction of
project definition requirements in the aerospace industry will re-
quire major and, in many cases, drastic changes in management
philosophies and procedures. Pre-proposal efforts, which previous-
ly required predominantly engineering and marketing efforts, will
now require not only considerably increased effort in these areas,
but, in addition, increased effort by engineering, production, and
other segments of any given organization. It is noted that the current
trend toward requiring a fixed price incentive proposal as part of
PDP will require a tremendous amount of additional overhead-
type effort. The requirement for stated performance incentive
goals will, inevitably, lead to more conservative design and engi-
neering during the project definition phase.

A64-19985

LONG RANGE PLANNING FOR A MAJOR COMPONENT MANUFAC-
TURER.

George P. Sutton (North American Aviation, Inc., Rocketdyne Div.,
Long Range Planning, Canoga Park, Calif.).

American Institute of Aeronautics and Astronautics, Annual Meeting,
1st, Washington, D.C., June 29-July 2, 1964, Paper 64-404. 7 p.
Members, $0.50; nonmembers, $1.00.

Brief review of the major facets and principal premises of
long-range planning activities as they are currently practiced at
Rocketdyne. The topics considered include the two basic steps in
long-range planning, evaluation of external influences, statement
and re-examination of objectives, identification of new opportunities
in rocket propulsion, major future programs and their selection,
major areas of research and development, market and sales predic-
tion, facilities plan, skills and personnel, dollar resources, the
planning organization, and key premises. Figures show charts of
the Rocket Division's total national market by product, national
market, and product sales.

A64-19891

RISK APPRAISAL OF PROGRAMS SYSTEM (RAPS).

J. R. Polski, I. M. Clausen, and H. W. Paige (General Electric
Co., Missile and Space Div., Management Systems, Philadelphia,
Pa.).

American Institute of Aeronautics and Astronautics, Annual Meeting,
1st, Washington, D.C., June 29-July 2, 1964, Paper 64-406. 15 p.
Members, $0.50; nonmembers, $1.00.

Description of a system for the evaluation of program risks.
The system evaluates the risk level associated with each hardware
end-item for each of seven "resource" or "external" limitations
factors, as assessed by the responsible engineer; and the extent
to which methods and practices are being adhered to in 21 key areas
as assessed by the responsible individual with the aid of a checklist
identifying the low-risk way of doing the job. A four-degree risk-
categorization system is used. Substantiations are required that
define the work needed to decrease risk and the cost of doing such
work. Appraisals are made periodically throughout the program.
It is stated that the data display with substantiation gives a greater
depth of understanding of the program than formerly available, and
that it provides a new basis for management action.

A64-19729

A SYSTEM FOR EVALUATING V. E. EFFORTS.
H. J. Smith (Aerojet-General Corp., Liquid Rocket Plant, Sacramento, Calif.).
Journal of Value Engineering, vol. 2, May 15, 1964, p. 38, 39, 73.
Description of a method of assessment. The rating system indicates to the plant manager how each division is performing its value engineering responsibility, provides incentive for the division manager and his value engineers to improve their rating, and provides the manager and his value engineers with a method of determining ways to improve their program. From these benefits, the rating system is considered to provide a valuable means for gradually strengthening program efforts.

A64-19728

NEED AND CRITERIA FOR MEASURING EFFECTIVENESS OF VALUE ENGINEERING.
A. F. Kaufmann (International Business Machines Corp., Federal Systems Div., Space Guidance Center, Rockville, Md.).
Journal of Value Engineering, vol. 2, May 15, 1964, p. 32-37.
7 refs.
Definition of basic areas requiring a means of measuring the effectiveness of value engineering. It is considered that there is a need for management to define more clearly the objectives of its reporting requirements and that management should consider placing more emphasis on value-engineering effectiveness in the areas of education and consultations. This can be brought about by scientifically examining the value-engineering job content with a management tool such as job analysis. Once the job content has been established, it is possible to measure the effectiveness of value engineering in the basic areas of responsibility.

A64-19725

BRINGING AN ESTABLISHED PROGRAM UP-TO-DATE.
S. Malasky (Radio Corporation of America, Missile and Surface Radar Div., Moorestown, N.J.).
Journal of Value Engineering, vol. 2, May 15, 1964, p. 14-18.
Review of steps taken at the RCA Missile and Surface Radar Division to increase the scope of value engineering responsibility and to improve the effectiveness with which value engineering recommendations are implemented. Comment is made on the role of value engineering in the preparation of new proposals. A problem in spares procurement is treated which is considered to show advances over the MIL specification governing spares provisioning. Value engineering is also concerned with application of microelectronics to heavy ground-based radar products, and a typical case is examined in some detail. The division of work in an office between scientific and engineering activities and administrative value engineering is discussed.

A64-18117

GOOD MANAGEMENT INSURES PROGRESS.
David F. Barber and Anthony Coppola (USAF, Rome Air Development Center, Griffiss AFB, N.M.).
(International Conference and Exhibit on Aerospace Electro-Technology, Phoenix, Ariz., Apr. 20-23, 1964.)
IEEE Transactions on Aerospace, vol. AS-2, Apr. 1964, p. 345-349.
Discussion of the role of management in the achievement of reliability. Considered are the management structure and management tools, and certain recommendations toward the improvement of reliability through better management are made.

A64-16049

PROVIDING TIMELY PRODUCTION DATA.
Robert D. Bernhard (Bell Helicopter Co., Data Processing Dept., Fort Worth, Tex.).
Automation, vol. 11, Mar. 1964, p. 48-55.
Description of a total information system designed to provide a company management with specific elements of information required for planning, execution, evaluation, and control of the total business - in this case, helicopters.

A64-16010

ON-LINE MANAGEMENT INFORMATION. I - PLANNING A SYSTEM.
Norman J. Ream (Lockheed Aircraft Corp., Burbank, Calif.).
Datamation, vol. 10, Mar. 1964, p. 27-30. 5 refs.
Discussion of plans for a real-time management information system. A real-time management information system monitors the physical environment but exerts only indirect control by the production of management type reports or displays. The general instrumentation of simplex, duplex, master/slave, shared-file, and multiprocessing systems is briefly surveyed. A real-time system is used for obtaining planning, control, and operating reports and can also be used to develop by-product data for the production of new criteria for performance evaluation.

A64-14704

PROGRAM MANAGEMENT TECHNIQUES AT MARTIN ORLANDO.
Leander Schaidt (Martin Marietta Corp., Martin Co., Air-to-Surface Missile Systems, Orlando, Fla.).
(Institute of Electrical and Electronics Engineers, National Winter Convention on Military Electronics, Los Angeles, Calif., Jan. 31, 1963.)
IEEE Transactions on Engineering Management, vol. EM-10, Sept. 1963, p. 124-137.
Description of the concepts and systems of program management and project control used at Martin-Orlando. The functions of each level of management are described. A project master plan is presented which summarizes major items of work and delivery status. The plan is color-coded to indicate firm business under control, carry on business expected against existing contracts, and potential business expected as a result of research and development and sales. Also presented is a missile flow plan which shows the sequence of completion of subassemblies and components, process flow through final assembly, and the required scheduling and time spans. Input-output control curves are discussed.

A63-23260

PROGRAM MANAGEMENT WITH CONFIGURATION CONTROL.
Irving Mayer (North American Aviation, Inc., Autonetics Division, Minuteman Systems Management Division, Downey, Calif.).
(Institute of Electrical and Electronics Engineers, International Conference and Exhibit on Aerospace Support, Washington, D.C., Aug. 4-9, 1963.)
IEEE Transactions on Aerospace, vol. AS-1, Aug. 1963, p. 467-473.
Brief review of the aspects of program phasing which dictate the need for total configuration control, in terms of design and data interface and concurrency concept considerations. Basic elements and organizations of a configuration control system are described and integrated with program, project, and functional department management. The importance of acquisition, verification, compilation, and integration of data with timely release for shared use is emphasized. Stress is also placed on the development and preservation of evolution traceability, and the cross-sensitivity of change effects among design, data, schedules, and resources.

A63-20760

OPERATIONAL SYSTEMS - A CURRENT COMPUTER TREND.
Robert E. Clement (IBM Corp., Data Processing Division, White Plains, N.Y.).
Electronic Industries, vol. 22, June 1963, p. K7-K9, K23.
Brief review of some industrial applications of computers. The use of computers for aerospace system simulation, such as the Marshall Space Flight Center's computer simulation of Saturn rockets, and data retrieval are noted, as is their use in operational systems for industrial applications. An example of such an application is the Inventory Management Program and Control Techniques (IMPACT), which is made up of three basic functions stored within the computer: ordering, forecasting and reviewing.

A63-16893
SYSTEMS PHILOSOPHY.
David O. Ellis (Litton Industries, Inc., Research and Analysis
Dept., Beverly Hills, Calif.) and Fred J. Ludwig (Litton Industries
Inc., Guidance and Control Systems Div., Beverly Hills, Calif.)
Englewood Cliffs, N.J., Prentice-Hall, Inc., 1962. 387 p.
$13.00.
Detailed discussion of the overall view of major concepts in-
volved in the engineering and management of man-made systems
and man/machine systems, treating systems technology as it exists
and interpreting the probable trends and implied conclusions of
current practice. The text is designed for both management and
the public, and also furnishes a general survey of the subject for
the scientific generalist and the specialist. Specifically covered
are (a) basic system concepts, including subsystems and compo-
nents, and selection and effectiveness criteria; (b) special problem
areas, including human subsystems; (c) design and analysis; (d)
the operational approach; and (e) a systems technology forecast for
the next era. Technical detail is, for the most part, confined to
the appendices which constitute the bulk of the book, and are com-
pletely independent, providing supportive and illustrative material
for the text. Included in the appendices are (1) a precise definition
of systems; (2) the notion of generalized logical design; (3) the par-
tial design of a hypothetical weapons system; (4) the systems matrix
approach; (5) a mathematical model of a conventional digital integra-
tor; (6) a discussion of generalized logic; (7) preliminary considera-
tion of an army surveillance system; (8) remarks on low-level
redundancy; (9) elements of a behavioral theory of static decisions;
(10) the relativistic Doppler effect, a new approach to space naviga-
tion; (11) limitations of contemporary terrestrial Doppler navigation
radars; (12) the tunnel display concept; and (13) application of elec-
tromyographic techniques in the integration of man/machine sys-
tems.

A63-16590
THE ANATOMY OF PROGRAM MANAGEMENT.
J. B. Medaris.
(National Advanced-Technology Management Conference, Proceed-
ings, Seattle, Wash., Sept. 4-7, 1962.)
IN: Science, Technology, and Management. New York, McGraw-
Hill Book Co., Inc., 1963, p. 112-128.
Analysis of the problems of government-industry program
management based on such projects as the Redstone, the Jupiter
IRBM, the Explorer and Juno series, the Pershing missile, and
the Saturn space vehicle. The uncertainty in decision making and
the conflicts existing during the late 1940's and early 1950's regard-
ing the national rocket and missile program are pointed out. The
importance of clearly defining the problems and objectives of a
program is stressed, indicating that this is one of the most impor-
tant managerial functions in establishing a new program on the right
basis. However, the conflict of values which often permeates a
program is spotlighted precisely and clearly. It is indicated that
the built-in conflicts among the customer, the national financial
authority, the final user of the product, the scientists and designers,
the production-oriented people, and business managers are to be
expected in advanced-technology programs. The establishment of
dual approaches in meeting new scientific and technical problems
is proposed. Finally, valuable suggestions for handling some of the
specific problems involved in actually managing a program are
provided. The vital importance of maintaining active communication
and coordination between the various groups within the project is
stressed, and the role of project management in this activity is
outlined.

A63-16589
FORMATION AND MANAGEMENT OF DEPARTMENT OF ARMY
PROGRAMS.
August Schomburg (U.S. Army, Supply and Maintenance Command,
Washington, D.C.)
(National Advanced-Technology Management Conference, Proceed-
ings, Seattle, Wash., Sept. 4-7, 1962.)
IN: Science, Technology, and Management. New York, McGraw-
Hill Book Co., Inc., 1963, p. 106-111.
Discussion of the importance of the Army's in-house capabili-
ties in meeting technological requirements. A strong case is made

for maintaining effective scientific, technical, and managerial skills
within the military services for the development of new systems.
Two of the Army's newest and most complex programs - the Zeus
missile program and the M-60 tank program - are described in
detail. The differences between these two programs are contrasted
in terms of their management approaches. The Zeus program
makes use of private industry for technical direction and manage-
ment, whereas the tank program is managed in-house.

A63-16588
PROJECT MANAGEMENT WITHIN THE ARMY MATERIEL
COMMAND.
F. S. Besson, Jr. (U.S. Army, Materiel Command, Washington,
D.C.)
(National Advanced-Technology Management Conference, Proceed-
ings, Seattle, Wash., Sept. 4-7, 1962.)
IN: Science, Technology, and Management. New York, McGraw-
Hill Book Co., Inc., 1963, p. 90-105.
Discussion of the recent reorganization of the Army as a result
of which the Army Materiel Command is established to integrate
the materiel functions of the Army. A strong emphasis is placed
upon the use of vertical project management, and it is shown how
this concept is being utilized in the AMC. It is suggested that the
discussion of the functions, roles, and organizational relationships
in this new type of organization should be meaningful in advanced
technology industries. The conflict between functional and project
management is outlined and ways for ameliorating it are suggested.
The idea of the "red line" - a subordinate communicating directly
with the top level in the organization while bypassing intermediate
superiors - is presented, and it is indicated that it is a departure
from the traditional military concept of single chain of command.

A63-13537
IMPLEMENTATION OF A DESIGN REVIEW PROGRAM.
Arthur S. Winthrop (Space Technology Laboratories, Inc., Redondo
Beach, Calif.)
(Institute of Radio Engineers, Annual Seminar, 3rd, Reliability of
Space Vehicles, Los Angeles, Calif., Oct. 26, 1962.)
IN: Third Annual Seminar on Reliability of Space Vehicles.
North Hollywood, Calif., Western Periodicals Co., 1962. 16 p.
Price of entire volume (137 p.): $6.50.
Description of the theoretical development and actual
implementation within a divisional organization of a comprehensive
design review program. Successful application to the Orbiting
Geophysical Observatory program is reported. The initial success
of the pilot operation suggests a company-wide application.

A63-13246
A METHODOLOGY FOR SYSTEMS ENGINEERING.
Arthur D. Hall (Bell Telephone Laboratories, Inc., Murray Hill,
N.J.)
Princeton, N.J., D. Van Nostrand Co., Inc., 1962. 478 p.
$12.00.
A treatment of the methodology of systems engineering is
presented to increase awareness and understanding of the process,
and to sharpen definitions and approaches to the principal recurring
problems, such as definition, goal setting, systems synthesis and
analysis, and choosing among alternate systems. Intended for
teachers and students of systems engineering, creative engineering,
design, operations research, management science, and related
fields, the material is presented in four groups: (1) description and
analysis of the overall process, with identification and discussion
of recurring problems; (2) problem definition and development of
systems requirements; (3) decision-making, emphasizing problems
of setting objectives, and designing effective value systems; and
(4) approaches and tools useful in systems synthesis and analysis.
Terms that are considered necessary for the logical development
of systems engineering are listed in the index.

A63-13078

OPERATIONS RESEARCH IN PRODUCTION AND INVENTORY
CONTROL.

Fred Hanssmann (International Business Machines Corp., Dayton,
Ohio).

New York, John Wiley and Sons, Inc., 1962. 254 p.
$8.95.

Survey of advances in inventory management, with emphasis
on problem solving and specific applications. The book was de-
veloped from the material in a graduate course taught by the author
at *Case Institute of Technology. Areas discussed include single*
station (static deterministic models, static probabilistic models,
and dynamic models), parallel stations, and series of stations.

A63-10176

A TECHNIQUE FOR MANAGEMENT OF MULTIPLE PROGRAMS
IN A MEDIUM SIZE ENGINEERING DEPARTMENT.

B. W. Goldberg (Bendix Corp., Utica Div., Utica, N.Y.)
Society of Automotive Engineers, National Aerospace Engineering
& Manufacturing Meeting, Los Angeles, Calif., Oct. 8-12, 1962,
Paper 576B. 8 p.

Description of a practical approach to the control of fiscal and
technical progress for multiple unrelated engineering projects.
The technique incorporates six basic steps: (1) definition of the
goals or the project aim; (2) preparation of the engineering esti-
mate; (3) preparation of the project plan; (4) periodic review and
evaluation of each project; (5) correlation and coordination of indi-
vidual projects into the overall engineering operation; and (6) pres-
entation to corporate management.

M2 CONTRACT MANAGEMENT

A67-15335 #

THE DEFENSE INDUSTRY - MANAGEMENT CHALLENGE OF
THE SEVENTIES.

John J. Bennett (USAF, Systems Command, Andrews AFB,
Washington, D.C.).
American Society of Mechanical Engineers, Winter Annual Meeting
and Energy Systems Exposition, New York, N.Y., Nov. 27-Dec. 1,
1966, Paper 66-WA/MGT-16. 7 p. 7 refs.
Members, $0.75; nonmembers, $1.50.

The paper addresses the alleged incompatibility between the
current government procurement practices and the trend toward
tighter management control techniques in dealing with defense and
space contractors. It attempts to show that the fundamental problem
is not incompatibility between greater contractor risk and control,
but how government has applied the new control techniques. It
describes several actions the government is undertaking to carry
out future development and implementation of management control
procedures in a more orderly manner and in a way that will reduce
the impact on industry. It concludes that considerable opportunity
exists for industry to improve its participation in a partnership with
government that will benefit both parties.   (Author)

A66-34251

TOTAL VALUE CONCEPTS IN THE CONTRACT DEFINITION
PHASE.

S. Robinson (Radio Corporation of America, Defense Electronic
Products, Missile and Surface Radar Div., Moorestown, N.J.).
IEEE Transactions on Aerospace and Electronic Systems, vol.
AES-2, July 1966, p. 402-408. 5 refs.

For large military research and development projects, Contract
Definition type contracts are meeting the cost-effectiveness challenge
by an intensive study of the total value considerations in a project

before it starts. This has extended the application of total value
concepts throughout all project activities and broadened their scope.
Total value concepts are discussed and applied to various aspects
of system effectiveness. The effects of configuration, reliability,
and system availability upon overall costs are considered, and cost
vs performance optimization curves are shown. Practical measures
of service life are calculated. Break-even curves relating acquisi-
tion and operational costs are shown. A decision matrix method for
assessing system value is included. A case study graphically
showing the effects of value considerations on a typical radar antenna
tower is contained in the paper.   (Author)

A65-18723

A MODEL FOR DETERMINATION OF INCENTIVE FEE.

E. A. Polgar (Lockheed Aircraft Corp., Lockheed Missiles and
Space Co., Sunnyvale, Calif.) and J. H. Yueh (Hughes Aircraft
Co., Culver City, Calif.).
IN: NATIONAL SYMPOSIUM ON RELIABILITY AND QUALITY
CONTROL, 11TH, MIAMI BEACH, FLA., JANUARY 12-14, 1965,
PROCEEDINGS. [A65-18710 09-15]
Symposium sponsored by the Institute of Electrical and Electronics
Engineers, American Society for Quality Control, American Soci-
ety of Mechanical Engineers, Institute of Environmental Sciences,
and Society for Nondestructive Testing.
New York, Institute of Electrical and Electronics Engineers, 1965,
p. 115-124.

Presentation of a procedure for determining the final fee in
Cost-Plus-Incentive-Fee (CPIF) contracts. As a basic part of the
plan, it is assumed that the contractor is willing to take a risk of
having essentially all of its fee eliminated when contract perfor-
mance is poor, and, in return, be awarded a substantial increase
in fee over the negotiated target when contract performance is
superior. It is noted that the Armed Services Procurement Regula-
tions (ASPR) limit the final fee to a maximum of 15%. It is shown
that between these two limits, the contract performance is deter-
mined by four incentive factors: cost incentive, schedule incentive
(delivery of hardware and documents), product performance incen-
tive, and reliability incentive. In conclusion, four advantages of
CPIF contracts are presented: (1) the contractor will have the added
incentive to secure the highest caliber management; (2) the cost of
the contractor's operations to fulfill the contract will generally go
down; (3) the customer and the contractor share the risks, since
the contractor could lose a large portion of his target fee for in-
ferior results; and (4) the reliability requirements become meaning-
ful because they can influence the final fee determination.   M.L.

A65-12837

PROGRAM MANAGEMENT UNDER FIXED PRICE CONTRACTS.

J. C. Brizendine (Douglas Aircraft Co., Inc., Aircraft Div., DC-9
Program, Long Beach, Calif.).
Society of Automotive Engineers, National Aeronautic and Space
Engineering and Manufacturing Meeting, Los Angeles, Calif.,
Oct. 5-9, 1964, Paper 926C. 6 p.
Members, $0.75; nonmembers, $1.00.

Discussion of the concept of program management in today's
aerospace business in relation to the requirement for an effective
management to cope with a complex management task involving
multiple interfaces of business and technical disciplines. Some
organizational precepts are presented as being fundamental to
achieving an effective management system in a multi-program
company environment of major aerospace programs. The program
management system evolved for the development of the DC-9 Jet
Transport is described to illustrate the implementation of the
concept. In this program, each program manager has under his
direct control the function of contract administration, subcontract
administration, work authorization, budget authorization, cost
control, and the measurement and control of program progress.
                                                              M.G.

A64-19982

THE IMPACT OF CONTRACT INCENTIVES ON AEROSPACE
PROGRAMS.

C. C. Walkey and R. M. Jacobs (Douglas Aircraft Co., Inc.,
Missile and Space Systems Div., Santa Monica, Calif.).
American Institute of Aeronautics and Astronautics, Annual Meeting,
1st, Washington, D.C., June 29-July 2, 1964, Paper 64-409. 9 p.
5 refs.

Members, $0.50; nonmembers, $1.00.

Discussion of problems, techniques, trends, and possibilities of incentive contracting, with application to specific aerospace projects. It is stated that it is difficult to draw conclusions about a new and, in a sense, exploding development such as the one treated. The work undertaken to date by the DOD, NASA, and segments of industry promises future benefits. More and more sizable incentive contracts, with greater profit/loss possibilities, are certain. And the planning and execution of these contracts will demand a growing percentage of management's attention. It is noted that lack of sufficient management attention to incentives will preclude successful incentive contracting and thwart the benefits potentially obtainable.

A64-19731

VALUE ENGINEERING IN PROGRAM CONTRACTS.
S. Robinson (Radio Corporation of America, Missile and Surface Radar Div., Moorestown, N.J.).
Journal of Value Engineering, vol. 2, May 15, 1964, p. 61-66.

Discussion of the Project Definition Phase (PDP) method of contracting, considered in a sense as an intensive value study conducted by all project activities. A significant aspect of PDP is the concept of system trade-offs among cost, performance, and schedules. A realistic and practical approach is to maximize capability for a specified cost or to minimize cost for a specified capability. The establishment of the PDP system is considered to have put value engineering into official government contracting policy. Various aspects of the problems involved are treated in detail.

A63-18030

NEW COMPLEXITIES IN R & D PROCUREMENT.
Walter R. Moynihan (Geophysics Corporation of America, Bedford, Mass.)
Aerospace Management, vol. 6, May 1963, p. 48-51.

Consideration of the changes in government contracting which took place in 1962 by enactment of Public Law 87-653, emphasizing the revised Certificate of Current Cost or Pricing Data. The effects which the new law will have on companies carrying R&D contracts are briefly discussed, including consequences in contract procurement and negotiations. The distinction made in PL 87-653 between "pricing data" and "cost data" is described. The procurements for which the Certificate of Current Cost or Pricing Data must be furnished are outlined.

M3 RESEARCH & DEVELOPMENT

A67-22143

RESEARCH AND DEVELOPMENT FOR BETTER MANUFACTURING.
Melvin E. Fields (USAF, Systems Command, Research and Technology Div., Materials Laboratory, Manufacturing Technology Div., Wright-Patterson AFB, Ohio).
IN: LASER WELDING AND MACHINING; ENGINEERING SEMINAR ON NEW INDUSTRIAL TECHNOLOGIES, PENNSYLVANIA STATE UNIVERSITY, UNIVERSITY PARK, PA., JUNE 27-JULY 2, 1965, PAPERS. [A67-22137 09-15]
University Park, Pa., Pennsylvania State University, 1966, p. 77-84.

General discussion of research and development for better manufacturing, with the emphasis on the manufacturing methods program. A specific organization in a manufacturing technology division is described, together with a few typical examples that are being sponsored. One of the programs mentioned is the development of the hydrothermal growth of high-quality ruby crystals of very large size. The ultimate objective of this program is the production of 15-lb crystals. Criteria for proposal evaluation are also considered. M.M.

A67-15336

ANCILLARY BENEFITS OF AN AUTOMATED R&D RESOURCES ALLOCATION SYSTEM.
Ambrose B. Nutt (USAF, Systems Command, Research and Technology Div., Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio).
American Society of Mechanical Engineers, Winter Annual Meeting and Energy Systems Exposition, New York, N.Y., Nov. 27-Dec. 1, 1966, Paper 66-WA/MGT-18. 9 p.
Members, $0.75; nonmembers, $1.50.

The ancillary benefits derived from use of an automated R and D resources allocation system are described, prefaced by a brief description of the system itself. The use of the system as an aid to management of a large Air Force R and D laboratory with a wide range of technical responsibilities is outlined. The several resultant benefits, exclusive of those related to resources allocation, are delineated and are shown to range from technical program data retrieval to vastly more knowledgeable planning at the task engineer level. These side benefits are concluded to be equally as useful to management as the basic system itself, which was designed originally only to be an aid to resources allocation. (Author)

A66-35534

INDEPENDENT RESEARCH MANAGEMENT.
R. J. McNair and F. C. Shadley (Avco Corp., New York, N.Y.).
IN: NAECON/66; PROCEEDINGS OF THE ANNUAL NATIONAL AEROSPACE ELECTRONICS CONFERENCE, 18TH, DAYTON, OHIO, MAY 16-18, 1966. TECHNICAL PAPERS. [A66-35501 19-21]
Conference sponsored by the Dayton Section of the Institute of Electrical and Electronics Engineers.
Dayton, Ohio, Institute of Electrical and Electronics Engineers, 1966, p. 343-345.

Study of the management approach used by Avco Corporation, Electronics Division, to implement and manage its independent research effort. There, the independent research effort is defense-oriented and centers on communication and IR technologies. Factors discussed include experience, personnel, facilities, and available funding. M.F.

A66-28435

CAPABILITY MANAGEMENT - AN APPROACH TO SELLING RESEARCH AND DEVELOPMENT.
Salvatore F. Divita (International Business Machines Corp., Federal Systems Div., Washington, D.C.).
IN: THE CHALLENGE OF SPACE; PROCEEDINGS OF THE THIRD SPACE CONGRESS, COCOA BEACH, FLA., MARCH 7-10, 1966.
[A66-28401 14-30]
Congress sponsored by the Canaveral Council of Technical Societies.
Cocoa Beach, Fla., Canaveral Council of Technical Societies, 1966, p. 427-432.

Review of the current approach to selling research and development (R and D) and an attempt to relate it to the workings of related marketing areas. Some fundamental shortcomings of the current practice are pointed out, and a new approach is suggested to the problem. A new concept is introduced in the approach to marketing R and D capabilities to the defense/space market which is based primarily on establishing capability managers as the focal point of the managing function. It is suggested that this is only one of the several new concepts that are needed to meet the challenges of marketing. B.B.

A66-26033

EVALUATING R&D EFFECTIVENESS.
George T. Buck (USAF, Systems Command, Research and Technology Div., Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio).
Astronautics and Aeronautics, vol. 4, Apr. 1966, p. 86-88.

Description of a program (called RDE) for evaluating the effectiveness of research and development programs. The program, which uses analog computer methods, was developed at the Air Force Flight Dynamics Laboratory (AFFDL). The ways in which RDE is used at AFFDL to help determine the allocation of resources to various R&D projects is outlined. R.A.F.

A66-19461

AN APPROACH TO RESEARCH AND DEVELOPMENT EFFECTIVE-
NESS.
A. B. Nutt (USAF, Systems Command, Research and Technology
Div., Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio).
(NATIONAL AEROSPACE ELECTRONICS CONFERENCE, 17TH,
DAYTON, OHIO, MAY 10-12, 1965, PROCEEDINGS, p. 339-345.)
IEEE Transactions on Engineering Management, vol. EM-12,
Sept. 1965, p. 103-112. 5 refs.
[For abstract see issue 18, page 2724, Accession no. A65-29270]

A65-29270 #

AN APPROACH TO RESEARCH AND DEVELOPMENT EFFECTIVE-
NESS.
A. B. Nutt (USAF, Systems Command, Research and Technology
Div., Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio).
IN: NATIONAL AEROSPACE ELECTRONICS CONFERENCE, 17TH,
DAYTON, OHIO, MAY 10-12, 1965, PROCEEDINGS. [A65-29228
18-09]
Conference sponsored by the Professional Group on Aerospace and
Navigational Electronics, Dayton Section of the Institute of Electrical
and Electronics Engineers, and American Institute of Aeronautics
and Astronautics.
Dayton, Institute of Electrical and Electronics Engineers, Dayton
Section, 1965, p. 339-345. 5 refs.
    Description of the Research and Development Effectiveness
(RDE) computerized planning program, designed to utilize analytical
techniques in the management of research and development resources
in the Air Force Flight Dynamics Laboratory. The concept of a
mission matrix, expressing the technical needs of the Air Force, is
introduced, and the mathematical model of the RDE program is
developed.   S.H.B.

A65-24155 #

SCOPE - MANAGEMENT VISIBILITY AND CONTROL SYSTEM.
W. Hochwald, W. D. Ashcraft, and B. U. Miller (North American
Aviation, Inc., Autonetics Div., Anaheim, Calif.).
IN: NATIONAL AEROSPACE ELECTRONICS CONFERENCE,
DAYTON, OHIO, MAY 11-13, 1964, PROCEEDINGS. [A65-24101
13-09]
Conference sponsored by the Professional Group on Aerospace and
Navigational Electronics, Dayton Section of the Institute of Electrical
and Electronics Engineers, and American Institute of Aeronautics
and Astronautics.
Dayton, Institute of Electrical and Electronics Engineers, Dayton
Section, 1964, p. 463-478.
    Description of the SCOPE (from Schedule, Cost, and Perfor-
mance) computer-aided management system for the budget and
schedule control of complex research and development programs.
The system uses a computer to combine, assess, and summarize
information from various organizational levels to provide data
which account for the schedule, cost, and performance of all work
units. The SCOPE output, in the form of reports, summaries and
graphs, enables management to rapidly recognize cost, schedule,
and organizational-interface problems. Project summaries are
used to indicate where corrective action can be applied both by
line supervision and program management.   P. K.

A64-23347

RESEARCH PROJECT SELECTION - TESTING A MODEL IN THE
FIELD.
William H. Pound (Northwestern University, Technological
Institute, Dept. of Industrial Engineering and Management Science,
Evanston, Ill.).
IEEE Transactions on Engineering Management, vol. EM-11, Mar.
1964, p. 16-22. 7 refs.
    Results of a field test of a procedure for evaluating research
projects. The procedure, based on what is termed an expected-
value model, considers the following decision elements: (1) the
environment of the problem, (2) the decision maker, (3) his objec-
tives, and (4) his alternatives. The decision maker's alternatives,
in this case a number of potential research projects, are evaluated
in the light of his objectives. The result of the procedure is a
ranking of potential projects in terms of their expected values.

This procedure was tested in a research laboratory by having four
decision makers evaluate a selected list of research projects. The
resulting ranking of the projects was found to agree with an intuitive
evaluation by the decision makers of the same list of projects.
This gives an indication that the expected-value model may be use-
ful in the complex area of research project selection.

A64-23346

THE DETERMINANTS OF INVESTMENT VARIATIONS IN RE-
SEARCH AND DEVELOPMENT.
Marshall Hall (Wisconsin, University, Dept. of Economics,
Madison, Wis.).
IEEE Transactions on Engineering Management, vol. EM-11, Mar.
1964, p. 8-15. 13 refs.
Research supported by the University of Wisconsin.
    Presentation and test of a model designed to explain the re-
search and development investment decision of firms. An attempt
is made to explain the role of certain variables after isolating other
variables that are not specified in the model. Estimates are made
of the departure from the desired level of research and development
expenditure and the coefficients of important variables that cause
deviations from the level. The main variables discussed are
profits, sales changes, expected sales changes, and expected
capacity changes. The statistical method used to estimate the
parameters of the variables is multiple regression analysis. On
the basis of the analysis, several hypotheses are proposed and
discussed in relation to alternative hypotheses.

A64-23238

LABORATORY MANAGEMENT.
Charles Cavalconte (Republic Aviation Corp., Power Conversion
Div., Farmingdale, N.Y.).
IN: INSTITUTE OF ENVIRONMENTAL SCIENCES, ANNUAL
TECHNICAL MEETING, PHILADELPHIA, PA., APRIL 13-15,
1964, PROCEEDINGS.
Mt. Prospect, Ill., Institute of Environmental Sciences, 1964,
p. 593-595.
    Discussion of the meaning of the concepts of research, de-
velopment, and test in terms of the activities of an industrial labora-
tory. The set of tasks which must be carried out regardless of the
project served are considered. These tasks which support the
laboratory activities are: technical assistance - engineering, ac-
tivities concerning the equipment, technician assistance, main-
tenance, and activities concerning the facilities.

A63-18271

MANAGEMENT OF AN INDEPENDENT LABORATORY.
Alan E. Surosky (General Testing Labs., Moonachie, N.J.).
IN: Institute of Environmental Sciences, 1963 Annual Technical
Meeting, Proceedings. Mt. Prospect, Ill., Institute of Environ-
mental Sciences, 1963, p. 95, 96.
    Analysis of the problems of managing an independent laborato-
ry in terms of personnel, equipment, scheduling, and establishing
of priorities, sales, and economic operation. The differences in
operation between an independent laboratory and a government or
company laboratory are discussed.

A63-16584

MANAGEMENT OF DEFENSE RESEARCH AND DEVELOPMENT.
Harold Brown (Dept. of Defense, Office of Defense Research and
Engineering, Washington, D.C.)
(National Advanced-Technology Management Conference, Proceed-
ings, Seattle, Wash., Sept. 4-7, 1962.)
IN: Science, Technology, and Management. New York, McGraw-
Hill Book Co., Inc., 1963, p. 49-60.
    Presentation of information concerning the current conduct of
DOD research and engineering activities. Management of research
in the defense establishment is studied. It is shown that manage-
ment provides the broad environmental influences wherein scientific
programs can take place and technical decisions can be made which

culminate in major scientific breakthroughs. It is suggested that management should not restrict creative ideas in the initial stages of a program, but should provide wide latitude for research and experimentation. However, it is pointed out that this process of maintaining flexibility and a number of avenues cannot continue through the later processes of engineering and development. At these stages, objectives have to be clearly defined and parameters established; the decision-making process is then more clearly defined. The current problems of the DOD in performing its functions are reviewed, and the actual management of the Office of Defense Research and Engineering program is discussed in detail.

M4 MANAGEMENT TOOLS & TECHNIQUES

A67-43019 #
COMPUTER AIDS TO ENGINEERING MANAGEMENT AND DESIGN - A MANAGER'S VIEW.
Fred W. Maxwell (Boeing Co., Aerospace Group, Missile and Information Systems Div., Seattle, Wash.).
American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 4th, Anaheim, Calif., Oct. 23-27, 1967, Paper 67-920. 9 p.
Members, $1.00; nonmembers, $1.50.
Description of an AGM-69A (an air-to-surface missile system) program-management system using a CRT display which translates PERT/Time and Cost Control data directly from computer storage into program-control displays. Thus the need for manual handling of the data and preparation of graphic illustrations is eliminated. This system has been given the acronyms COACH, for computer-aided chartroom, and IMPACT, for instantaneous method for predicting, appraising, communicating, and tracking. A technical description of the system, the operation of the system, the application of the system to the AGM-69A program, and the lessons learned to date regarding the use of the system are given - from a manager's point of view.   P.v.T.

A67-42966 #
ANALYSIS AND COMPARISON OF SPACECRAFT RESOURCES FORECASTING TECHNIQUES FOR UNMANNED MISSIONS.
Sanford L. Rosing (Martin Marietta Corp., Friendship International Airport, Md.) and William J. Bursnall (Martin Marietta Corp., Martin Co., Denver, Colo.).
American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 4th, Anaheim, Calif., Oct. 23-27, 1967, Paper 67-809. 16 p. 41 refs.
Members, $1.00; nonmembers, $1.50.
Review of existing resource-predicting techniques for making effective decisions in marketing and facility planning of future space programs in connection with a forthcoming tougher evaluation of future space programs by the Executive Branch and Congress in terms of priority shifts and low confidence in cost-forecasting precision. Selected techniques are compared and evaluated for Mariner C and Voyager with emphasis on proposed program-resource forecasting against expenditure estimates for a program underway. The impact of new technology not specifically reflected in these techniques, such as increasing complexity of experiments, long-life reliability, and sterilization, on the forecasting precision is discussed.   V. Z.

A67-34671
SPECIFICATION TREES - A TOOL FOR MANAGEMENT.
Charles K. Murtaugh (General Electric Co., Missile and Space Div., Re-Entry Systems Dept., Philadelphia, Pa.).
IN: ANNALS OF RELIABILITY AND MAINTAINABILITY; ANNUAL RELIABILITY AND MAINTAINABILITY CONFERENCE, 6TH, COCOA BEACH, FLA., JULY 17-19, 1967, PROCEEDINGS. VOLUME 6 - ALL SYSTEMS GO? [A67-34648 18-15]

Conference sponsored by the Society of Automotive Engineers, the American Society of Mechanical Engineers, and the American Institute of Aeronautics and Astronautics.
New York, Society of Automotive Engineers, Inc., 1967, p. 322-330.
Discussion of a Specification Tree - a pictorial presentation of the interrelationship of requirement documents, specifications, and standards applicable to a particular program. Its purpose as a management tool consists in (1) providing a basis for technical management of Hardware and Software control, (2) forming a part of the Program Work Package Structure for Earned Value administration and control, (3) serving as a ready-reference document for procuring agency and contractor personnel, and (4) portraying pictorially the effect of decisions on the configuration and data requirements for the Contract End Items. Diagrams of specification tree samples are included.   (Author)

A67-33635
HYBRID SIMULATORS - INDISPENSABLE FOR SYSTEMS MANAGE-MENT [HYBRIDSIMULATOREN UNERLÄSSLICH FÜR DIE SYSTEM-FÜHRUNG].
Eveline Gottzein (Bölkow GmbH, Ottobrunn, West Germany).
Bölkow-WMD/SIAT Report, May 1967, p. 10-19. In German.
Discussion of hybrid simulators, with description of a large unit which has been in operation for some time at Bölkow GmbH mainly for aerospace and military programs. It consists of analog-computer units with a total of approximately 1200 operational amplifiers, two digital computers adapted to the special requirements of hybrid computation, and the interface units for handling the data flow between analog- and digital-computer elements. The necessity of such units for planning and accomplishing large-scale programs is shown. Examples are taken from the development of the third stage of the Europa 1 launch vehicle.   F.R.L.

A67-33634
PERT - A PLANNING METHOD [PERT - EIN PLANUNGSVER-FAHREN].
Ekkehard Schmid (Bölkow GmbH, Ottobrunn, West Germany).
Bölkow-WMD/SIAT Report, May 1967, p. 7-9. In German.
Discussion of the PERT (Program Evaluation and Review Technique) planning method, the primary objective of which is to give project management a simple means for controlling the project with respect to time in order to accomplish a task with a known capacity in the shortest possible time. The project being planned is first described by a model, in order to ensure that at any moment the method supplies information on the state of the project and on the chances for future development and that it is always possible to determine the influences of possible decisions and of new events on the further progress of the project with the greatest possible accuracy. A PERT method is described in detail.   F.R.L.

A67-30223
THE USE OF CRITICAL PATH ANALYSIS METHODS IN THE EUROPEAN SPACE VEHICLE LAUNCHER DEVELOPMENT ORGANISATION.
I. Stevenson (European Space Vehicle Launcher Development Organisation, Central Planning and Progressing Service, Paris, France).
IN: INTERNATIONAL COMPUTERS AND TABULATORS, NETWORK PLANNING USERS CONFERENCE, LONDON, ENGLAND, JUNE 8, 1967, PAPERS. [A67-30221 15-34]
London, International Computers and Tabulators, Ltd., 1967, p. 43-53.
Outline of the Critical Path Analysis system (CPA), a project control system based on network techniques which has been adopted by ELDO to coordinate the separate development programs of its Member States into an overall plan. This plan should (1) provide an effective overall planning method, a common progress-reporting routine, and a timely informed project management at all levels, and (2) be easy to introduce, compatible with systems used by individual Member States, and understandable at all levels of management.   V. Z.

A67-24655

PRACTICAL APPLICATIONS OF PLANNING DEVELOPMENT PROGRAMMES AND NEW MANAGEMENT TECHNIQUES.
G. P. Dollimore (Hunting Engineering, Ltd., Luton, Beds., England).
(Symposium on Management, London, England, Mar. 2, 1966, Paper.)
Royal Aeronautical Society, Journal, vol. 71, Mar. 1967, p. 193-201.
6 refs.

Investigation of the management methods used in the development of an item of military equipment to be used with a range of aircraft. It is concluded that the relatively simple management methods selected as a basis for the experiments have proved themselves sufficiently useful to be employed with confidence on similar developments. **B. B.**

A67-17246

QERT.
Virgil Rehg (Ohio State University, Defense Management Center, Columbus, Ohio).
IN: ANNUAL TECHNICAL CONFERENCE TRANSACTIONS 1966; AMERICAN SOCIETY FOR QUALITY CONTROL, ANNUAL TECHNICAL CONFERENCE, 20TH, NEW YORK, N.Y., JUNE 1-3, 1966, TRANSACTIONS. [A67-17240 05-15]
Milwaukee, American Society for Quality Control, Inc., 1966, p. 107-114.

Description of the quality evaluation review technique (QERT) which provides a manager with a tool for facilitating program planning and scheduling. It makes use of a graphic network which allows the manager to see quickly the status of the program. Ways of using this technique for quality improvement are discussed. **M. F.**

A67-14498

STRATEGIC VERSUS TACTICAL PLANNING IN MODERN BUSINESS.
H. R. Headley (Radio Corporation of America, Defense Electronic Products, Missile and Surface Radar Div., Moorestown, N.J.).
IN: RADAR, RANGE INSTRUMENTATION AND MEASUREMENT SYSTEMS.
Camden, N.J., Radio Corporation of America, 1966, p. 2-5.

Summary of efforts to date in the application of an advanced feedback-system simulation technique as a strategic planning discipline. The results of an extensive parameter-sensitivity analysis are presented, and the utility of simulation is evaluated. **M. F.**

A67-14256

THE MONTE CARLO METHOD: THE METHOD OF STATISTICAL TRIALS.
N. P. Buslenko, D. I. Golenko, Iu. A. Schreider, I. M. Sobol', and V. G. Sragovich.
(Translation of Metod Statisticheskikh Ispytanii - Metod Monte-Karlo, Moscow, Fizmatgiz, 1962).
Edited by Iu. A. Shreider.
Oxford and New York, Pergamon Press (International Series of Monographs in Pure and Applied Mathematics. Volume 87), 1966. 381 p.
$12.50.

This book gives an explanation of the basic features of the method of statistical trials (the Monte Carlo method) and considers typical examples of its application to simple problems in computational mathematics. A detailed study of the computation of multidimensional integrals is presented, a variety of examples of statistical modeling is analyzed, and the accuracy of the computations is investigated. The applications of the Monte Carlo method in those branches of physics and technology where it has been widely and successfully used are reviewed. The applications of the Monte Carlo method to the investigation of servicing processes are developed. This branch is concerned with the simulation of complex systems of control and operations research. Methods are considered for organizing statistical experiments on universal digital computers. **M. F.**

A66-37972 #

SYSTEM ANALYSIS - A MANAGEMENT TOOL.
William F. Stevens (USAF, Systems Command, Andrews AFB, Washington, D. C.).
IN: ANNALS OF RELIABILITY AND MAINTAINABILITY. VOLUME 5 - ACHIEVING SYSTEM EFFECTIVENESS; ANNUAL RELIABILITY AND MAINTAINABILITY CONFERENCE, 5TH, NEW YORK, N.Y., JULY 18-20, 1965, PAPERS. [A66-37879 20-15]
Conference sponsored by the American Institute of Aeronautics and Astronautics, the Society of Automotive Engineers, and the American Society of Mechanical Engineers.
New York, American Institute of Aeronautics and Astronautics, 1966, p. 944-947.

Discussion of system analysis as a management tool and of its application in aviation. Certain basic inputs are necessary in order to properly simulate aircraft operation. These inputs fall into three categories: system's characteristics, mission requirements, and maintenance and operational factors. The outputs discussed include mission success rates, downtime, availability, utilization rate, maintenance manhours, and space requirements. **M. F.**

A66-33947

THE MANAGEMENT OF COST REDUCTION - METHOD OR MYTH?
H. Davies (Thiokol Chemical Corp., Reaction Motors Div., Denville, N.J.).
Royal Aeronautical Society, Journal, vol. 70, June 1966, p. 639-648. 15 refs.

Examination of the general framework of business profitability and review of a number of the possibilities for practical cost reduction within the field of the aerospace industry. The business profitability model is described and cost effectiveness is studied. The U.S. Department of Defense cost reduction program is reviewed. Possible approaches to cost reduction are reviewed including program management and control, design and process cost studies, value analysis, competitive purchasing, operational research, the statistical design of experiments, operations auditing, natural productivity increases, investment analysis, and zero defects. **M. F.**

A66-31739

SYSTEMS AND SIMULATION.
D. N. Chorafas.
New York, Academic Press, Inc., 1965. 503 p.
$14.50.

A fundamental study of the theory and application of mathematical simulation in man-made systems, this book begins with mathematical abstraction, the establishment of simulation studies, and the development and use of mathematical models. It contains practical information on writing and testing equations and the collection and analysis of data for systems. After specific case studies in industrial systems, military operations, traffic and cargo problems, and in hydraulic applications, the book concludes with the supplementary use of analog media in scientific investigation. **M. F.**

A66-23833

AN INTEGRATED COMPUTER SYSTEM FOR ENGINEERING PROBLEM SOLVING.
Daniel Roos (Massachusetts Institute of Technology, Dept. of Civil Engineering, Cambridge, Mass.).
IN: AMERICAN FEDERATION OF INFORMATION PROCESSING SOCIETIES, 1965 FALL JOINT COMPUTER CONFERENCE, LAS VEGAS, NEV., NOVEMBER 1965, PROCEEDINGS. VOLUME 27 - PART I. [A66-23824 12-08]
Washington, D.C., Spartan Books, 1965, p. 423-433. 13 refs.

Description of a modular computer system designed to enable the engineer to easily communicate and interact with the computer. The programer uses the ICETRAN (ICES-FORTRAN) programing language to develop and modify the necessary components of the system. Dynamic memory allocation, alternate data structures and data transfer and management facilities are available to the programer. It is noted that these features combine to make ICES an integrated computer system for total civil engineering problem solving. **M. M.**

A66-23439 #
COST EFFECTIVENESS.
G. R. Herd (Kaman Aircraft Corp., Bloomfield, Conn.).
IN: ELECTRONIC INDUSTRIES ASSOCIATION, CONFERENCE
ON SYSTEMS EFFECTIVENESS, 1ST, WASHINGTON, D.C.,
OCTOBER 19, 20, 1965, PROCEEDINGS. [A66-23434 11-34]
Washington, D.C., Electronic Industries Association, 1965,
p. 78-85.
The paper discusses cost effectiveness as an analytical tool for
engineering and management. It identifies the tasks and inputs that
should be included in an analysis. Cost data are discussed as well
as the risks and uncertainties involved in the costing. The cautions
and limitations involved in interpreting and implementing the results
are presented along with the benefits of the approach. Simple exam-
ples are used to illustrate the various ideas. (Author)

A66-23060 #
VALUE ANALYSIS AS A WORKING TOOL.
H. Davies (Thiokol Chemical Corp., Reaction Motors Div., Den-
ville, N. J.).
Chartered Mechanical Engineer, vol. 13, Feb. 1966, p. 60-64. 7 refs.
Review of value analysis as a management technique that
results in cost reduction. The example discussed is the applica-
tion of the technique to the production of the Bullpup A and B
missiles, both of which were already in service when the tech-
nique was applied. It is shown that in the case of production
programs which are contracted out on a successive basis, value
analysis provides an effective tool for improving competitive effi-
ciency. The manner of organization of the value analysis technique
with respect to existing company structure and departments is
explained. The importance of supplier participation is emphasized.
Two small components - a pintle (used as a flame holder and
turbulence increasing device in the injector area of the combustion
chamber) and a small plug - are cited as specific examples where
the technique permitted significant cost reductions. A check on
production records shows that value analysis reduces cost without
causing any reduction in quality and reliability. M. L.

A66-21321
SIMULATION.
A. W. Swan (Nova Scotia Technical College, Halifax, Nova Scotia,
Canada).
The Engineer, vol. 221, Jan. 28, 1966, p. 170-172.
Discussion of the relatively simple basic principles of simulation
which can represent an extremely complex, managing policy. It is
noted that a simulation imitates an industrial situation by converting
it into a mathematical model and that, whereas it is usually impos-
sible to experiment with an actual situation, to see for example the
effect on costs of varying production rates or the effect on stock
levels of varying ordering policies, it is possible to experiment as
one wishes with a mathematical model, once it has been proved to
be an accurate simulation, and arrive at an optimum policy. It is
pointed out that one of the most remarkable examples of simulations
from industry concerned a textile mill in which the highly complex
rules that governed the running of the mill, many of which had be-
come buried in the subconscious minds of the heads of the departments,
were converted to a mathematical simulation model which so im-
pressed the managers with its faithful reproduction of policy that
they arranged to use it for the basis of their weekly planning meeting.
M. M.

A65-34621
SCORING AND PROFITABILITY MODELS FOR EVALUATING AND
SELECTING ENGINEERING PROJECTS.
Burton V. Dean (Case Institute of Technology, Cleveland, Ohio)
and Meir J. Nishry (Boeing Co., Seattle, Wash.).
(The Institute of Management Sciences and Operations Research
Society of America, National Meeting, Minneapolis, Minn., Oct.
7-9, 1964, Paper.)
Operations Research, vol. 13, July-Aug. 1965, p. 550-569.
Construction of mathematical models yielding solutions for al-
locating manpower resources to projects. A scoring model is con-

structed and then used to determine the important factors in a prof-
itability model. The significant elements in the decision process
are found to be the uncertainty in estimating model-parameter values
and the optimal utilization of limited engineering-manpower resources
where this uncertainty exists. (Author) A.B.K.

A65-34072 #
APPLICATION OF THE THEORY OF GRAPHS IN THE DESCRIPTION
AND ANALYSIS OF INFORMATION-FLOW SCHEMES IN CONTROL
SYSTEMS [O PRILOZHENII TEORII GRAFOV DLIA OPISANIIA I
ANALIZA SKHEMY POTOKOV INFORMATSII V UPRAVLIAIU-
SHCHIKH SISTEMAKH].
V. L. Epshtein.
Avtomatika i Telemekhanika, vol. 26, Aug. 1965, p. 1403-1409.
6 refs. In Russian.
Description and analysis of information-flow schemes in control
systems, using contiguity matrices of information graphs. The
properties of this matrix model are considered. A.B.K.

A65-25176
ELEMENTS OF A STRATEGY FOR MAKING MODELS IN LINEAR
PROGRAMMING.
A. Charnes (Northwestern University, Evanston, Ill.) and W. W.
Cooper (Carnegie Institute of Technology, Pittsburgh, Pa.).
IN: SYSTEM ENGINEERING HANDBOOK.
Edited by R. E. Machol, W. P. Tanner, Jr., and S. N. Alexander.
New York, McGraw-Hill Book Co., 1965, p. 26-1 to 26-30. 44 refs.
A description of the techniques applicable to the construction of
models in linear programing, with particular application to manage-
ment and social science. The need for distinguishing between a
problem and the way it might be modeled is stressed, as, for
example, in the search for intersections between the wanted solutions
of a nonlinear problem and a linear model constructed to deal with
it. Model equivalents that can be obtained by effecting various
transformations are discussed. These transformations, together
with the properties of a constrained optimization, can be used to
obtain still further extensions - for example, when obtaining the
replacement of a compound objective with a simpler objective, in
order to deal with a larger problem in engineering design. Tech-
niques for characterizing the rank of a matrix, applying duality to
linear programing, using constrained regressions for algorithmic
completion, and extending the simplex method to algorithmic
alterations are described. D.P.F.

A65-25151
THE ROLE OF LARGE-SCALE SIMULATION IN THE PROGRAM
DEFINITION PHASE ENVIRONMENT - AN EXAMPLE.
William J. Kenneally (U.S. Army, Electronics Command, Electron-
ics Laboratories, Fort Monmouth, N.J.).
IEEE Transactions on Military Electronics, vol. MIL-9, Apr. 1965,
p. 163-171. 33 refs.
Discussion of the role of the government laboratory in the
Program Definition Phase (PDP) environment. Emphasis is placed
on the dual task of defining the technical boundaries of the problem,
and evaluating the PDP reports to select the most acceptable engi-
neering approach. The problem of accomplishing a detailed techni-
cal evaluation of several proposed approaches in a short time frame
is examined, with the result that a requirement for a better "yard-
stick" is established. Design decisions leading to the final specifica-
tion of such a yardstick - the Tactical Avionics System Simulator
(TASS) - and a summary of its anticipated capabilities are presented.
(Author) V.P.

A65-24537
HOW PERT WAS USED IN MANAGING THE X-20 (DYNA-SOAR)
PROGRAM.
Raymond M. Sadow (USAF, Systems Command, Aeronautical
Systems Div., DOD AIMS System Program Office, Program
Control Div., Wright-Patterson AFB, Ohio).
(USAF, Aeronautical Systems Division, Science and Engineering
Symposium, Wright-Patterson AFB, Ohio, 1963.)
IEEE Transactions on Engineering Management, vol. EM-11,
Dec. 1964, p. 138-154. 6 refs.

Description of the method with which the program evaluation review technique (PERT) was developed in the X-20 program and of the manner in which it was used in managing that program. The X-20 System Program Office (SPO), Aeronautical Systems Division (ASD), organized and directed the overall X-20 PERT effort of both government and industry and employed a system of discrete detailed networks which collectively covered the entire program. The data from these reporting networks were computer-integrated into a total program PERT output. The problem of translating voluminous data into meaningful information for management and the development of effective PERT analyses, displays, and indicators are discussed. The operating concepts, atmosphere, and resources necessary for a successful PERT operation, the role of PERT in X-20 contractors' in-house management systems with actual examples, and its uses within the X-20 SPO are also described. Experience of the dynamics of a systems development program and the honest reporting resulting from the X-20 PERT system are presented as unique and advanced aspects of this new management technique. A review of resources required to operate PERT and a summary of the conclusions, contributions, and impact of original work performed in the Dyna-Soar SPO are included.   (Author) M.M.

A65-24154 #

A MULTIPLE-OBJECTIVE CHANCE-CONSTRAINED APPROACH TO COST EFFECTIVENESS.
A. Charnes (Teledyne, Inc.; Northwestern University, Evanston, Ill.), W. W. Cooper (Teledyne, Inc.; Carnegie Institute of Technology, Pittsburgh, Pa.), G. Kozmetsky, and L. Steinman (Teledyne, Inc.).
IN: NATIONAL AEROSPACE ELECTRONICS CONFERENCE, DAYTON, OHIO, MAY 11-13, 1964, PROCEEDINGS. [A65-24101 13-09]
Conference sponsored by the Professional Group on Aerospace and Navigational Electronics, Dayton Section of the Institute of Electrical and Electronics Engineers, and American Institute of Aeronautics and Astronautics.
Dayton, Institute of Electrical and Electronics Engineers, Dayton Section, 1964, p. 454, 455.
    Discussion of considerations involved in planning the construction and development of major industrial aerospace facilities. The field of aerospace testing is treated in order to illustrate the problems involved in planning facilities. The competitive situation for companies developing new facilities is reviewed, and guides for aiding the selection and evaluation of new equipment and facilities are discussed.   P.K.

A65-23612 #

PLANNING AND MEASURING TECHNICAL PROGRESS.
J. B. Meyer (General Electric Co., Daytona Beach, Fla.).
IN: NEW DIMENSIONS IN SPACE TECHNOLOGY; SPACE CONGRESS, 2ND, COCOA BEACH, FLA., APRIL 5-7, 1965, PROCEEDINGS. [A65-23599 13-31]
Congress sponsored by the Canaveral Council of Technical Societies.
Cocoa Beach, Canaveral Council of Technical Societies, 1965, p. 170-187.
    Discussion of a methodology useful to planning and measuring (testing) progress toward the maturity of equipment, including sample visualizations useful to the program manager. The technique discussed provides a thorough assessment of a test program and enables gaps, omissions, or duplications to be easily visualized by a matrix-type approach. It highlights areas of criticality for management and enables resources to be allocated realistically for optimizing demonstrations by test. It also provides a measure of the risk associated with each test (thereby enabling replanning to spread the risk more evenly over a series of tests) and permits management to visualize the contribution of ground and flight tests to that risk. From the assessment described, it appears that other measures of value can be applied to each test as well as the measure of technical value. Modified approaches might include other influences, such as the cost per test, to obtain other parameters for measuring progress toward maturity.   D.H.

A65-23611 #

FUNCTIONAL FLOW DIAGRAMS - A NEW TOOL FOR ENGINEERING MANAGEMENT.
S. R. Hirsch.
IN: NEW DIMENSIONS IN SPACE TECHNOLOGY; SPACE CONGRESS, 2ND, COCOA BEACH, FLA., APRIL 5-7, 1965, PROCEEDINGS. [A65-23599 13-31]
Congress sponsored by the Canaveral Council of Technical Societies.
Cocoa Beach, Canaveral Council of Technical Societies, 1965, p. 152-169.
    Description of the preparation of functional flow diagrams which can provide technical managers with (1) a rapid comprehensive way of evaluating all the alternatives and the consequences of their decisions on the rest of the system, and (2) a means of assuring that all the requirements are satisfied. The illustrations are typical for a Manned Orbiting Laboratory (MOL) Program. The standard functional flow diagrams, required by AFSCM 375-5 (System Engineering Management Procedures) and prepared for the Titan II and Titan III programs, are of limited value because they tend to lag the conceptual and design efforts. The derivation of the new functional flow diagram - which starts where the traditional type ends - is described in some detail, and illustrations are given.
                    D.H.

A65-22760

PROJECT SCHEDULING - THE SECOND GENERATION.
James J. O'Brien.
Machine Design, vol. 37, Apr. 29, 1965, p. 172-181.
    Discussion of major extensions to both PERT and CPM, and of the state of the art of the two similar systems, which are tools for scheduling the design and development work of engineering personnel. Both systems are considered equally good at the prime tasks of planning the logical order of assignments. A network diagram is presented for a prototype air-ground signal unit, demonstrating how PERT and CPM are used. Data are obtained from a computer. PERT-cost and its CPM equivalent, COP (Control of Profit), are defined and discussed. With CPM, expenditure rates can be forecast. An extension to CPM, the Resources Planning and Scheduling Method (RPSM), utilizes a computer to handle resources. Three fictitious line networks designed to optimize manpower on three projects, worked out by RPSM, are presented. A table comparing the various systems is given. It is considered that the extensions of CPM have broader capability than those of PERT.   F.R.L.

A65-20691

TECHNIQUES FOR THE APPLICATION OF NETWORK PLANNING IN AIRCRAFT PRODUCTION [SYSTEMATIK ZUR ANWENDUNG DER NETZWERKPLANUNG IM FLUGZEUGBAU].
Alexander Herold (Ernst Heinkel Flugzeugbau GmbH, Munich, West Germany).
Luftfahrttechnik Raumfahrttechnik, vol. 11, Mar. 1965, p. 68-76.
In German.
    Development of practical guides for the application of the network technique to aircraft design and development. Particular attention is given to a technique of devising networks for the entire working process and extending it to a network system by introducing an arbitrary number of individual networks. A technique for determining individual time plans from the overall time-planning network is proposed. It is shown how changes in the individual time plans and the time plan of the entire working process can be accomplished by making changes in the networks.   V. P.

A65-19582

EXPEDITING DESIGN TRADE-OFFS BY USING RELATIVE COST.
Robert T. Smith (Douglas Aircraft Co., Inc., Aircraft Div., Long Beach, Calif.).
IN: ASTME, WESTERN METAL AND TOOL EXPOSITION AND CONFERENCE, LOS ANGELES, CALIF., FEBRUARY 22-26, 1965, COLLECTED PAPERS. [A65-19577 09-15]
Dearborn, American Society of Tool and Manufacturing Engineers, 1965, Paper 666. 8 p.

Illustration of how the use of a relative cost handbook will
assist the value-trained designer in evaluating his efforts, using
relative cost as a design parameter. It is said that with this hand-
book the designer will be able to make "rule-of-thumb" cost com-
parisons for design alternatives which provide the equivalent func-
tions. These costs are not used to measure the efficiency of the
shop, but are developed as a means for measuring the cost-effective-
ness of a function or design. (Author) A. B. K.

A65-16855
TOOLS OF AIRLINE MANAGEMENT.
J. T. Dyment (Air Canada, Montreal, Canada).
(Royal Aeronautical Society, British Commonwealth Lecture, 20th,
London, England, Oct. 15, 1964.)
Royal Aeronautical Society, Journal, vol. 69, Jan. 1965, p. 9-24;
Discussion, p. 24-26. 6 refs.
Review of some typical modern management tools in the light
of increasing competition. Although it is felt that the use of
electronic data processing equipment (EDP) can be overdone, it is
believed that, when wisely used, EDP can be of tremendous help
in enabling management to fulfill its responsibilities and to make
good decisions. Many areas where EDP has been used to advantage
are reviewed, including processes used for planning, marketing,
maintenance, inventory, finance, personnel, and on-line systems
such as automatic reservations, teletype switching, etc. Although
the examples represent modern airline management techniques,
they are also usable by many other industries. Other tools reviewed
include a system of customer service measurements to provide
management with indices of the quality of the services it is giving
to its customers and an extensive management development program
to build an efficient team of managers and supervisors. Where
rapidly growing techniques such as Critical Path and PERT can be
used, these are also reviewed. (Author) W. M. R.

A65-13346
HOW PERT PAID ITS WAY IN THE C-141A STARLIFTER PRO-
GRAM.
Hans H. Driessnack (USAF, Washington, D. C.).
Armed Forces Management, vol. 11, Dec. 1964, p. 44-46.
Description of the application of the PERT (Program Evaluation
and Review Technique) to the management of the Air Force C-141A
Starlifter Program. Air Force and Lockheed management person-
nel used PERT from the proposal stage through the delivery of the
hardware to "flag" and isolate problem areas. The manner in
which the PERT was implemented and used, enabling the C-141A to
be completed and flown on schedule, is discussed. P. K.

A65-12838
RESEARCH AND DEVELOPMENT CAN BE CONTROLLED.
E. C. Soistman (Martin Marietta Corp., Martin Co., Baltimore,
Md.).
Society of Automotive Engineers, National Aeronautic and Space
Engineering and Manufacturing Meeting, Los Angeles, Calif.,
Oct. 5-9, 1964, Paper 926A. 7 p.
Members, $0.75; nonmembers, $1.00.
Description of a management technique to monitor and control
research tasks as to cost and scheduled objectives. An input-output
technique used for all projects, hardware, development, study, and
research is described, and a typical input-output performance
chart is presented. The function of a planner is outlined, whose
questioning, monitoring, analyses, and evaluations pinpoint problems
and coordinate the actions of the technical and support team.
Methods of long-range planning are discussed and illustrated
briefly by the development of the Bomber Advanced System. A
typical program plan is presented, as is a bid and proposal committee
form. M. G.

A65-11942
PERT/PMD-PROJECT MONITORING DEVICE.
E. J. Johnson (System Development Corp., Paramus, N. J.).
IEEE Transactions on Engineering Management, vol. EM-11, June
1964, p. 82-84.
Description of the PERT Project Monitoring Device using the
basic networking system of PERT for representation of a schedule.

It is stated, however, that the PMD approach to a network is
unlike that of PERT. The PMD uses activities as the basic units
of a schedule, rather than the time of occurrence of events as in
PERT. The use of this approach leads to the discovery of the fact
that a scheduling system could be logically derived with capabilities
not found in existing PERT systems. The capabilities that exist
in the current model of the PMD are listed. It is pointed out that,
because of these added capabilities, the PMD is particularly suitable
for research and development projects where a knowledge of all
activities necessary to the development of a product may not be
available or known at the start of the project. M. M.

A65-11940
NOTES ON THE DEVELOPMENT OF NETWORK MODELS FOR
RESOURCE ALLOCATION IN R & D PROJECTS.
Richard S. Rosenbloom (Harvard University, Graduate School of
Business Administration, Boston, Mass.).
IEEE Transactions on Engineering Management, vol. EM-11, June
1964, p. 58-63. 29 refs.
Discussion of the extension of PERT and critical path-planning
models for the analysis of cost-time tradeoffs and resource alloca-
tion. Various scheduling algorithms with and without resource
constraints are noted and compared, as reported in the literature.
Key assumptions and some practical limitations are analyzed.
Recommendations for further research are offered. It is concluded
that, in complex projects where more than one efficient duration
can be specified for an activity given a constant level of technical
performance, and where reasonably good estimates of duration
can be made, a network model for analysis of the efficiency and
capacity problems ought to serve a useful role in management
planning. (Author) M. M.

A65-10915
PERT FOR THE ENGINEER.
Jordan Kadet and Bruce H. Frank (Sylvania Electric Products, Inc.,
Sylvania Electronic Systems Div., Waltham, Mass.).
IEEE Spectrum, vol. 1, Nov. 1964, p. 131-137.
Application of PERT (Program Evaluation and Review Tech-
nique) to modest engineering tasks and projects. It is reported that
PERT techniques for planning and control, involving graphic methods
and network analysis to depict and analyze a project, can be applied
either formally or informally to large and small projects alike. The
networking technique is said to be applicable primarily to the "once-
through" type of effort typically associated with the development of
a system or subsystem. Topics covered include: what PERT is and
is not, defining the job, network planning, time estimating, schedul-
ing, day-to-day control, task plan vs project plan, PERT/COST es-
timating, and the use of computers. D. H.

A65-10517
CONSTRAINED EXTREMIZATION MODELS AND THEIR USE IN
DEVELOPING SYSTEM MEASURES.
Abraham Charnes (Northwestern University, Evanston, Ill.) and
William W. Cooper (Carnegie Institute of Technology, Pittsburgh,
Pa.).
IN: VIEWS ON GENERAL SYSTEMS THEORY; PROCEEDINGS OF
THE SECOND SYSTEMS SYMPOSIUM, CASE INSTITUTE OF TECH-
NOLOGY, CLEVELAND, OHIO, APRIL 1963.
Edited by Mihajlo D. Mesarović.
New York, John Wiley and Sons, Inc., 1964, p. 61-88. 17 refs.
Development of certain general ideas with reference to special
artifacts for securing extensions for constrained optimization
models, for certain problems of system design. Ways are con-
sidered in which optimizations (extremal principles) might be used
for purposes such as generating "equivalences" to do the following:
(1) obtaining suitable measures for assessing the performance of a
system, and (2) guiding and controlling certain kinds of simulation
for system design purposes. The discussion is centered about
examples in management planning where these measures are used
for evaluating design proposals. It is stated that various artifacts
make it possible also to utilize constrained extremization models
for systems wherein optimization per se is not an issue. Such
models may also be used in additional ways when, for instance,
further evaluations are wanted to guide additional alterations in a
system by reference to by-product information induced by an op-
timization principle. M. M.

A65-10378
PRESS - THE POOR MAN'S PERT.
Stewart F. Paterson (Westinghouse Electric Corp., Electronic Tube Div., Elmira, N.Y.).
Assembly Engineering, vol. 7, Nov. 1964, p. 39-45.

Description of PRESS (Project Review, Evaluation, and Scheduling System), a critical-path technique of project analysis and review. Projects are considered to be made up of jobs (activities) and results (events). A network is drawn up consisting of a series of events, represented by large circles, which are connected by numbered arrows, representing the individual activities. A basic assumption is that an activity has a definite beginning event and a definite ending event. Several activities can originate from the same event. Conversely, one activity may be preceded by several activities. In the determination of the time values for the network calculations, it is assumed that the time to complete any given job or activity is a variable. The pattern of this time variation may be a normal distribution, one that is skewed left or right, or one that is uniform or spiked. These distributions can be approximated by estimating three time values for each activity: expedited time T_x, the shortest practical time in which an activity can be completed; normal time T_n, the most likely time it would take to complete the activity, or the time that would be allotted if only one estimate is required; and pessimistic time T_p, the time it would take to complete the activity if almost everything went wrong. The three estimates are used in conjunction with a nomograph to determine the expected time t_e, the statistical mean or average value of the three estimated times. (It represents the average time that the activity would take if it were repeated many times.) A project with six activities is followed step-by-step to demonstrate the calculations for a critical path network. The network calculations, performed manually (without the aid of a computer) and adaptable to projects ranging from $1000 to over $500,000, indicate not only the critical path of the project, but also the amount of slack time or float in each branch of the network.　　　　　　　　　W.M.R.

A64-26705
A NEW MANAGEMENT TOOL - THE OPERATIONAL SIMULATOR [UN NOUVEL APPAREIL DE GESTION - LE SIMULATEUR OPERATIONNEL].
P. Rousseau (M.B.L.E. Manufacture Belge de Lampes et de Matériel Electronique, S.A., Service Organisation, Méthodes, Temps, Brussels, Belgium).
Revue mble, vol. 7, June 1964, p. 95-134. In French.

Presentation of the principles of the Program Evaluation and Review Task (PERT) method and its application in the resolution of problems of delays, costs, and investments which arise during the performance of all contract tasks. The simulator consists essentially of equipment which can be adjusted in such a way that the relations between physical quantities, which it puts into play (in the regions of hydraulics, optics, mechanics, or electricity) can be related as closely as possible to numerical values characterizing those economic phenomena which are to be studied. Examples are given of how the equipment can be applied to solution of problems arising during a program which involve such factors as reductions in price from the workshops or from subcontractors, cost reductions which involve shorter delay periods, and on what financial conditions such shorter delays could be obtained.　　　　　　F. R. L.

A64-23349
THE DIFFUSION OF NETWORK TECHNIQUES THROUGHOUT GOVERNMENT PUBLICATIONS.
George Poletti (Sperry Rand Corp., Sperry Gyroscope Co., Great Neck, N.Y.).
(Hofstra University Yearbook of Business, Series I, vol. II, 1963, Chapter V.)
IEEE Transactions on Engineering Management, vol. EM-11, Mar. 1964, p. 43-50. 21 refs.

Investigation of the role of the government in fostering the use of network scheduling and control techniques. Specifically, an analysis is made of the volume, quality, and content of the publications through which information on critical path scheduling techniques, primarily PERT, is made available. The results of this analysis indicate that significant government publications on critical path scheduling did not emerge until two years after its development,

and that then the technique was discussed almost solely in terms of application. PERT is generally discussed as a computerized system used primarily on research and development projects. Insofar as the literature provides an accurate picture of the application of PERT, this study indicates that its use has not been extended beyond the industries that have been forced by the military to use it. A bibliography of relevant government publications is included.

A64-22985
PROJECT CONTROL USING PERT.
Robert A. Frantz, Jr. and Lloyd B. Nothern (Western Electric Co., New York, N.Y.).
Electro-Technology, vol. 74, Aug. 1964, p. 87-91. 6 refs.

Discussion of a program management method, developed by the Navy and designated PERT (Program Evaluation and Review Technique), which provides faster information flow, more accurate appraisal of progress, and tighter management control. The method is based on a dependency diagram or symbolic representation of a program of action which depicts all significant events involved. The itemized activity list and a typical PERT network diagram illustrating interrelationships between activities required in the manufacture and testing of a unit of electronic equipment are presented. The effectiveness of the method is evaluated.

A64-16870
MANAGEMENT TECHNIQUES APPLICABLE TO SYSTEMS TEST PROGRAMS.
Jeremy A. Lifsey (Burroughs Corp., Defense and Space Group, Paoli, Pa.).
IEEE Transactions on Engineering Management, vol. EM-10, Dec. 1963, p. 166-174.
Contracts No. AF 33(600)-40540; No. AF 33(657)-7583.

Presentation of the results of an application of basic management principles to the Airborne Long Range Input (ALRI) test program. The testing involved system integration of airborne electronic sensor and communication equipment with ground electronic data processing and computation equipment. The management of the test program coordinated the efforts of approximately ten industrial subcontractors to comply with requirements and procedures of the Air Force. The methods used to keep all personnel informed of the activities at the site, at the home office, and at the management meetings with the Air Force are discussed. Some of the techniques appear to be simple and obvious, but precisely because of this, they are usually overlooked. Experience has shown that the implementation of these techniques is effective in preventing troublesome situations. Other techniques discussed include the methods of data documentation, the maintenance of administrative records, which are generally regarded as an unnecessary evil and, hence, injudiciously avoided, and the arrangement of schedules to obtain maximum performance and minimal disruption of testing. A listing is provided of those techniques that were considered important in the hope that they will be of use to system managers looking forward to a similar test program.

A64-15227
AN ANALYTICAL STUDY OF THE PERT ASSUMPTIONS.
Kenneth R. MacCrimmon (Carnegie Institute of Technology, Pittsburgh, Pa.) and Charles A. Ryavec (Michigan, University, Ann Arbor, Mich.).
Operations Research, vol. 12, Jan.-Feb. 1964, p. 16-37. 6 refs.
USAF-sponsored research.

Presentation of the results of a mathematical analysis of the standard assumptions used in PERT calculations. The objectives of this analysis were four-fold: (1) to pull together the mathematical aspects of the PERT model, (2) to suggest relevant analytic techniques, (3) to obtain an indication of the magnitude and direction of errors introduced by the assumptions, and (4) to suggest possible modifications and improvements in the model. Analyzed first are those assumptions which are relevant to the individual activities. Three possible sources of error are considered here: (1) the beta distribution assumption, (2) the standard deviation assumption and the approximation formula for the mean, and (3) the imprecise time estimates. Then, the PERT network as a whole is considered and

the calculations underlying the project mean, standard deviation, and probability statements are analyzed. The concept of relative criticalness is explored for the PERT stochastic model. Techniques for network reduction are outlined.

A64-14705

PROJECT COST CONTROL AT RAYTHEON'S WAYLAND LABORATORY.
E. L. Williams and G. A. Wilson (Raytheon Co., Surface Radar and Navigation Operation, Equipment Div., Wayland, Mass.).
IEEE Transactions on Engineering Management, vol. EM-10, Sept. 1963, p. 138-149.
Description of the development and implementation of the Project Cost Control system, to assist those who wish to install such a system in their organizations. Included in the discussion are: (1) the definitions of responsibility and authority required to make the system work; (2) the roles and interrelationships of the controller, line management, and project management; (3) the requirement for, and methods of, dividing projects into manageable pieces both in terms of size and of time; (4) the paperwork required for documentation of data inputs and outputs; and (5) the interpretation of reports in terms of project, organization, and individual performance.

A64-14703

AN APPLICATION OF A NETWORK FLOW MODEL TO PERSONNEL PLANNING.
William Gorham (Department of Defense, Washington, D. C.).
IEEE Transactions on Engineering Management, vol. EM-10, Sept. 1963, p. 113-123. 5 refs.
Contract No. AF 49(368)-700.
Application of a network flow model to the problem of choosing the best pattern of training and retraining activities, undertaken to insure that properly trained personnel are available when and where needed at minimum cost. The nodes of the flow model represent individual specialties in specific time periods, and the links represent all potential training and retraining flows (and all nontraining flows and intraspecialty movement as well). By using one node for each specialty in each time period, a dynamic flow is simulated by a static network. The problem emphasized is the maximization of the achievement of requirements. The solution yields the set of flows over nontraining, training, and retraining links which maximizes the aggregate value of the network, the set of flows which results in the best match of expected available manpower to projected requirements.

A64-11217

MONTE CARLO METHODS AND THE PERT PROBLEM.
Richard M. Van Slyke (California, University, Berkeley, Calif.).
Operations Research, vol. 11, Sept.-Oct. 1963, p. 839-860. 13 refs.
Contract No. Nonr-222(83).
Presentation of the results of a Monte Carlo simulation of PERT networks. The concept of using Monte Carlo methods to give solutions to PERT problems under less restrictive assumptions is discussed. Results are given for the accuracy obtainable, for the computing time required and devices for reducing computation are developed. A "criticality" index is defined for each activity. This index is simply the probability that the activity will be on the critical path. The ramifications and uses of this parameter, which is not available using current techniques, are developed.

A63-26012

THE PROGRESS FUNCTION IN THE AEROSPACE INDUSTRY - A HISTORICAL ANALYSIS.
Robert P. Zieke (Aerospace Corp., San Bernardino, Calif.).
IEEE Transactions on Engineering Management, vol. EM-10, June 1963, p: 74-86. 109 refs.
Study of the development and use of the progress function by aerospace companies. The progress function is a predictive model developed by the airframe industry in the 1930's. It is also called the "improvement curve" or the "learning curve." It reflects the relationship between gross production output and the effect required

to produce each unit of production. The history of these curves in the airframe industry is reviewed. Modifications of the basic functions are examined. Seven major uses of progress curves by the aerospace industry are in (1) cost estimates, (2) scheduling, (3) efficiency comparisons, (4) procurement and subcontracting, (5) facilities planning, (6) personnel planning, and (7) long-range planning. An evaluation is made of current usage.

A63-23238

MANAGEMENT CONTROL AND MONITORING TECHNIQUES.
J. T. Molieri (RCA, Defense Electronic Products, Aerospace Communications and Controls Division, Camden, N.J.).
(Institute of Electrical and Electronics Engineers, International Conference and Exhibit on Aerospace Support, Washington, D. C., Aug. 4-9, 1963.)
IEEE Transactions on Aerospace, vol. AS-1, Aug. 1963, p. 251-259.
Discussion of management control and monitoring techniques in terms of policy determination and operation philosophy. Application of these techniques is a self-imposed discipline that extends to all activities in the Engineering Department in a uniform manner and ensures proper "control awareness" by engineers and engineering supervision. A significant feature of the technique is the ready availability of data on performance of time, cost, and technical accomplishments on a recurring basis for all programs.

A63-10806

PERT IN THE DYNA-SOAR.
Theodore L. Senecal and Raymond M. Sadow (USAF, Systems Command, Aeronautical Systems Div., Dyna-Soar System Program, Wright-Patterson AFB, Dayton, Ohio).
Aerospace Management, vol. 5, Dec. 1962, p. 18-23.
General discussion of the advantages of Program Evaluation and Technical Review (PERT) as a valid management technique in the Dyna-Soar program.

A63-10177

GRAPHIC PERT/COST MILESTONE REPORTING.
R. K. Swim (North American Aviation, Inc.)
Society of Automotive Engineers, National Aerospace Engineering & Manufacturing Meeting, Los Angeles, Calif., Oct. 8-12, 1962, Paper 576D. 3 p.
Description of a simple, direct, and flexible system of associating costs with program milestones. This system, the PERT milestone system, provides a basis for summarization of PERT schedule data for various levels of management, from the detail components through the weapon system levels. The concept of the system is described along with its application.

M5 PERSONNEL MANAGEMENT

A67-34342

THE IMPACT OF MICROELECTRONICS ON THE UTILIZATION AND TRAINING OF MAINTENANCE PERSONNEL.
Douglas H. Harris (North American Aviation, Inc., Autonetics Div., Anaheim, Calif.).
Human Factors, vol. 9, Apr. 1967, p. 161-174. 9 refs.
Investigation of the impact of microelectronics on maintenance personnel and on training and organizational requirements. Microelectronic functional equivalents are defined for two operational systems: (1) a ship's inertial navigation system, and (2) a torpedo guidance system. The maintenance personnel and the training and organizational requirements of the microelectronic and existing configurations are compared by means of maintenance-burden analyses. It is found that microelectronics reduce the amount of maintenance required by the ship's inertial navigation system by 84% and the amount required by the torpedo guidance system by 18%, under existing maintenance philosophies.   M.M.

A67-15334 #
GROUP FORCES - RESISTANCE OR COUNTERPART TO ADP
SYSTEMS DESIGN.
John Badin, Jr. (USAF, Systems Command, Andrews AFB,
Washington, D.C.).
American Society of Mechanical Engineers, Winter Annual Meeting
and Energy Systems Exposition, New York, N.Y., Nov. 27-Dec. 1,
1966, Paper 66-WA/MGT-10. 6 p. 9 refs.
Members, $0.75; nonmembers, $1.50.
      Discussion of the group dynamics approach that encompasses
long-range personnel planning and use of the group as participants
and contributors to the evolving system as a means of improving
the effectiveness of studies and the utilization of the developed
system. Resistance to change is examined as an aspect of the
environment that confronts the planning, conversion, and management
of automatic data-processing systems. It is emphasized that per-
sonal attitudes of line and staff personnel that result from fear of
job dislocation or loss, as well as of understanding of unit or organi-
zation mission objectives, can seriously affect the results of the
feasibility study and cause overdevelopment or underdevelopment
of systems design.   S.Z.

A66-10117
MEASUREMENT AND PREDICTION OF HUMAN PERFORMANCE
AS A QUANTITATIVE FACTOR IN SYSTEM EFFECTIVENESS.
Wilton P. Chase (Space Technology Laboratories, Inc., Redondo
Beach, Calif.).
IN: ANNALS OF RELIABILITY AND MAINTAINABILITY; ANNUAL
RELIABILITY AND MAINTAINABILITY CONFERENCE, 4TH, LOS
ANGELES, CALIF., JULY 28-30, 1965. VOLUME 4 - PRACTICAL
TECHNIQUES AND APPLICATION. [A66-10048 01-15]
Edited by John de S. Coutinho.
Washington, Spartan Books, Inc., 1965, p. 803-816. 12 refs.
      Discussion of the methodologies which must be mastered and
actively applied in system development programs to reduce the
incidence of human error and, consequently, increase the reliability
of human performance in system performance. Tables show the
following: (1) summary of factors to be considered in allocating
functional decisions requirements to equipment and personnel, (2)
summary of progressive methodological approaches in system
development, and their significance for human error prediction,
and (3) summary of general orientation toward system management
by government procuring agencies and their engineering contractors,
and requirements to implement an overall change of viewpoints by
1975.   M.M.

M6 URBAN MANAGEMENT

No abstracts in this issue

M7 MANAGEMENT POLICY & PHILOSOPHY

A67-29669
THE STATE OF THE ART IN MANAGEMENT STUDIES APPLICABLE
TO AEROSPACE ACTIVITIES.
G. P. Dollimore (Hunting Engineering, Ltd., Luton, Beds., England)
(Royal Aeronautical Society, Management Studies in the Field of
Aeronautics, Symposium, London, England, Feb. 27, 1967, Paper.)
Royal Aeronautical Society, Journal, vol. 71, May 1967, p. 338-340;
Discussion, p. 340-342.
      Discussion of management methods which are applicable to the
aerospace industry. The application of mathematical methods used

in large industrial complexes to aerospace organizations is discussed,
and the introduction of integrated information systems into aerospace
companies is considered. Problems which arise in project and
production management are reviewed. The need for the development
of new techniques in the aerospace management field is emphasized
in a discussion, and the use of critical path analysis is discussed.
                                                          M.F.

A67-29667
THE INITIATION OF PROJECTS.
B. D. Blackwell (Bristol Siddeley Engines, Ltd., Small Engine
Div., Leavesden, Herts., England).
(Royal Aeronautical Society, Management Studies in the Field of
Aeronautics, Symposium, London, England, Feb. 27, 1967,
Paper.)
Royal Aeronautical Society, Journal, vol. 71, May 1967, p. 330-333;
Discussion, p. 333, 334. 7 refs.
      Analysis of the scope and scale of a proper Project Initiation
Study with particular emphasis on the market, the product (design,
cost, and timing), and the resources to market the product. Public
relations techniques applicable to an advanced technological product
are described, and techniques for cost estimation and cost effec-
tiveness studies at the project initiation stage are treated. Timing
strategies for the introduction of an advanced technological product
are mentioned, and pricing policies and techniques applicable to
advanced technological products are studied.   M.F.

A67-27513
EVOLUTION OF THE SYSTEMS APPROACH.
C. J. Dorrenbacher (Douglas Aircraft Co., Inc., Missile and Space
Systems Div., Santa Monica, Calif.). .
IN: SPACE AGE IN FISCAL YEAR 2001; AMERICAN ASTRONAUTI-
CAL SOCIETY, GODDARD MEMORIAL SYMPOSIUM, 4TH,
WASHINGTON, D.C., MARCH 15, 16, 1966, PROCEEDINGS. [A67-
27501 13-34]
Edited by E. B. Konecci, M. W. Hunter, II, and R. F. Trapp.
Tarzana, Calif., American Astronautical Society (AAS Science and
Technology Series. Volume 10), 1967, p. 359-383; Discussion,
p. 384. 10 refs.
      Review of the growth of the "systems approach" in an attempt
to predict its future development and its possible application to
complex problems of the future. The systems approach may be
thought of as the systematic investigation of the research, engineer-
ing, and management activities applicable to the utilization of any
complex combination of elements for technological or sociological
gain. The 1930 to 1950 period is described as an era in which the
systems approach was primarily applied to the development cycle.
As the application of these techniques grew, it was found that they
encompassed both the area of development and applied research;
the present period is described as the "research era." A case study
for the potential utilization of an orbital research laboratory is pre-
sented to illustrate the application of the systems approach in deter-
mining research and development objectives and relating these to
the benefits to be derived. The extrapolation of these activities to
the future indicates that the ability to conduct applied research will
exceed economic capability, and therefore, the systems approach
must be applied to the sociological as well as the technological
disciplines.   T.M.

A67-25742
CHARACTERISTICS AND PROBLEMS OF AEROSPACE COMPANY
MANAGEMENT.
George Schussel.
Journal of the Astronautical Sciences, vol. 14, Jan.-Feb. 1967,
p. 27-34. 9 refs.
      Discussion of the basic and unique problems of management in
aerospace/defense firms. The relationship between aerospace
companies and their chief customer, the U.S. government, is dis-
cussed in terms of the nature of contracts, governmental financing,
profit control, and governmental incentives and (unintentional) dis-
incentives for good company management.   R.B.S.

A66-41047 #

NASA MANAGEMENT AT THE CROSSROADS.

S. Peter Kaprielyan.

Aerospace Management, vol. 1, Summer 1966, p. 3-11.

Attempt to delineate NASA's management challenge as viewed broadly from top echelon. NASA's budgetary problems are sketched, and managerial successes, challenges, and problems are briefly discussed. The controversy of the incentives system in industrial contracting is reviewed, and the trend toward maximizing competition is stressed. S.Z.

A66-18551

SCIENCE AND PUBLIC POLICY IN AEROSPACE.

Edward C. Welsh (National Aeronautics and Space Council, Washington, D.C.).

(Conference on Civilian and Military Uses of Aerospace, New York, N.Y., Jan. 11-14, 1965, Paper.)

New York Academy of Sciences, Annals, vol. 134, Nov. 22, 1965, p. 30-33.

Discussion of factors involved in shaping policy with regard to aerospace activity, with emphasis on the role of the scientist in developing this policy. Areas of science and technology which have been aided by aerospace research are reviewed, and the overall benefits to society from aerospace activity are noted. It is suggested that while the scientist must of course provide the information on which policy decisions are to be made, his own judgment on policy is not necessarily more infallible or omniscient than that of the ordinary mortal. P.K.

A64-19984

RECENT DEVELOPMENTS AFFECTING AEROSPACE MANAGEMENT.

R. L. Johnson (Douglas Aircraft Co., Inc., Missile and Space Systems Div., Product Development, Santa Monica, Calif.).

American Institute of Aeronautics and Astronautics, Annual Meeting, 1st, Washington, D.C., June 29-July 2, 1964, Paper 64-516. 16 p. 11 refs.

Members, $0.50; nonmembers, $1.00.

Discussion of recent developments which have a significant impact on aerospace management. New requirements and procedures are discussed which show that: (1) the project definition phase (PDP) sets the stage for incentives by quantifying the trades between performance alternatives; (2) the PDP sets the stage for reliability, maintainability and value-engineering efforts, by providing specific criteria in these areas; (3) the PDP creates the initial program control plans - i.e., PERT networks, etc.; (4) the contractor performance evaluation (CPE) supplements incentives by evaluating and ultimately rewarding or penalizing nonincentivized performance elements of the development program; (5) in a broad sense, the function of program review and control techniques is to disclose performance results or projected results which threaten nonconformance with the PDP plan; (6) a good weighted-guideline analysis would be based in part on the task and manpower loading analyses of PDP; and (7) the weighted guideline turns to CPE for past performance inputs. A chart illustrates the interdependence of the above events.

A63-16581

SCIENCE, TECHNOLOGY, AND MANAGEMENT: AN OVERVIEW.

Fremont E. Kast and James E. Rosenzweig (University of Washington, College of Business Administration, Seattle, Wash.)

(National Advanced-Technology Management Conference, Proceedings, Seattle, Wash., Sept. 4-7, 1962.)

IN: Science, Technology, and Management. New York, McGraw-Hill Book Co., Inc., 1963, p. 16-30.

Discussion of the relationship between science, technology, and management, particularly in large-scale advanced-technology programs. The evolution of science in Western society is traced, and its pervasiveness is emphasized, with special reference to its impact on the United States. This evolution is measured by the vast increase in expenditures for research and development. The importance of management in the development of science is considered

and the fundamental concept is stressed that scientific achievements and technological advancements are translated into useful products or services through management processes. It is noted that the functions of management have become much more difficult and complex because of advances in science and technology. The program management concept is introduced and defined. Finally, the five basic missions necessary for successful mission accomplishment are discussed: (1) perception of need, (2) design-development, (3) production, (4) delivery-deployment, and (5) utilization.

A63-16580

PLANNING FOR TECHNOLOGY.

Warren G. Magnuson (U.S. Senate, Washington, D.C.)

(National Advanced-Technology Management Conference, Proceedings, Seattle, Wash., Sept. 4-7, 1962.)

IN: Science, Technology, and Management. New York, McGraw-Hill Book Co., Inc., 1963, p. 8-10.

Keynote address emphasizing the growing complexity and confusion of technology. A plea is made for more understanding of science and technology on the part of statesmen and politicians. Cooperation among scientists, engineers, and managers is stressed, but the scientists themselves are urged to learn to manage technology in its applications.

M8 ECONOMICS

A67-35648

THE ECONOMIC CONSIDERATIONS OF SPACE OPERATIONS.

S. L. Hislop (McDonnell Douglas Corp., St. Louis, Mo.).

IN: PRACTICAL SPACE APPLICATIONS; AMERICAN ASTRONAUTICAL SOCIETY, NATIONAL MEETING, SAN DIEGO, CALIF., FEBRUARY 21-23, 1966, PROCEEDINGS. [A67-35634 19-30]

Edited by L. L. Kavanau.

Washington, American Astronautical Society, Inc.; Sun Valley, Calif., Scholarly Publications, Inc. (Advances in the Astronautical Sciences. Volume 21), 1967, p. 245-267. 9 refs.

Discussion of some of the elements involved in the economics of space operations. Specific applications to operational space costs, both on a recurring and nonrecurring basis, are given. Several factors upon which the proper utilization of cost-effectiveness analysis is based are presented. These include: (1) the identification of the proper parameters; (2) open-mindedness on the part of program planners; and (3) proper utilization of "figures of merit." Other factors, which are the key elements in the identification of economically practical space operations, are also considered. Two preliminary conclusions drawn are: (1) the recovery and reuse of the launch vehicles, in the small spacecraft categories, will not reduce space operational costs significantly; and (2) the spacecraft predominates in the costs of the space operations. Accordingly, the greatest potential for reducing space operational costs involves the recovery and reuse of the spacecraft. R.B.S.

A65-27269

CURRENT FINANCIAL CONSIDERATIONS IN AIRLINE AIRCRAFT ACQUISITIONS.

J. P. Mitchell (Chase Manhattan Bank, New York, N.Y.).

Society of Automotive Engineers, National Aeronautic Meeting and Production Forum, Washington, D.C., Apr. 12-15, 1965, Paper 650244. 5 p.

Members, $0.75; nonmembers, $1.00.

Appraisal of airline equities by the financial market. Better profits, an improved stock-market image, and the health of the general economy are said to be the outstanding financial considerations today. Other aspects include the benefits of investment tax credits and the continuing opportunity to benefit therefrom, with substantial purchase commitments running into 1968 and 1969. Possibilities of leasing are receiving greater consideration, and the procedure has certain advantages, as well as disadvantages.

Financing assistance by manufacturers is evidence of the strong competition in a buyers' market. A continuing strong economy is considered to be the key to airline realization of potential heavy cash flow adequate to service the sizeable purchase commitments.

(Author) F.R.L.

A64-23543

DEFENSE - SPACE MARKET RESEARCH.
Edited by J. Fred Weston.
Cambridge, Mass., MIT Press, 1964. 280 p.
$6.

A textbook is presented whose formulation is intended to fill the gap between general marketing and market research works and the existing literature on various aspects of the size of the market and certain specific aspects of the weapons procurement process. The volume represents the edited contributions of a large number of people experienced in defense-space market research. Their efforts were brought together by the Electronics Industry Association, and they are listed as text contributors or planning and editorial contributors. The work discusses the nature of the market, market research and planning, and general characteristics of defense-space market research; various aspects of the process of and the organization for defense-space market research, with an appendix giving positions descriptions in two companies; information sources, including a discussion of the link between military planning and defense budgeting, with an appendix giving program element lists; forecasting the market, identifying growth areas, and utilizing information. A list of abbreviations, a glossary, selected references, and an index are presented. The work is intended to provide a basic text for courses in defense-space marketing and economics which should shorten the period required for in-house training programs and expand the supply of persons competent to function effectively in this professional activity.

M9 GENERAL

A67-38215 #

OBSERVATIONS ON THE MANAGEMENT OF SPACE ELECTRONIC PROGRAMS.
Arthur H. Wulfsberg (Collins Radio Co., Spacecraft Systems Div., Cedar Rapids, Iowa).
Société Française des Electroniciens et des Radioélectriciens, Colloque International sur l'Electronique et l'Espace, Paris, France, Apr. 10-15, 1967, Paper. 7 p.

Discussion of the role of the program manager in the integration of the requirements of a space program. A differentiation is made between the functional or matrix-type organization, in which all program efforts are performed by the company departments, and the project organization, in which essentially all effort is performed by a specially organized project team under the direct supervision of the project manager. The advantages of an organization characterized by integration and employee self-control over one of authoritative direction and control are discussed. R.B.S.

A67-37619 #

NATIONAL SPACE PROGRAM PLANNING VIEWPOINT OF EXECUTIVE BRANCH OF FEDERAL GOVERNMENT.
Edward C. Welsh (National Aeronautics and Space Council, Washington, D.C.).
American Institute of Aeronautics and Astronautics, Space Program Issues of the 70's Meeting, Seattle, Wash., Aug. 28-30, 1967, Paper 67-628. 5 p.
Members, $0.75; nonmembers, $1.50.

Discussion of problems involved in space planning by the Executive Branch of the Government. It is pointed out that one of the most arduous and time-consuming activities in the entire planning

exercise is the preparation and defense of the budget. Planning in the 1970s, as compared with the 1960s, will have to clear the hurdle of greater competition for the Federal dollar. The coming decade will find substantially more dollars spent on space projects than its predecessor, but they will have to meet the practical tests of benefits and payoffs. Another outstanding feature of the coming decade will be the convergence of aeronautics and astronautics, with the greatest advances in each joining to improve transportation within the earth's atmosphere and out into space. Broad mission objectives for evaluating space programs and considering what should be done in advancing the national interest through space technology are outlined. M.M.

A67-32218 #

THE DYNAMICS OF ACCIDENT PREVENTION INFORMATION.
C. O. Miller (Southern California, University, Institute of Aerospace Safety and Management, Los Angeles, Calif.).
(Canadian Aeronautics and Space Institute, American Institute of Aeronautics and Astronautics, and Cornell-Guggenheim Aviation Safety Center, Aviation Safety Meeting, Toronto, Canada, Oct. 31-Nov. 1, 1966, Paper.)
Canadian Aeronautics and Space Journal, vol. 13, June 1967, p. 273-277. 18 refs.

Discussion of the role of recording of accident data and the dynamics of accident-prevention information. Known precedent in accident causation has traditionally been the foundation of accident prevention. Thousands of accidents have occurred from which lessons of the past have been learned. Still, repetitive causal factors are regularly observed. Some of these are undoubtedly due to man's inherent limitations; others result from information lost or degraded during transmission from accident occurrence to prevention of other accidents. F.R.L.

A67-27506

PLANNING THE TECHNOLOGICAL (R) EVOLUTION.
Joseph E. Karth (U.S. Congress, Washington, D.C.).
IN: SPACE AGE IN FISCAL YEAR 2001; AMERICAN ASTRONAUTICAL SOCIETY, GODDARD MEMORIAL SYMPOSIUM, 4TH, WASHINGTON, D.C., MARCH 15, 16, 1966, PROCEEDINGS. [A67-27501 13-34]
Edited by E. B. Konecci, M. W. Hunter, II, and R. F. Trapp.
Tarzana, Calif., American Astronautical Society (AAS Science and Technology Series. Volume 10), 1967, p. 114-132.

Discussion of the planning and decision-making system in the area of science and technology. The results of Congressional hearings on the allocation of funds, and the investigation of the Executive Department's decision-making process on research and development are summarized. The need for frequent, systematic, large-scale surveys and analysis of science and technology is stressed from the present to the future frontiers of knowledge. The possibility of a technological revolution in the sense of a sudden and radical change is explained in contrast to the gradual and relatively peaceful process of evolutionary exchange. The need for planning the evolutionary progress is evident but it must be done with the expectation of revolutionary changes. The creation of a "Hoover-type" commission is urged to undertake a complete review of the relationship between public policy and science and technology. T.M.

A67-11199 #

HOW ROLLS-ROYCE USES COMPUTERS.
L. Griffiths (Rolls-Royce, Ltd., Derby, England).
Shell Aviation News, no. 339, 1966, p. 7-9.

Discussion of Rolls-Royce's use of computers in engineering, manufacturing, and marketing operations. The company now has 11 computers in use. The current annual expenditure on computing and data processing within the Aero Division lies between 1-1/2 and 2% of annual turnover. Approximately 600 of the Division's staff are employed directly in this work. The design, manufacture, and checking of compressor blades is a typical computer application. M.M.

A66-37732

A SELECTED ANNOTATED BIBLIOGRAPHY ON R & D MANAGE-
MENT.
L. N. Goslin (Indiana University, Graduate School of Business,
Bloomington, Ind.).
Bloomington, Ind., Indiana University, Graduate School of Business,
Bureau of Business Research (Indiana Business Information Bulletin
no. 56), 1966. 204 p.
$3.25.
A book containing a bibliography on various aspects of R & D
management with book abstracts. Among the subjects covered are
allocation of resources, budgeting, communication, control,
creativity, decision making, economics, evaluation of results,
expenditures, motivation, objective, organization, patents, philos-
ophy, planning, project selection, responsibility, strategy and
tactics, system, and theory.   V.Z.

A66-24747

A TRILLION DOLLAR MARKET.
Vincent P. Rock (Communications Central, Washington, D.C.).
American Institute of Aeronautics and Astronautics, Communica-
tions Satellite Systems Conference, Washington, D.C., May 2-4,
1966, Paper 66-274. 16 p. 7 refs.
Members, $0.75; nonmembers, $1.50.
Examination of three market problems connected with the de-
velopment of Satellite Educational and Informational Television (SEIT) -
what values will foster growth of SEIT, what is the nature of market
demand and structure, and what is the role of SEIT in opening up
this market. Values which facilitate the growth of the market poten-
tial are discussed. The "information system," consisting of the
complex of peoples, institutions, and technology through which in-
formation is created, is described. The role of the SEIT program
is evaluated. The conclusions of experts who reviewed the develop-
mental work on TV for educational purposes are set forth. Advan-
tages of satellite communication are reviewed.   D.P.F.

A65-10717

THE GOVERNMENT'S ATTITUDE TOWARD PROFIT.
Dave W. Lang (NASA, Manned Spacecraft Center, Houston, Tex.).
IN: AMERICAN INSTITUTE OF AERONAUTICS AND ASTRO-
NAUTICS, AND NASA, MANNED SPACE FLIGHT MEETING,
3RD, HOUSTON, TEX., NOVEMBER 4-6, 1964, TECHNICAL
PAPERS (AIAA Publication CP-10).
New York, American Institute of Aeronautics and Astronautics,
1964, p. 353-355. 7 refs.
Review of changes in Government policies towards profits in
the aerospace industry. Shortcomings in cost-plus-fixed-fee
contracts are reviewed, and the increasing use of cost-plus-
incentive-fee contracts is discussed. The role of competitive
pressures in determining profit rates is noted. The incentive
contract, with its basic philosophy of reward for good performance
and penalty for poor, is concluded to offer the best opportunity for
the contractor to achieve higher profits.   P.K.

A64-14706

SELECTED REFERENCES ON PERT AND RELATED TECHNIQUES.
B. L. Fry (North American Aviation, Inc., Atomics International
Div., Management Systems and Evaluation, Canoga Park, Calif.).
(RAND Corp., Memorandum RM-3074-PR, Feb. 1963.)
IEEE Transactions on Engineering Management, vol. EM-10, Sept.
1963, p. 150, 151.
Bibliography of 50 items selected to demonstrate the scope of
material covered in studies of the network-type management control
systems. The documents are organized by author, title, author's
organization, chronology, and a file number. The bibliography
comprises two listings, one indexed by author and one indexed by
title.

A63-18274

INFORMATION PROBLEMS OF ENGINEERS IN AN INDUSTRIAL
ORGANIZATION.
Bernard K. Dennis (General Electric Co., Flight Propulsion Div.,
Cincinnati, Ohio).
IN: Institute of Environmental Sciences, 1963 Annual Technical
Meeting, Proceedings. Mt. Prospect, Ill., Institute of Environ-
mental Sciences, 1963, p. 121-127.
Discussion of the problems encountered in keeping up with re-
search and developments thorugh published technical information.
The information problems are summed up as too little and too late.
Security restrictions, competitive jealousies, and organizational
weaknesses are blamed for the "too little" aspect. The large vol-
ume of data, the reliance on traditional methods (which make use
of an increasing number of specialized journals and the multiplica-
tion of more and more specialized societies), and the multitude of
information sources contribute to the "too late" aspect. Suggestions
on how the engineer can help solve his own information problems
are provided. Recommendations for the establishment of a national
technical information center are included.

Subject Index

Typical Subject Index Listing

ECONOMIC ANALYSIS
Program budgeting - Applying economic analysis to
government expenditure decisions
NASA-CR-75492   N67-27753 01-M4

NOTATION OF CONTENT	REPORT NUMBER	ACCESSION NUMBER	ISSUE AND CATEGORY NUMBER
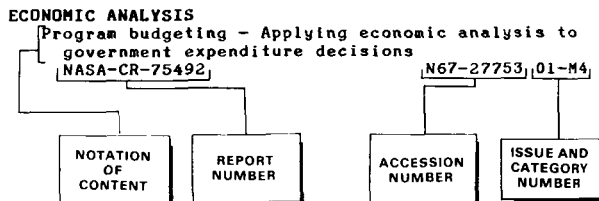
A Notation of Content, rather than the title of the document, appears under
each subject heading; it is listed under several headings to provide multiple
access to the subject content. The accession number is located beneath and to
the right of the Notation of Content, e.g., N67-12345. Under any one subject
heading, the accession numbers are arranged in sequence.

C

CAPABILITY MANAGEMENT
Capability management in selling research and
development to defense/space market
A66-28435 02-M3
Management for marketing research and development
capabilities to defense/space market
N66-36539 02-M3
COMMUNICATION
Large scale computer based simulations for
processing information in large scale operations
TM-1128/100/00   N67-15410 02-M4
CONFIGURATION MANAGEMENT
Aspects of program phasing, dictating the need for
total configuration control in terms of design
and data interface and concurrency concept
considerations   A63-23260 02-M1
Project Definition Phase /PDP/ method of
contracting, noting system trade-offs among
cost, performance and schedules
A64-19731 02-M2
Developments affecting aerospace management,
detailing objectives of Project Definition
Phase /PDP/
AIAA PAPER 64-516   A64-19984 02-M7
NASA and Defense Department space program
organization and management with discussion of
systems concepts   A65-21357 02-M1
Value engineering and configuration management in
management network for system compatibility and
mission success at lowest cost
A66-28436 02-M1
Configuration management outlining requirements
for change identification, control,
implementation, etc.
ASME PAPER 66-MD-69   A66-38498 02-M1
General purpose approach to real time direct
access management information systems - AESOP
MTP-33   N66-36541 02-M1
Configuration management operational procedures,
engineering and vendor controls, and inspection
and specifications programs
PUBL-2758   N66-87320 02-M1
Aerospace ground equipment management problems
solved by program ensuring proper recognition by
contractor and customer management
SAE PAPER 660686   A67-10590 02-M1
Software configuration management by engineering
methods, considering application to Automatic
Support Equipment /ASE/ for Saturn S-IVB
stage   A67-14221 02-M1
Configuration management, method for current and

precise documentation which attempts to assure
customer and builder that final hardware is what
they agreed on   A67-14424 02-M1
Management of engineering changes in manufacturing
processes to prevent design or systems
deficiencies resulting from poor control of
changes   A67-21049 02-M1
CONTRACT DEFINITION
Total value concepts applied in system
effectiveness analysis are helping Contract
Definition type contracts meet cost
effectiveness requirements   A66-34251 02-M2
CONTRACT INCENTIVES
Incentive contract effect on aerospace programs
AIAA PAPER 64-409   A64-19982 02-M2
Review of changes in Government policies toward
profits in aerospace industry
A65-10717 02-M9
Department of Defense cost effectiveness analysis
effects on industrial management planning
ISA PAPER 20.2-2-64   A65-11307 02-M1
Procedure for determination of final fee in Cost-
Plus-Incentive-Fee /CPIF/ contracts
A65-18723 02-M2
Evaluation and future of cost effectiveness
management   A66-10052 02-M1
NASA management, budgetary problems, controversy
of incentives system, etc.   A66-41047 02-M7
Research-development and production combined
contract with cost and risk-taking
considerations   N66-36538 02-M2
Management of aerospace programs - AAS
Conference, University of Missouri, November
1966   A67-27545 02-M1
Management of aerospace programs, discussing
budgeting and contracting procedures
A67-35879 02-M1
Total package procurement concept
AD-655814   N67-40140 02-M2
CONTRACT MANAGEMENT
Selected bibliography of contract proposals
LS-BIB-63-6   N64-15674 02-M9
Integration of management techniques - systems
analysis, interface, change control,
progress charts, and scheduling
N65-23971 02-M4
Aerospace ground equipment management problems
solved by program ensuring proper recognition by
contractor and customer management
SAE PAPER 660686   A67-10590 02-M1
Interface management of aerospace systems noting
associated disciplines, documentation,
contractor interrelationships and procuring
agencies
AAS PAPER 66-159   A67-20976 02-M1
Management of aerospace programs - AAS
Conference, University of Missouri, November
1966   A67-27545 02-M1
Management control system for technical,
production, financial and contractual management
of large scale or technical industry programs
AAS PAPER 67-153   A67-29969 02-M1
CONTRACT NEGOTIATION
Effect of public law 87-653 on R and D
contracts   A63-18030 02-M2
Procedure for determination of final fee in Cost-
Plus-Incentive-Fee /CPIF/ contracts
A65-18723 02-M2
CONTRACTOR SELECTION
Selected bibliography of contract proposals
LS-BIB-63-6   N64-15674 02-M9
Evaluation and future of cost effectiveness
management   A66-10052 02-M1
COST ANALYSIS
Description of simple and flexible system of

associating costs with program milestones
SAE PAPER 576D   A63-10177 02-M4
Administration and organization for data
management of logistics
AD-242853   N63-81003 02-M1
Project cost control system, defining roles and
interrelationships of controller, line
management and project management, at Raytheon
Wayland Laboratory   A64-14705 02-M4
Program control techniques to assist management
planning, scheduling, performance analysis and
cost control   A64-21607 02-M1
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involved, limitations, benefits, etc
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and aspects of turn-around problem
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   Plus-Incentive-Fee /CPIF/ contracts
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   aerospace industry   A66-33947 02-M4
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   etc   A65-16855 02-M4
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A65-10717 02-M9
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procedures
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problems   A67-25742 02-M7
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procedures
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AROD-0010-6   N62-16582 02-M5
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counterpart of planning, conversion and
management of automatic data processing systems
design
ASME PAPER 66-WA/MBT-10   A67-15334 02-M5
Additional follow-up criterion for validating
predictor scores for measuring psychological
characteristics of sample of Air Force
scientists
AFOSR-67-0896   N67-29665 02-M5
Dynamics of role theory for workers judgement
TR-18   N67-36016 02-M5
Information systems simulation and modeling
techniques, study of large organizations by
computers, and environmental simulation for
studying human behavior   N67-80496 02-M4
Morale and productivity of first-line supervisors,
engineers, and draftsmen
Y-1575   N67-85689 02-M5

I

INCENTIVE TECHNIQUES
Group dynamics approach to resistance or
counterpart of planning, conversion and
management of automatic data processing systems
design
ASME PAPER 66-WA/MBT-10   A67-15334 02-M5
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1966   A67-27545 02-M1
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problems - Queueing theory
TR-62   N62-17220 02-M4
Progress function in the aircraft and aerospace
industries evaluated, discussing applications of
this predictive model to production planning
A63-26012 02-M4
Industrial laboratory management, considering
technicians, maintenance and equipment
A64-23238 02-M3
Bibliography on industrial technology for metal
working processes - Factory management and
production engineering
W-94   N66-19673 02-M9
Abstracts and bibliographic notes on industrial
economics, logistics, personnel, and psychology
N66-21177 02-M9
Rolls-Royce use of computers in engineering,
manufacturing and marketing operations
A67-11199 02-M9
Management aspects of technological capability
within large hardware systems business
A67-28697 02-M1
Industrial location theory in era of super cargo
aircraft
AD-655695   N67-37187 02-M9
INDUSTRIAL PSYCHOLOGY
Dynamics of role theory for workers judgement
TR-18   N67-36016 02-M5
INDUSTRIAL RELATIONS
Use of aerospace management techniques in other
industries
P-2927   N64-28816 02-M8
INFORMATION FLOW
Problems encountered in keeping up with research
and development through published technical
information   A63-18274 02-M9
Product Administration and Contract Control
/PACC/, an integrated data processing system for
management control of overall program operation
AIAA PAPER 64-411   A64-20262 02-M1
Federal role in fostering use of network
scheduling and control techniques as revealed in
government publications   A64-23349 02-M4
NASA and Defense Department space program
organization and management with discussion of
systems concepts   A65-21357 02-M1
Schedule, cost and performance /SCOPE/ computer
aided management system for budget and schedule
control of complex programs R and D
A65-24155 02-M3
Time allocation among engineers and scientists in
research and development projects - Management
of science and technology
REPT.-131-65   N66-13617 02-M3
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personnel - Bibliography and abstracts
PRL-TR-65-23   N66-38220 02-M5
INFORMATION MANAGEMENT
Command and control system analysis
R-RD-1539-TR1   N63-17425 02-M1
INFORMATION SYSTEMS
Industrial application of computers, including
aerospace system simulation and data retrieval
A63-20760 02-M1
Information system simulation and modeling
techniques
MITRE-SS-7   N64-82043 02-M4
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provide generalized routines for functions
common to large class of command and management
problems   A66-22050 02-M1
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Television, noting management, market and
development problems in terms of profit, demand
and growth potential
AIAA PAPER 66-274   A66-24747 02-M9
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information systems
AFOSR-67-1998   N67-39410 02-M1
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techniques, study of large organizations by

computers, and environmental simulation for
studying human behavior   N67-80496 02-M4
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SP-2655   N67-83219 02-M1
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Survey of scientific research in United States
                                 N64-27208 02-M3
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Optimal policy for inventory management based on
field life of item
TR-3   N65-88396 02-M1
INVENTORY MANAGEMENT
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management with emphasis on problem solving and
specific applications   A63-13078 02-M1
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through data processing and personnel training
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Processing /EDP/ and other systems for planning,
inventory, maintenance, automatic reservation,
etc   A65-16855 02-M4
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TR-2   N65-88394 02-M1
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and stochastic demand
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exponential smoothing
P-3264-1   N67-10583 02-M1
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and production control   N67-81516 02-M1

L

LINE MANAGEMENT
Program management, control and integration of
large aggregations of resources outside
traditional flows of authority and
responsibility   A65-29269 02-M1
LOGISTICS MANAGEMENT
Administration and organization for data
management of logistics
AD-242853   N63-81003 02-M1
Air Force improvement in spares management
through data processing and personnel training
                                 A64-22639 02-M1
Space logistics management procedures
P-2613   N65-80491 02-M7
New concepts in railroad management oriented to
logistics market and return on investment
                                 A66-29801 02-M1

M

MAN/MACHINE SYSTEMS
Major concepts involved in engineering and
management of man-made systems and man-machine
systems   A63-16893 02-M1
Command and control system analysis
R-RD-1539-TR1   N63-17425 02-M1
Management concepts underlying development of
command and control systems in support of
decision making and action taking by military
organizations
SP-1174   N64-83865 02-M1
Mechanization problems of industrial management
                                 N65-30279 02-M9
Computerized tools and constant analysis for real
time experiment flight management planning
system   A66-11638 02-M1
Human factors and system effectiveness, noting
role of customer project officer, contractor
engineering manager and human factor specialist
                                 A66-23445 02-M1
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from man machine interactions
AD-633003   N66-86457 02-M5
Group dynamics approach to resistance or
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management of automatic data processing systems
design
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Large scale computer based simulations for
processing information in large scale operations
TM-1128/100/00   N67-15410 02-M4
MANAGEMENT ANALYSIS
Government-industry program management, referring
to Redstone, Jupiter IRBM, Explorer and
Juno series, Pershing and Saturn
                                 A63-16590 02-M1
Management science and managing
ONR RES. MEMO-53   N63-13737 02-M7
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                                 A64-18117 02-M1
Computerized tools and constant analysis for real
time experiment flight management planning
system   A66-11638 02-M1
New concepts in railroad management oriented to
logistics market and return on investment
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Data, mathematical models, and decision in program
management
AD-620172   N66-10809 02-M4
Measurements standards and instrument calibration
program for research and development laboratory
SC-DC-66-1491   N66-32852 02-M3
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relation to computerization
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leadership with emphasis on ACW sites in Alaska
AAL-TDR-62-35   N66-82383 02-M5
Group behavior, human engineering concepts, and
general theory on organizational taxonomy
AD-642496   N67-19717 02-M7
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development programs - manual
                                 N67-82721 02-M1
MANAGEMENT INFORMATION SYSTEMS
Real time management information systems covering
hardware, programming and design
                                 A64-16010 02-M1
Bell helicopter company management planning,
execution, evaluation and control, using a total
information system   A64-16049 02-M1
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/PACC/, an integrated data processing system for
management control of overall program operation
AIAA PAPER 64-411   A64-20262 02-M1
Project COMET - Advanced computer techniques and
management methods
AD-276938   N64-84874 02-M4
Management information systems application
problems with reference to PERT/cost systems
ASME PAPER 64-WA/MGT-1   A65-13154 02-M1
Research and Development Effectiveness /RDE/
computerized planning program, utilizing
analytical techniques in management of research
and development resources   A66-19461 02-M3
Configuration management and value engineering
compatibility in aerospace and weapon system
technology   N66-35641 02-M4
PERT-C - extension of PERT to multi-project and
functional management
AD-417333   N66-80359 02-M4
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implementation
AD-646851   N67-83225 02-M1
MANAGEMENT METHODS
Approach to control of fiscal and technical
progress for multiple unrelated engineering
projects
SAE PAPER 576B   A63-10176 02-M1
Problems encountered in the management of Defense
Research and Development   A63-16584 02-M3
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which the Army Materiel Command will integrate
materiel functions   A63-16588 02-M1
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aerospace system simulation and data retrieval
                                 A63-20760 02-M1
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terms of policy determination and operation
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                                 A63-23238 02-M4
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industries evaluated, discussing applications of

this predictive model to production planning
                                    A63-26012 02-M4
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    ONR RES. MEMO-53   N63-13737 02-M7
Network-type management control systems
    RM-3074-PR   N63-15733 02-M9
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    TR-67   N63-21721 02-M1
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    management of logistics
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    AIAA PAPER 64-406   A64-19891 02-M1
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    AIAA PAPER 64-516   A64-19984 02-M7
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    management
    AIAA PAPER 64-405   A64-20063 02-M1
Product Administration and Contract Control
    /PACC/, an integrated data processing system for
    management control of overall program operation
    AIAA PAPER 64-411   A64-20262 02-M1
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    system or space system   A64-22617 02-M1
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    and behavioral scientists in regard to
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    functions   A65-25155 02-M1
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    applicable to management and social science
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                                    N65-30279 02-M9
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    noting importance of military specification
                                    A66-10075 02-M1
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    time experiment flight management planning
    system   A66-11638 02-M1
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    provide generalized routines for functions
    common to large class of command and management
    problems   A66-22050 02-M1
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    example   A66-23060 02-M4
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    aircraft manufacture
    SAE PAPER 660205   A66-26391 02-M1
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    facilities for environmental testing, including
    management planning, work load reorientation,
    etc   A66-30441 02-M1
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    aerospace industry   A66-33947 02-M4
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    application in aviation   A66-37972 02-M4
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    through correct management decisions
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    decision making
    SP-1175   N66-85827 02-M1
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    manufacturing and marketing operations
                                    A67-11199 02-M9
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    between risk and controls, relations between
    government and contractors and implementation
    procedures
    ASME PAPER 66-WA/MGT-16   A67-15335 02-M2
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    Gemini spacecraft noting program organization,
    management techniques and personnel motivation
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                                    A67-22143 02-M3
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    development to be used with aircraft
                                    A67-24655 02-M4
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    projects, considering network analysis
                                    A67-24656 02-M1
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    aerospace industry, considering introduction of
    integrated information systems
                                    A67-29669 02-M7
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    portraying interrelationship of requirement
    documents, specifications and standards
    applicable to particular program

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   statistical trials   A67-14256 02-M4
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   AIAA PAPER 67-809   A67-42966 02-M4
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   and production control   N67-81516 02-M1
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   planning of space missions
   MR-0-120   N67-85872 02-M1

O

OPERATIONS ANALYSIS
   Algorithm for divisible activity problem in
   critical path analysis for program management
                                      N67-38062 02-M4
OPERATIONS RESEARCH
   Book presenting a survey of advances in inventory
   management with emphasis on problem solving and
   specific applications   A63-13078 02-M1
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   implementation and application
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   Operations research for program planning
   ONR-ACR/NAR-27   N64-32217 02-M3
   Airline management using Electronic Data
   Processing /EDP/ and other systems for planning,
   inventory, maintenance, automatic reservation,
   etc   A65-16855 02-M4
   Systems engineering definition, structure and
   functions   A65-25155 02-M1
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   noting application of Poisson distribution
                                      A65-33159 02-M1
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   techniques for management science and operations
   research   N65-21145 02-M9
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   management   A66-10052 02-M1
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   human engineering disciplines
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   quality control
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   systems analysis, reliability, and statistics
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Information retrieval effectiveness based on
   numerical taxonomy method for evaluating and
   predicting equipment performance from
   environmental engineering data
   FA-R-1847   N67-33913 02-M4
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   planning of space missions
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ORGANIZATIONAL BEHAVIOR
   Recent reorganization of the army as a result of
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   materiel functions   A63-16588 02-M1
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                                      N64-27208 02-M3
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   management
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   for change identification, control,
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   and training, and methodology for military
   organizational staffing
   AAL-TR-61-62   N66-82368 02-M9
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   AAL-TDR-62-35   N66-82383 02-M5
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   productivity, and personnel management at
   Office of Aerospace Research
                                      N66-84247 02-M3
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   from man machine interactions
   AD-633003   N66-86457 02-M5
   Information systems simulation and modeling
   techniques, study of large organizations by
   computers, and environmental simulation for
   studying human behavior   N67-80496 02-M4
   Organizational behavior and performance prediction
   in R and D management
   AD-641423   N67-81120 02-M3
   Organizational behavior in R and D management
   AD-645016   N67-82994 02-M5
   Organizational behavior and personnel development
   TR-13   N67-84525 02-M5
ORGANIZATIONAL PROBLEMS
   Problems encountered in keeping up with research
   and development through published technical
   information   A63-18274 02-M9
   Decision making, rewards, type of work,
   communication, and interpersonal relationships
   in studying creativity in context of
   organizations in advanced modern social system
   AD-635261   N66-37074 02-M5
   Management barriers to delegate authority in
   formal organizations
   NASA-RP-13   N66-37529 02-M5
   Organization control systems for complex
   operations
   JPRS-38762   N67-12014 02-M4
   Group behavior, human engineering concepts, and
   general theory on organizational taxonomy
   AD-642496   N67-19717 02-M7

P

PERFORMANCE PREDICTION
    Laboratory management - Factors influencing
        technical performance
        AROD-0010-6   N62-16582 02-M5
    Qualitative and Quantitative Personnel
        Requirement Information /QQPRI/
        MRL-TDR-62-4   N63-13146 02-M4
    Project cost control system, defining roles and
        interrelationships of controller, line
        management and project management, at Raytheon
        Wayland Laboratory   A64-14705 02-M4
    Risk Appraisal of Programs System /RAPS/
        providing new basis for reliability assurance
        and management action
        AIAA PAPER 64-406   A64-19891 02-M1
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        /Critical Path Method/ as tools for scheduling
        design and development work of engineering
        personnel   A65-22760 02-M4
    Matrix type approach for planning and measuring
        technical progress, examining equipment maturity
        and test risks   A65-23612 02-M4
    Effectiveness of research and development
        procurement efforts in field of airborne
        targetry
        ATL-TR-64-70   N65-86414 02-M3
    System engineering methodologies to show how
        prediction of human error leads to higher system
        performance reliabilities   A66-10117 02-M5
    Additional follow-up criterion for validating
        predictor scores for measuring psychological
        characteristics of sample of Air Force
        scientists
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        numerical taxonomy method for evaluating and
        predicting equipment performance from
        environmental engineering data
        FA-R-1847   N67-33913 02-M4
    Organizational behavior and performance prediction
        in R and D management
        AD-641423   N67-81120 02-M3
PERSONNEL DEVELOPMENT
    Qualitative and Quantitative Personnel
        Requirement Information /QQPRI/
        MRL-TDR-62-4   N63-13146 02-M4
    Network flow model used to determine most economic
        pattern for personnel training and retraining
        activities   A64-14703 02-M4
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        automated training and decision making
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        familiarization, task analysis, and procedures
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PERSONNEL MANAGEMENT
    Qualitative and Quantitative Personnel
        Requirement Information /QQPRI/
        MRL-TDR-62-4   N63-13146 02-M4
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        activities   A64-14703 02-M4
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        inventory, maintenance, automatic reservation,

    etc   A65-16855 02-M4
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        selection and training techniques in military,
        industrial, and research facilities
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        and training, and methodology for military
        organizational staffing
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    Laboratory management - Factors influencing
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        engineers and other aspects of scientific
        personnel administration   N64-21601 02-M5
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        government   N64-83423 02-M5
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        in studying creativity in context of
        organizations in advanced modern social system
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        satisfaction
        SAM-TR-66-46   N66-39799 02-M5
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        Gemini spacecraft noting program organization,
        management techniques and personnel motivation
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        within large hardware systems business
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        electronic programs
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        scientists
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        engineers, and draftsmen
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PERSONNEL PROBLEMS
    Automatic data processing equipment capabilities
        and impact on management planning and personnel
        displacement
        RSIC-438   N66-16001 02-M7
    Analysis of Air Force personnel comments to
        determine factors in job satisfaction
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detailing objectives of Project Definition
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Discussion of advantages of program evaluation
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detailing objectives of Project Definition
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stressing role of scientist
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detailing objectives of Project Definition
Phase /PDP/
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management
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provides Government with yardstick of measuring
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environment   A65-25151 02-M4
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manager   A67-29668 02-M1
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PERT in Dyna-Soar - Project management
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programs   A63-16589 02-M1
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to Redstone, Jupiter IRBM, Explorer and
Juno series, Pershing and Saturn
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interrelationships of controller, line
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management methods
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management techniques and personnel motivation
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manager   A67-29668 02-M1
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integrated information systems
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PROJECT PLANNING
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planning problems, treating project schedules as
directed acyclic network   A64-11217 02-M4

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Factors in shaping policy for aerospace activity,
stressing role of scientist
                                       A66-18551 02-M7
Project initiation emphasing market, product
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market product   A67-29667 02-M7

R

R AND D MANAGEMENT
Problems encountered in the management of Defense
Research and Development   A63-16584 02-M3
Problems of managing an independent laboratory
                                       A63-18271 02-M3
Congressional Hearings on systems development and
management   N63-11213 02-M1
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management   N63-11214 02-M1
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management   N63-11215 02-M1
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management   N63-11216 02-M1
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management   N63-11217 02-M1
Program control techniques to assist management
planning, scheduling, performance analysis and
cost control   A64-21607 02-M1
PERT provides faster information flow, appraisal
of progress and management control
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technicians, maintenance and equipment
                                       A64-23238 02-M3
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engineers and other aspects of scientific
personnel administration   N64-21601 02-M5
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resource allocation in research and development
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research tasks relative to costs and scheduled
objectives
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organization and management with discussion of
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aided management system for budget and schedule
control of complex programs R and D
                                       A65-24155 02-M3
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computerized planning program, utilizing
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affect innovation and invention policies of
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contracts   A63-18030 02-M2
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NSF-66-21   N66-87784 02-M9
Mathematical modeling technique for information
systems management
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management and organizational planning, and
optimal parameter for evaluating research
efforts
JPRS-41188   N67-85937 01-M8

RESEARCH ENVIRONMENT
Decision making, rewards, type of work,
communication, and interpersonal relationships
in studying creativity in context of
organizations in advanced modern social system
AD-635261   N66-37074 02-M5
Taxation, finance, and competition factors that
affect innovation and invention policies of
government and industry   N67-85833 02-M9

RESEARCH MANAGEMENT
Scoring and profitability mathematical models for

S

STATISTICAL ANALYSIS
    Monte Carlo method for program evaluation - PERT
      project
      RM-3367-PR   N63-15702 02-M4
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      decision of firms   A64-23346 02-M3
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      quantity of units manufactured doubles, hours
      per unit /reflecting cost/ decline at some
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      Processing /EDP/ and other systems for planning,
      inventory, maintenance, automatic reservation,
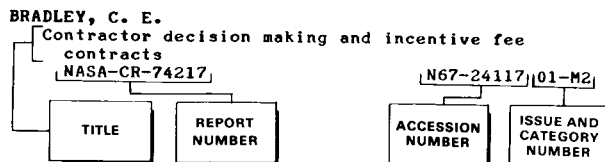   etc   A65-16855 02-M4
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      project
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      categories in program management
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      for system design   A65-10517 02-M4
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      analysis, interface, change control,
      progress charts, and scheduling
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    AIAA PAPER 67-843   A67-42981 02-M1
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      issuance of new instruction manuals and in
      revision of system specifications
                                     A66-10074 02-M1
    Group dynamics approach to resistance or
      counterpart of planning, conversion and
      management of automatic data processing systems
      design
      ASME PAPER 66-WA/MBT-10   A67-15334 02-M5
    Systems approach as systematic investigation of
      research, engineering and management activities
      for technological or sociological gain
                                     A67-27513 02-M7
    Advanced space vehicle planning analyzed from
      economic approach to decision making, noting
      cost decrease with time   A67-29833 02-M1
    Economic, management, and retrieval aspects of
      information systems
      AFOSR-67-1998   N67-39410 02-M1
    Systems analysis and design of information systems
      SP-2655   N67-83219 02-M1
    Management information systems design and
      implementation
      AD-646851   N67-83225 02-M1
SYSTEMS EFFECTIVENESS
    Evaluation and future of cost effectiveness
      management   A66-10052 02-M1
    System engineering methodologies to show how
      prediction of human error leads to higher system
      performance reliabilities   A66-10117 02-M5
    Rationale for systems effectiveness in Air Force
      Systems Command   A66-23435 02-M1
    Methodology of systems effectiveness based on
      reliability, maintainability, value, safety and
      human engineering disciplines
                                     A66-23436 02-M1
    Systems effectiveness through design function
      management, noting necessity of decision guide
      activities   A66-23441 02-M1
    Human factors and system effectiveness, noting
      role of customer project officer, contractor
      engineering manager and human factor specialist
                                     A66-23445 02-M1
    System effectiveness in manned space program
      through correct management decisions
                                     A66-37974 02-M1
    Administrative considerations in systems
      effectiveness programs
      SAE PAPER 660731   A67-10631 02-M1
    Experiment selection process for specific flights
      in Apollo Applications Program /AAP/, using
      algorithms
      AAS PAPER 66-142   A67-20967 02-M1
    Management control system for technical,
      production, financial and contractual management
      of large scale or technical industry programs
      AAS PAPER 67-153   A67-29969 02-M1
SYSTEMS ENGINEERING
    Book on the methodology of systems engineering,
      including problems of definition, goal setting,
      synthesis, analysis and choosing
                                     A63-13246 02-M1
    Text on correlation requirements for technical
      data for systems engineering and support
                                     A65-19756 02-M1

NASA and Defense Department space program
organization and management with discussion of
systems concepts   A65-21357 02-M1
Systems engineering definition, structure and
functions   A65-25155 02-M1
Software configuration management by engineering
methods, considering application to Automatic
Support Equipment /ASE/ for Saturn S-IVB
stage   A67-14221 02-M1
Interface management of aerospace systems noting
associated disciplines, documentation,
contractor interrelationships and procuring
agencies
AAS PAPER 66-159   A67-20976 02-M1
A FSCM 375-5 as methodology for system
engineering, discussing management,
documentation, applications, development
operation, design, etc   A67-33494 02-M1
Control engineering in systems management applied
to missile control and guidance
                                    A67-33636 02-M1

SYSTEMS MANAGEMENT
Major concepts involved in engineering and
management of man-made systems and man-machine
systems   A63-16893 02-M1
Congressional Hearings on systems development and
management   N63-11213 02-M1
Congressional Hearings on systems development and
management   N63-11214 02-M1
Congressional Hearings on systems development and
management   N63-11215 02-M1
Congressional Hearings on systems development and
management   N63-11216 02-M1
Congressional Hearings on systems development and
management   N63-11217 02-M1
Management techniques applicable to systems tests
programs, specifically Airborne Long Range
Input /ALRI/ test program
                                    A64-16870 02-M4
Project definition effect on aerospace system
management
AIAA PAPER 64-405   A64-20063 02-M1
Program control techniques to assist management
planning, scheduling, performance analysis and
cost control   A64-21607 02-M1
Advantages of preplanned management of ICBM
system or space system   A64-22617 02-M1
Program control oriented to systems management
                                    A64-23348 02-M1
PERT application to management of Air Force
C-141A Starlifter Program
                                    A65-13346 02-M4
Text on correlation requirements for technical
data for systems engineering and support
                                    A65-19756 02-M1
NASA and Defense Department space program
organization and management with discussion of
systems concepts   A65-21357 02-M1
Program Evaluation Review Technique /PERT/
developed for X-20 program
                                    A65-24537 02-M4
Integration of management techniques - systems
analysis, interface, change control,
progress charts, and scheduling
                                    N65-23971 02-M4
Air Force system safety management progress in
issuance of new instruction manuals and in
revision of system specifications
                                    A66-10074 02-M1
Safety and management in aerospace industry,
noting importance of military specification
                                    A66-10075 02-M1
Rationale for systems effectiveness in Air Force
Systems Command   A66-23435 02-M1
Methodology of systems effectiveness based on
reliability, maintainability, value, safety and
human engineering disciplines
                                    A66-23436 02-M1
Systems effectiveness through design function
management, noting necessity of decision guide
activities   A66-23441 02-M1
Data processing approach for management control of
aircraft manufacture
SAE PAPER 660205   A66-26391 02-M1
General purpose approach to real time direct
access management information systems - AESOP
MTP-33   N66-36541 02-M1
Administrative considerations in systems
effectiveness programs

SAE PAPER 660731   A67-10631 02-M1
Interface management of aerospace systems noting
associated disciplines, documentation,
contractor interrelationships and procuring
agencies
AAS PAPER 66-159   A67-20976 02-M1
Management of aerospace programs - AAS
Conference, University of Missouri, November
1966   A67-27545 02-M1
A FSCM 375-5 as methodology for system
engineering, discussing management,
documentation, applications, development
operation, design, etc   A67-33494 02-M1
Hybrid simulators used for aerospace and military
programs consisting of analog computers, digital
computers and interface units for handling data
flow   A67-33635 02-M4
Existing system management techniques adapted to
computer programs for system compatibility,
design integrity, and technical control
ESD-TR-67-205   N67-28911 02-M1
Economic, management, and retrieval aspects of
information systems
AFOSR-67-1998   N67-39410 02-M1

T

TECHNICAL MANAGEMENT
Discussion of a management program for evaluation
of aerospace systems design - Orbiting
Geophysical Observatory /OGO/ is used as an
example   A63-13537 02-M1
Complexity of modern technology, the confusion
resulting from its rapid growth and the planning
necessary for our welfare   A63-16580 02-M7
Air Force maintenance technical data system
AMRL-TDR-62-85   N63-10094 02-M1
Relationship between basic skills of economists
and behavioral scientists in regard to
management decisions
SAE PAPER 926B   A65-12839 02-M1
Developing, controlling and packaging approach to
critical element of software schematic noting
mechanical, electrical and hydraulic functions
                                    A66-13798 02-M1
Selection, flow and transference of technology in
large electronics aerospace firm, noting
methodology, planning, market area selection,
etc   A66-30400 02-M1
Planning and decision-making system in
technological evolution and revolution
                                    A67-27506 02-M9
Management aspects of technological capability
within large hardware systems business
                                    A67-28697 02-M1
Management control system for technical,
production, financial and contractual management
of large scale or technical industry programs
AAS PAPER 67-153   A67-29969 02-M1
Role in management of specification trees
portraying interrelationship of requirement
documents, specifications and standards
applicable to particular program
                                    A67-34671 02-M4

V

VALUE ENGINEERING
Value engineering covering organization, scope,
implementation and application
                                    A64-19725 02-M1
Performance measurement of value engineering
groups   A64-19728 02-M1
Value engineering efforts assessed, detailing
organization, rating system and report content
                                    A64-19729 02-M1
Project Definition Phase /PDP/ method of
contracting, noting system trade-offs among
cost, performance and schedules
                                    A64-19731 02-M2
Developments affecting aerospace management,
detailing objectives of Project Definition
Phase /PDP/
AIAA PAPER 64-516   A64-19984 02-M7
Relative cost handbook for making cost comparisons
for design alternatives which provide equivalent
functions
ASTME PAPER 666   A65-19582 02-M4
Value control and cost effectiveness for

design   A65-23604 02-M1
Engineering symposium on advancement in state-of-
  the-art - Cost estimate, economics and
  applications
  AD-616516   N65-32701 02-M1
Value analysis as cost reduction factor, using
  production of Bullpup A and B missiles as
  example   A66-23060 02-M4
Value engineering and configuration management in
  management network for system compatibility and
  mission success at lowest cost
                                   A66-28436 02-M1
Practical cost reduction possibilities within
  aerospace industry   A66-33947 02-M4
General purpose approach to real time direct
  access management information systems - AESOP
  MTP-33   N66-36541 02-M1
Improvements in management control of complex
  projects, considering network analysis
                                   A67-24656 02-M1

MANAGEMENT / a continuing literature survey

Typical Personal Author Index Listing

BRADLEY, C. E.
Contractor decision making and incentive fee contracts
NASA-CR-74217
N67-24117 01-M2

TITLE	REPORT NUMBER	ACCESSION NUMBER	ISSUE AND CATEGORY NUMBER

The accession number is located beneath and to the right of the title, e.g., N67-12345. Under any one author's name, the accession numbers are arranged in sequence.

A

ALLEN, R. H.
A study of the Air Force maintenance technical data system   Final report
AMRL-TDR-62-85   N63-10094 02-M1
ALLEN, T. J.
Research program on the management of science and technology. The allocation among three technical information channels by R and D engineers
REPT.-131-65   N66-13617 02-M3
ANDRIANOV, D. P.
Management, planning and economics of aircraft production
FTD-TT-63-1121/1+2   N65-82345 02-M9
ANDRIEN, M. P., JR.
Research program on the management of science and technology. The allocation among three technical information channels by R and D engineers
REPT.-131-65   N66-13617 02-M3
ARCHIBALD, R. D.
Problems and pitfalls in implementing management information systems.
ASME PAPER 64-WA/MGT-1   A65-13154 02-M1
ASHCRAFT, W. D.
Scope - Management visibility and control system.   A65-24155 02-M3

B

BADIN, J., JR.
Group forces - Resistance or counterpart to ADP systems design.
ASME PAPER 66-WA/MBT-10   A67-15334 02-M5
BAGOT, W. C.
Introduction to Project Logic Planning
UCRL-10491   N63-11798 02-M1
BAILEY, J. A.
Spares management in the USAF.
                                    A64-22639 02-M1
BARBER, D. F.
Good management insures progress.
                                    A64-18117 02-M1
BASS, B. M.
The interface between personnel and organizational psychology
TR-13   N67-84525 02-M5
BECKWITH, G. S.
Use of Air Force ADP experience to assist Air Force ADP management, phase II.
Volume I - Summary, conclusions, and

recommendations   Final report, 16 Feb. - 15 Dec. 1966
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Use of Air Force ADP experience to assist Air Force ADP management, volume II.
Phase II - Activities Final report, 16 Feb. - 15 Dec. 1966
PRC-R-932, VOL. II   N67-25119 02-M1
BEESON, H. C.
Factors affecting the morale and productivity of engineering personnel
Y-1575   N67-85689 02-M5
BELL, C. F.
Space logistics - Technology versus management
P-2613   N65-80491 02-M7
BENNETT, E. M.
AESOP - A general purpose approach to real-time, direct access management information systems
MTP-33   N66-36541 02-M1
BENNETT, J. J.
The defense industry - Management challenge of the seventies.
ASME PAPER 66-WA/MGT-16   A67-15335 02-M2
BENNETT, W. G.
Configuration management operating procedures
PUBL-2758   N66-87320 02-M1
BENSON, F. S., JR.
Project management within the Army Materiel Command.   A63-16588 02-M1
BERNHARD, R. D.
Providing timely production data.
                                    A64-16049 02-M1
BERNSTEIN, S.
The impact of project definition on aerospace system management.
AIAA PAPER 64-405   A64-20063 02-M1
BLACK, R. P.
Transferability of research and development skills in the aerospace industry Final report
R12860   N66-22445 02-M9
BLACKWELL, B. D.
Development management and cost control.
                                    A66-17487 02-M1
The initiation of projects.   A67-29667 02-M7
BLOOM, W.
Managing a development program
                                    N67-82721 02-M1
BODIN, L. D.
A note on divisible activities in critical path analysis   N67-38062 02-M4
BORKO, H.
The analysis and design of information systems
SP-2655   N67-83219 02-M1
BOYD, J. H., JR.
An application of critical path scheduling to design engineering /sans computer/
Y-1480   N65-23854 02-M4
BRIZENDINE, J. C.
Program management under fixed price contracts.
SAE PAPER 926C   A65-12837 02-M2
BROADSTON, J. A.
Success strategy for technically oriented management.
SAE PAPER 926B   A65-12839 02-M1
BROWN, H.
Management of Defense Research and Development.   A63-16584 02-M3
BUCK, G. T.
Evaluating R and D effectiveness.
                                    A66-26033 02-M3

HAMILTON, J. E.
Experience in data collection. 1 -
Administration and organization for data
collection
AD-242853   N63-81003 02-M1
HANCEY, C.
Safety education and the management process.
A66-10073 02-M1
HANCOCK, J. K.
Apollo Applications Program - Experiment
selection process.
AAS PAPER 66-142   A67-20967 02-M1
HANNAN, R. E.
PERT - The development of experimental
programs for automated training in decision
making
ESD-TDR-63-608   N64-12319 02-M4
HANSSMANN, F.
Operations research in production and
inventory control.   A63-13078 02-M1
HARRIS, D. H.
The impact of microelectronics on the
utilization and training of maintenance
personnel.   A67-34342 02-M5
HARTMAN, B. O.
Factors in job-satisfaction - Analysis of
spontaneous comments
SAM-TR-66-57   N66-39790 02-M5
Factors in job-satisfaction
SAM-TR-66-46   N66-39799 02-M5
HATRY, H. P.
Cost-benefit analysis as an aid to system
selection
SP-201   N63-12833 02-M1
HAYTHORN, W. W.
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sciences. Session 7 - Information system
simulation and modelling techniques
MITRE-SS-7   N64-82043 02-M4
HEADLEY, H. R.
Strategic versus tactical planning in modern
business.   A67-14498 02-M4
HEBELER, H. K.
The integration tools of system management
N65-23971 02-M4
HEINZE, K.
Management of computer programming for
command and control systems
SDC-TM-903/00/02   N65-82741 02-M4
HENNESY, H. D.
Contract proposals - A selected bibliography,
1961-1963
LS-BIB-63-6   N64-15674 02-M9
HERD, G. R.
Cost effectiveness.   A66-23439 02-M4
HERNER, S.
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plain English
AFOSR-67-1998   N67-39410 02-M1
HEROLD, A.
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planning in aircraft production /Systematik
zur Anwendung der Netzwerkplanung im
Flugzeugbau/.   A65-20691 02-M4
HILLIER, F. S.
Economic models for industrial waiting line
problems
TR-62   N62-17220 02-M4
HIRSCH, S. R.
Functional flow diagrams - A new tool for
engineering management.   A65-23611 02-M4
HISLOP, S. L.
The economic considerations of space
operations.   A67-35648 02-M8
HOCHWALD, W.
Scope - Management visibility and control
system.   A65-24155 02-M3
HODGES, J. W.
Factors affecting the morale and
productivity of engineering personnel
Y-1575   N67-85689 02-M5
HOUSER, E. A., JR.
Critical path scheduling - A preliminary
literature search
TID-3568/REV. 1/   N62-16407 02-M9
HUDOCK, P. F.
A systems analysis approach to commuter airline
planning.
AIAA PAPER 67-843   A67-42981 02-M1

HUDOCK, R. P.
A systems analysis approach to commuter airline
planning.
AIAA PAPER 67-843   A67-42981 02-M1

I

INTRILIGATOR, M. D.
Some aspects of the allocation of scientific
effort between teaching and research
RM-4339-PR   N66-30520 02-M9
IRESON, W. G.
Quality cost analysis implementation handbook
AD-631090   N66-87127 02-M9
ISAYEV, E. A.
Administrative efficiency and computers
JPRS-39895   N67-21172 02-M9

J

JACKSON, R. R. P.
Operational research and aviation management.
I - An introduction to operational research.
A65-33159 02-M1
JACOBS, R. M.
The impact of contract incentives on aerospace
programs.
AIAA PAPER 64-409   A64-19982 02-M2
JAGANNATHAN, R.
On the application of the theory of maximum
principle to a production control problem
RR-108   N67-40062 02-M1
JANSSEN, O. F., JR.
A review of progress in the areas of
aeronautical and aerospace spares management.
A64-22640 02-M1
JOHNSON, B. M.
Optimal linear inventory control and first
order exponential smoothing
P-3264-1   N67-10583 02-M1
JOHNSON, E. J.
PERT/PMD project monitoring device.
A65-11942 02-M4
JOHNSON, R. L.
Recent developments affecting aerospace
management.
AIAA PAPER 64-516   A64-19984 02-M7
JOHNSON, W. L.
The management of aerospace programs.
A67-35879 02-M1
JONES, M. V.
Estimating methods and data sources used in
costing military systems
TM-04263   N66-20839 02-M4

K

KADET, J.
PERT for the engineer.   A65-10915 02-M4
KADLEC, V.
Cybernetics and economic management
JPRS-26773   N64-32816 02-M9
KAPRIELYAN, S. P.
NASA management at the crossroads.
A66-41047 02-M7
KARTH, J. E.
Planning the technological /R/ evolution.
A67-27506 02-M9
KAST, F. E.
Science, technology, and management - An
overview.   A63-16581 02-M7
Organization and management of space programs.
A65-21357 02-M1
KAUFMANN, A. F.
Need and criteria for measuring effectiveness
of value engineering.   A64-19728 02-M1
KEELER, H. B.
Freedom and control - The dilemma of
creativity in the organizational environment
AD-635261   N66-37074 02-M5
KENNEALLY, W. J.
The role of large-scale simulation in the
program definition phase environment - An
example.   A65-25151 02-M4
KIENE, R. C.
Command and control systems analysis Final
report
R-RD-1539-TR1   N63-17425 02-M1

KIRBY, M. J. L.
Application of chance-constrained programming
to solution of the so-called **savings and loan
association** type of problem
RAC-P-12   N66-20637 02-M4
KLAMKA, N.
Control - A systems management problem
/Regelung - Ein Systemfuehrungsproblem/.
                                A67-33636 02-M1
KLEIN, M.
Inventory depletion management
TR-2   N65-88394 02-M1
KLEY, R. R.
An analytical concept for the selection, flow,
and transference of technology in a large
electronics/aerospace firm.
                                A66-30400 02-M1
KLICK, A. F.
Cost analysis for large scale development/
production programs.
AAS PAPER 66-148   A67-20968 02-M1
KOTTLER, J. L.
The learning curve - A case history in its
application.   A64-25355 02-M1
KOZMETSKY, G.
A multiple-objective chance-constrained
approach to cost effectiveness.
                                A65-24154 02-M4
Management of space enterprises.
AAS PAPER 67-153   A67-29969 02-M1
KREAMER, W. K.
A signal corps concept for multi-project
management
AD-276938   N64-84874 02-M4
KRIEBEL, C. H.
A resume of mathematical research on
information systems
AD-616113   N66-80867 02-M9

L

LA BOLLE, V.
Management of computer programming for
command and control systems
SDC-TM-903/00/02   N65-82741 02-M4
Development of equation for estimating
the costs of computer program production
TM-2918/000/00   N66-39602 02-M4
LA MASTER, C. H.
Critical-path method for scheduling the
transuranium processing plant - An appraisal
ORNL-3925   N67-21816 02-M4
LAINE, M. J.
Configuration management.   A67-14424 02-M1
LANDI, D. M.
Optimal linear inventory control and first
order exponential smoothing
P-3264-1   N67-10583 02-M1
LANG, D. W.
The Government*s attitude toward profit.
                                A65-10717 02-M9
LERBINGER, O.
The engineer today - The supply, his
development, needs, status and treatment
                                N64-83423 02-M5
LESHNER, E.
Value control for system design.
                                A65-23604 02-M1
LEWIS, D. A.
Inception, design and implementation of a
management information system
AD-646851   N67-83225 02-M1
LIEBERMAN, G. J.
Some further results on inventory depletion
management
TR-3   N65-88396 02-M1
LIFSEY, J. A.
Management techniques applicable to systems
test programs.   A64-16870 02-M4
LONGTON, P. A.
Operational research and aviation management.
I - An introduction to operational research.
                                A65-33159 02-M1
Operational research and aviation management.
II - Procurement and capital investment
programmes.   A66-10341 02-M1
LOSEE, J. E.
A study of the Air Force maintenance
technical data system Final report

AMRL-TDR-62-85   N63-10094 02-M1
LUDWIG, F. J.
Systems philosophy.   A63-16893 02-M1

M

MAC CRIMMON, K. R.
An analytical study of the PERT assumptions.
                                A64-15227 02-M4
MACHOL, R. E.
Methodology of system engineering.
                                A65-25155 02-M1
MAGNUSON, W. G.
Planning for technology.   A63-16580 02-M7
MALASKY, S.
Bringing an established program up-to-date.
                                A64-19725 02-M1
MARKOWITZ, H. M.
A brief review of Simscript as a simulating
technique
RM-3778-PR   N63-19347 02-M4
MARKS, M. R.
Development of qualitative and quantitative
personnel requirements information Final
report
MRL-TDR-62-4   N63-13146 02-M4
MARSH, F. E., JR.
Critical path scheduling - A preliminary
literature search
TID-3568/REV. 1/   N62-16407 02-M9
MAXWELL, F. W.
Computer aids to engineering management and
design - A manager*s view.
AIAA PAPER 67-920   A67-43019 02-M4
MAYER, I.
Program management with configuration control.
                                A63-23260 02-M1
MC CONNELL, L. F.
Classification management at System
Development Corporation
SP-2388   N67-84744 02-M1
MC NAIR, R. J.
Independent research management.
                                A66-35534 02-M3
MC NEIL, J. F.
Program control systems.   A64-21607 02-M1
Program control systems.   A64-23348 02-M1
MEDARIS, J. B.
The anatomy of program management.
                                A63-16590 02-M1
METZ, W. W.
A study of R and D effectiveness of a small
USAF organization employing time, cost, and
performance factors of contracted effort
ATL-TR-64-70   N65-86414 02-M3
MEYER, J. B.
Planning and measuring technical progress.
                                A65-23612 02-M4
MILLER, B. U.
Scope - Management visibility and control
system.   A65-24155 02-M3
MILLER, C. O.
The dynamics of accident prevention
information.   A67-32218 02-M9
MITCHELL, G.
A generalized system for project control and
evaluation.   A66-41777 02-M1
MITCHELL, J. P.
Current financial considerations in airline
aircraft acquisitions.
SAE PAPER 650244   A65-27269 02-M8
MITCHELL, W. E.
A systems approach to computer programs
ESD-TR-67-205   N67-28911 02-M1
MOLIERI, J. T.
Management control and monitoring
techniques.   A63-23238 02-M4
MOORE, C. B.
Use of operations research in the effective
planning of space missions and space programs
MR-0-120   N67-85872 02-M1
MORGAN, C. J.
Operational employment criteria /a space age
management tool/.   A64-22617 02-M1
MORGAN, D. E.
Quality cost analysis implementation handbook
AD-631090   N66-87127 02-M9
MOYNIHAN, W. R.
New complexities in R and D procurement.

ROBINSON, S.
    Value engineering in program contracts.
                           A64-19731 02-M2
    Total value concepts in the contract definition
      phase.   A66-34251 02-M2
ROBY, T. B.
    Computer simulation models for organization
      theory
      TR-8   N65-23091 02-M4
ROCK, V. P.
    A trillion dollar market.
      AIAA PAPER 66-274   A66-24747 02-M9
ROME, B. K.
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      TM-1128/100/00   N67-15410 02-M4
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ROOS, D.
    An integrated computer system for engineering
      problem solving.   A66-23833 02-M4
ROSENBLOOM, R. S.
    Notes on the development of network models for
      resource allocation in R and D projects.
                            A65-11940 02-M4
ROSENZWEIG, J. E.
    Science, technology, and management - An
      overview.   A63-16581 02-M7
    Organization and management of space programs.
                            A65-21357 02-M1
ROSING, S. L.
    Analysis and comparison of spacecraft resources
      forecasting techniques for unmanned missions.
      AIAA PAPER 67-809   A67-42966 02-M4
ROUSSEAU, P.
    A new management tool - The operational
      simulator un nouvel appareil de gestion - le
      simulateur operationnel.   A64-26705 02-M4
ROWLEY, D.
    Improvements in management control of complex
      projects.   A67-24656 02-M1
RYAVEC, C. A.
    An analytical study of the PERT assumptions.
                            A64-15227 02-M4
RYLE, B. L.
    An engineering approach to software
      configuration management. A67-14221 02-M1

S

SADOW, R. M.
    PERT in the Dyna-Soar.   A63-10806 02-M4
    How PERT was used in managing the X-20 /Dyna-
      Soar/ program.   A65-24537 02-M4
    PERT in Dyna-Soar
      IAS PAPER NO. 62-160 N62-13353 02-M4
SCHAIDT, L.
    Program management techniques at Martin
      Orlando.   A64-14704 02-M1
SCHMID, E.
    PERT - A planning method /PERT - Ein
      Planungsverfahren/.   A67-33634 02-M4
SCHMISSRAUTER, J. M.
    Interface management of aerospace systems.
      AAS PAPER 66-159   A67-20976 02-M1
SCHNEIDER, R. L.
    Organization and management of a standards
      and calibration program for a research and
      development laboratory
      SC-DC-66-1491   N66-32852 02-M3
SCHOMBURG, A.
    Formation and management of Department of
      Army programs.   A63-16589 02-M1
SCHREIDER, IU. A.
    The Monte Carlo method - The method of
      statistical trials.   A67-14256 02-M4
SCHUSSEL, G.
    Characteristics and problems of aerospace
      company management.   A67-25742 02-M7
SELLS, S. B.
    Military small group performance under
      isolation and stress. 4 - Organizational
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      AAL-TR-61-62   N66-82368 02-M9
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      AAL-TR-61-23   N66-82369 02-M9
    Military small group performance under
      isolation and stress. 5 - Psychological
      principals of management and leadership
      Critical review
      AAL-TDR-62-35   N66-82383 02-M5
    General theoretical problems related to
      organizational taxonomy - A model solution
      and its assumptions
      AD-642496   N67-19717 02-M7
SENECAL, T. L.
    PERT in the Dyna-Soar.   A63-10806 02-M4
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SHADLEY, F. C.
    Independent research management.
                            A66-35534 02-M3
SHALLER, H. I.
    An exploratory study in research planning
      methodology
      ONR-ACR/NAR-27   N64-32217 02-M3
SHESHINSKI, E.
    The nonsubstitution and nonswitching theorems
      in a model with fixed capital
      TR-135   N66-15167 02-M4
SIMMONS, J. W.
    Combining R and D and follow-on
      production in a single contract
                         N66-36538 02-M2
SIMPSON, M. H.
    A numerical taxonomy method to evaluate and
      predict equipment performance and
      environmental engineering data
      FA-R-1847   N67-33913 02-M4
SIMS, L. S., JR.
    Factors in job-satisfaction - Analysis of
      spontaneous comments
      SAM-TR-66-57   N66-39790 02-M5
    Factors in job-satisfaction
      SAM-TR-66-46   N66-39799 02-M5
SMITH, B. L. R.
    Some aspects of the allocation of scientific
      effort between teaching and research
      RM-4339-PR   N66-30520 02-M9
SMITH, C. G.
    Organizational factors in scientific
      performance in an industrial research
      laboratory Final technical report
      AD-641423   N67-81120 02-M3
SMITH, H. J.
    A system for evaluating V. E. efforts.
                           A64-19729 02-M1
SMITH, R. T.
    Expediting design trade-offs by using relative
      cost.
      ASTME PAPER 666   A65-19582 02-M4
SMITH, W. L.
    Development of qualitative and quantitative
      personnel requirements information Final
      report
      MRL-TDR-62-4   N63-13146 02-M4
SNEDDON, G. T.
    Introduction to critical path planning
      AERE-M-1280   N65-23231 02-M4
SNYDER, F. T.
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      management of research and development
      projects
      ORNL-4112   N67-33183 02-M3
SNYDER, M. T.
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      personnel requirements information Final
      report
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SOBOL, I. M.
    The Monte Carlo method - The method of
      statistical trials.   A67-14256 02-M4
SOISTMAN, E. C.
    Research and development can be controlled.
      SAE PAPER 926A   A65-12838 02-M4
SPARKS, D. E.
    A methodology for the analysis of information
      systems Final report
      R-4003-1   N66-87830 02-M4
SPEVAK, E. C.
    Configuration management. A67-14424 02-M1

WILLIAMS, E. L.
    Project cost control at Raytheon*s Wayland
       Laboratory.   A64-14705 02-M4
WILLIAMS, P. M.
    An .evaluation of barriers to the delegation
      of authority in formal organizations
      NASA-RP-13   N66-37529 02-M5
WILSON, G. A.
    Project cost control at Raytheon*s Wayland
       Laboratory.   A64-14705 02-M4
WINLUND, E. S.
    Cost-effectiveness management.
                       A66-10052 02-M1
WINRICH, L. B.
    Command and control systems analysis Final
      report
      R-RD-1539-TR1   N63-17425 02-M1
WINTHROP, A. S.
    Implementation of a design review program.
                       A63-13537 02-M1
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      Air Force ADP management, phase II.
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      recommendations Final report, 16 Feb. -
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      recommendations Final report, 16 Feb. -
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      Air Force Adp management, volume III.
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      report, 16 Feb. - 15 Dec. 1966
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WULFSBERG, A. H.
    Observations on the management of space
      electronic programs
      YM-12981   A67-38215 02-M9

Y

YAGI, K.
    Results for an additional follow-up criterion
      on a sample of Air Force scientists
      AFOSR-67-0896   N67-29665 02-M5
YUEH, J. H.
    A model for determination of incentive fee.
                       A65-18723 02-M2

Z

ZAGORSKI, H. J.
    Research into the management of computer
      programming - A transitional analysis of cost
      estimation techniques
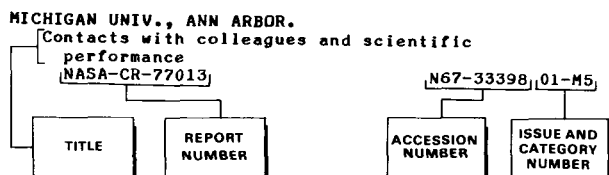   TM-2712/000/00   N66-29484 02-M4
ZIEKE, R. P.
    The progress function in the aerospace
      industry - A historical analysis.
                     A63-26012 02-M4

Corporate Source Index

MANAGEMENT / a continuing literature survey

MAY 1968

Typical Corporate Source Index Listing

MICHIGAN UNIV., ANN ARBOR.
Contacts with colleagues and scientific performance
NASA-CR-77013 | N67-33398 | 01-M5

| TITLE | REPORT NUMBER | ACCESSION NUMBER | ISSUE AND CATEGORY NUMBER |

The accession number is located beneath and to the right of the title, e.g., N67-12345. Under any one corporate source, the accession numbers are arranged in sequence.

A

AEROSPACE MEDICAL DIV. PERSONNEL RESEARCH
LAB. /6570TH/, LACKLAND AFB, TEX.
  Abstracts of personnel research reports.
    VI - 1954-1965
    PRL-TR-65-23   N66-38220 02-M5
AIR FORCE SYSTEMS COMMAND, ANDREWS AFB, MD.
  Management of contractor data reports,
    volume 1
    AFSCM-310-I   N66-87880 02-M2
AIR FORCE SYSTEMS COMMAND, EDWARDS AFB, CALIF.
  A study of R and D effectiveness of a small
    USAF organization employing time, cost, and
    performance factors of contracted effort
    ATL-TR-64-70   N65-86414 02-M3
AIR FORCE SYSTEMS COMMAND, WRIGHT-
PATTERSON AFB, OHIO.
  PERT in Dyna-Soar
    IAS PAPER NO. 62-160   N62-13353 02-M4
  Development of qualitative and quantitative
    personnel requirements information Final
    report
    MRL-TDR-62-4   N63-13146 02-M4
  Management, planning and economics of aircraft
    production
    FTD-TT-63-1121/1+2   N65-82345 02-M9
AMERICAN INST. OF AERONAUTICS AND
ASTRONAUTICS, NEW YORK.
  Risk Appraisal of Programs System /RAPS/
    AIAA PAPER 64-406   A64-19891 02-M1
  The impact of contract incentives on aerospace
    programs.
    AIAA PAPER 64-409   A64-19982 02-M2
  Recent developments affecting aerospace
    management.
    AIAA PAPER 64-516   A64-19984 02-M7
  Long range planning for a major component
    manufacturer.
    AIAA PAPER 64-404   A64-19985 02-M1
  The impact of project definition on aerospace
    system management.
    AIAA PAPER 64-405   A64-20063 02-M1
  PACC - A significant advance in management
    control.
    AIAA PAPER 64-411   A64-20262 02-M1
AMERICAN UNIV., WASHINGTON, D. C.
  Inception, design and implementation of a
    management information system
    AD-646851   N67-83225 02-M1
ANALYTIC SERVICES, INC., BAILEYS CROSSROADS,
VA.
  Transferability of research and development

skills in the aerospace industry Final
report
  R12860   N66-22445 02-M9
Industrial-location theory in the era of
super-cargo aircraft
  AD-655695   N67-37187 02-M9
APPLIED PHYSICS LAB., JOHNS HOPKINS UNIV.,
SILVER SPRING, MD.
  Schedule analysis procedure
    TG-397   N66-22554 02-M4
APPLIED SCIENCE ASSOCIATES, INC., VALENCIA,
PA.
  Guidelines for Training Situation Analysis
    /TSA/ Final report
    NAVTRADEVCEN-1218-4   N66-12122 02-M5
ARINC RESEARCH CORP., WASHINGTON, D. C.
  Special interim report on cost studies
    AD-261062   N66-82755 02-M1
ARMY ELECTRONICS LOGISTICS RESEARCH OFFICE,
PHILADELPHIA, PA.
  An extension of PERT to multi-project and
    functional management - PERT-C
    AD-417333   N66-80359 02-M4
ARMY MISSILE COMMAND, HUNTSVILLE, ALA.
  Value Engineering Symposium - Advancement in
    the state of the art
    AD-616516   N65-32701 02-M1
  The impact of ADP on the future managerial
    environment
    RSIC-438   N66-16001 02-M7
ARMY SIGNAL CORPS, PHILADELPHIA, PA.
  A signal corps concept for multi-project
    management
    AD-276938   N64-84874 02-M4
ATOMIC ENERGY COMMISSION, WASHINGTON,
D. C.
  Critical path scheduling - A preliminary
    literature search
    TID-3568/REV. 1/   N62-16407 02-M9
  Mathematical approaches to inventory
    management - A survey   N67-81516 02-M1

B

BOEING CO., SEATTLE, WASH.
  The integration tools of system management
                  N65-23971 02-M4
BROWN ENGINEERING CO., INC., HUNTSVILLE, ALA.
  The compatibility of value engineering and
    configuration management N66-35641 02-M4

C

CALIFORNIA UNIV., BERKELEY.
  On optimal development in a multi-sector
    economy
    ORC-66-11   N66-29268 02-M8
  A note on divisible activities in critical
    path analysis   N67-38062 02-M4
CALIFORNIA UNIV., BERKELEY. LAWRENCE
RADIATION LAB.
  Introduction to Project Logic Planning
    UCRL-10491   N63-11798 02-M1
CALIFORNIA UNIV., LOS ANGELES.
  An evaluation of barriers to the delegation
    of authority in formal organizations
    NASA-RP-13   N66-37529 02-M5
CARNEGIE INST. OF TECH., PITTSBURGH, PA.
  A resume of mathematical research on
    information systems
    AD-616113   N66-80867 02-M9
  Economic programming and the Von Neumann
    model - Some planning techniques
    REPT.-78   N67-20591 02-M8
  On the application of the theory of maximum
    principle to a production control problem

RR-108   N67-40062 02-M1
CASE INST. OF TECH., CLEVELAND, OHIO.
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      comparative study in a research and
      development organization
    AD-645016   N67-82994 02-M5
COLUMBIA UNIV., NEW YORK.
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      TR-2   N65-88394 02-M1
    Some further results on inventory depletion
      management
      TR-3   N65-88396 02-M1
COMMERCE DEPT., WASHINGTON, D. C.
    Technological innovation - Its environment
      and management   N67-85833 02-M9
COMMITTEE ON POST OFFICE AND CIVIL SERVICE
/U. S. HOUSE/.
    Improved manpower management in the Federal
      government. Examples for the period Jan. -
      Jun. 1966   N66-87919 02-M1
CONGRESS. HOUSE. COMMITTEE ON GOVERNMENT
OPERATIONS.
    Systems development and management. Part 1 -
      Hearings before a Subcommittee of the
      Committee on Government Operations, U.S.
      House of Representatives, June 21, 22, 27,
      29, and August 15, 1962   N63-11213 02-M1
    Systems development and management. Part 2 -
      Hearings before a Subcommittee of the
      Committee on Government Operations, U.S.
      House of Representatives, 23-27 July 1962
                                N63-11214 02-M1
    Systems development and management. Part 3 -
      Hearings before a Subcommittee of the
      Committee on Government Operations, U.S.
      House of Representatives, August 1, 2, 3,
      6, 7, 9, 10, and 13, 1962 N63-11215 02-M1
    Systems development and management. Part 4 -
      Hearings before a Subcommittee of the
      Committee on Government Operations, U.S.
      House of Representatives, 13-16 and 20-21
      August 1962   N63-11216 02-M1
    Systems development and management. Part 5,
      Hearings before a Subcommittee of the
      Committee on Government Operations, U.S.
      House of Representatives, 28-31 August 1962
                                N63-11217 02-M1
    Better management of research equipment
      procurement and utilization in Federal
      laboratories   N67-40547 02-M2

D

DAVID TAYLOR MODEL BASIN, WASHINGTON, D. C.
    MODERN MISER - A critical path and resource
      allocation method for the UNIVAC LARC
      DTMB-1796   N66-17591 02-M4
DEUTSCHE FORSCHUNGSANSTALT FUR LUFT- UND
RAUMFAHRT, BRUNSWICK /WEST GERMANY/.
    Network planning technique. A survey on
      the methods of CPM and PERT
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      DLR-MITT.-66-12   N67-13766 02-M4

E

ELECTRONIC SYSTEMS DIV., BEDFORD, MASS.
    A systems approach to computer programs
      ESD-TR-67-205   N67-28911 02-M1

F

FEDERAL COUNCIL FOR SCIENCE AND TECHNOLOGY,
WASHINGTON, D. C.
    Current problems in the management of
      scientific personnel   N64-21601 02-M5
FRANKFORD ARSENAL, PHILADELPHIA, PA.
    A numerical taxonomy method to evaluate and
      predict equipment performance and
      environmental engineering data
      FA-R-1847   N67-33913 02-M4

G

GENERAL DYNAMICS/FORT WORTH, TEX.
    Use of operations research in the effective
      planning of space missions and space programs
      MR-0-120   N67-85872 02-M1

GENERAL ELECTRIC CO., SCHENECTADY, N. Y.
    Cost-benefit analysis as an aid to system
      selection
      SP-201   N63-12833 02-M1
GENERAL PRECISION, INC., LITTLE FALLS, N. J.
    Managing a development program
                               N67-82721 02-M1
GEORGE WASHINGTON UNIV., WASHINGTON, D. C.
    Experience in data collection. 1 -
      Administration and organization for data
      collection
      AD-242853   N63-81003 02-M1

H

HERNER AND CO., WASHINGTON, D. C.
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      1961-1963
      LS-BIB-63-6   N64-15674 02-M9

I

INFORMATION DYNAMICS CORP., WAKEFIELD, MASS.
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      systems Final report
      R-4003-1   N66-87830 02-M4
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BETHESDA, MD.
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      selling research and development
                               N66-36539 02-M3

J

JOINT PUBLICATIONS RESEARCH SERVICE,
WASHINGTON, D. C.
    Cybernetics and economic management
      JPRS-26773   N64-32816 02-M9
    Problems of the mechanization of management
      work   N65-30279 02-M9
    Mathematical formulation of a simplified
      model of production planning
      JPRS-33613   N66-15196 02-M4
    Automatic operational management of processes
      of production   N66-24515 02-M1
    Application of organization control systems
      JPRS-38762   N67-12014 02-M4
    Administrative efficiency and computers
      JPRS-39895   N67-21172 02-M9
    Discussion of the economics of scientific
      research - USSR
      JPRS-41188   N67-85937 01-M8

L

LITTON SYSTEMS, INC., WOODLAND HILLS, CALIF.
    Configuration management operating procedures
      PUBL-2758   N66-87320 02-M1
LOCKHEED MISSILES AND SPACE CO., SUNNYVALE,
CALIF.
    Long-range planning and technological
      forecasting - An annotated bibliography
      SRB-63-12   N64-22200 02-M9
    Creativity, innovation, and invention - An
      annotated bibliography   N64-28451 02-M9
    Long-range planning and technological
      forecasting - An annotated bibliography,
      supplement 1
      LMSC-5-10-65-3   N65-19831 02-M9
LOGISTICS MANAGEMENT INST., WASHINGTON, D. C.
    Multi-year procurement at the subcontractor
      level
      AD-655815   N67-39769 02-M2
    Total package procurement concept, synthesis
      of findings
      AD-655814   N67-40140 02-M2

M

MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
    Freedom and control - The dilemma of
      creativity in the organizational environment
      AD-635261   N66-37074 02-M5
MATRIX CORP., ARLINGTON, VA.
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personnel requirements information Final
report
  MRL-TDR-62-4   N63-13146 02-M4
MELBOURNE UNIV., PARKVILLE /AUSTRALIA/.
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judgement
  TR-18   N67-36016 02-M5
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management, as related to performance
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  AROD-0010-6   N62-16582 02-M5
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report
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MITRE CORP., BEDFORD, MASS.
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  MITRE-SS-7   N64-82043 02-M4
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AESOP - A general purpose approach to
real-time, direct access management
information systems
  MTP-33   N66-36541 02-M1
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Research program on the management of science
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engineers
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scientific research - United States
                                      N64-27208 02-M3
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implications of science and technology, 1965
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NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
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                                      N67-80945 02-M4
NEW ENGLAND CONSULTANTS, INC., BOSTON, MASS.
The engineer today - The supply, his
development, needs, status and treatment
                                      N64-83423 02-M5
NORTHWESTERN TECHNOLOGICAL INST., EVANSTON,
ILL.
Management science and managing
  ONR RES. MEMO-53   N63-13737 02-M7
Data, modeling and decisions
  AD-620172   N66-10809 02-M4

O

OAK RIDGE NATIONAL LAB., TENN.
Critical-path method for scheduling the
transuranium processing plant - An appraisal
  ORNL-3925   N67-21816 02-M4
Critical path time-cost scheduling for
management of research and development
projects
  ORNL-4112   N67-33183 02-M3
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methodology
  ONR-ACR/NAR-27   N64-32217 02-M3
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and scheduling of a research project
                                      N66-80779 02-M4

P

PENNSYLVANIA UNIV., PHILADELPHIA.
Inventory control under stochastic lead time
and stochastic demand
  AD-620921   N66-11335 02-M4
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organizational psychology
  TR-13   N67-84525 02-M5

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Air Force ADP management, phase II.
Volume I - Summary, conclusions, and
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Air Force Adp management, volume III.
Phase III - Concept and plan Final
report, 16 Feb. - 15 Dec. 1966
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Phase II - Activities Final report,
16 Feb. - 15 Dec. 1966
  PRC-R-932, VOL. II   N67-25119 02-M1

R

RADIATION, INC., MELBOURNE, FLA.
Combining R and D and follow-on
production in a single contract
                                      N66-36538 02-M2
RAND CORP., SANTA MONICA, CALIF.
Uses of Monte Carlo in PERT
  RM-3367-PR   N63-15702 02-M4
Network-type management control systems
bibliography
  RM-3074-PR   N63-15733 02-M9
A brief review of Simscript as a simulating
technique
  RM-3778-PR   N63-19347 02-M4
The usefulness of aerospace management
techniques in other sectors of the economy
  P-2927   N64-28816 02-M8
Space logistics - Technology versus
management
  P-2613   N65-80491 02-M7
Research on social consequences of space
activities
  P-3220   N66-12088 02-M9
Some aspects of the allocation of scientific
effort between teaching and research
  RM-4339-PR   N66-30520 02-M9
Procedures for estimating the resource
requirements of manned space flights
  P-3382   N66-33837 02-M1
Optimal linear inventory control and first
order exponential smoothing
  P-3264-1   N67-10583 02-M1
RAYTHEON CO., WALTHAM, MASS.
PERT - The development of experimental
programs for automated training in decision
making
  ESD-TDR-63-608   N64-12319 02-M4
REPUBLIC AVIATION CORP., FARMINGDALE, N. Y.
A study of the Air Force maintenance
technical data system Final report
  AMRL-TDR-62-85   N63-10094 02-M1
RESEARCH ANALYSIS CORP., MCLEAN, VA.
Application of chance-constrained programming
to solution of the so-called **savings and loan
association** type of problem
  RAC-P-12   N66-20637 02-M4

S

SANDIA CORP., ALBUQUERQUE, N. MEX.
Organization and management of a standards
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