Resources for NASA Managers

by William M. Lawbaugh

What's New in the Library Collection

Following is a list of books and articles that have most recently been added to the PPM Library Collection. All of the materials may be borrowed through interlibrary loan from you Center Library *except* the Summer Study documentation. (The sheer volume of paper makes this study difficult to circulate.) Call 202/453-8740 or FTS 8-453-8740 for further information.

Project Management Summer 1991 Study documentation, which includes 10 volumes of information plus individual papers and earlier NASA management studies.

The Organizational Behavior Reader
Edited by David A Kolb, Irwin M. Rubin, and Joyce S. Oslond
5th ed. 1991. Call Number HF5548.8 .K552 1991.

Thinking About Management
by Theodore Levitt, 1991.
Call Number: HD31 .L3848 1991.

Quality Training: What Top Companies Have Learned
by Kathryn L. Try
The Conference Board Report Number 959, 1991. Call Number: HF5549.5 .T76 1991.

NASA, Maintaining the Program Balance, National Academy of Public Administration, 1991. Call Number: TL521.312 .N374

A Report by the Academy Panel examining the distribution of NASA science and engineering work between NASA and contractors and the effect on NASA's in-house technical capability.

Business Ethics: Ethical Decision Making and Cases
by O.C. Ferrell, 1991.
Call Number: HF5387 .F47 1991.

CASE: Computer-Aided Software Engineering
by T.G. Lewis, 1991.
Call Number: QA76.758 .L49 1991.

Project Management: How to Plan and Manage Successful Projects
by Joan Knutson, American Management Association, 1991.
Call Number: T56.8 .K58 1991.

System Engineering Management
by Benjamin S. Blanchard, 1991.
A Wiley-Interscience Publication series entitled New Dimensions in Engineering. Call Number: TA168 .B53 1991.

A Review of the Office of Aeronautics and Space Technology's Management Processes and Practices
by the National Academy of Public Administration, 1991.
Call Number: TL521. 312 .R48 1988.

NASA Project Status Reports: Congressional Requirements Can be Met, but Reliability Must be Insured
General Accounting Office, GAO/NSIAD-90-40, 1990. Call Number: T58. 4 .U55 1990.

Articles

Risk Management Integration with System Engineering and Program Management,
by G. Vlay, presented at AIAA Space Programs and Technologies Conference September 25-28, 1990. Call Number 91A10139.

The Causes of Project Failure
by Jeffrey K. Pinto and Samuel J. Mantel, Jr. in IEEE Transactions on Engineering Management, Vol. 37, No. 4, November 1990, pp. 269-276.
Call Number: 91A19889.

Can Space Exploration Survive the End of the Cold War?
by Bruce Murray, Space Policy Vol. 7, No. 1, February 1991, pp. 23-34.
Call Number 91A27566.

Risk Assessment and Program Management
Jerold Haber, in Aerospace Testing Seminar March 13-15, 1990, Proceedings of the Institute of Environmental Sciences, pp. 31-38.
Call Number: 91A29698.

Concurrent Engineering: The Challenge for the 90s
by Kevin M. Smith and Carol A. Marlin, presented at National Aerospace and Electronics Conference, May 21-25, 1990, pp. 1313-1323.
Call Number: 91A31023.

The Explorer Platform Planning System: An Application of a Resource Reasoning Planning Shell
by David R. McLean, Brenda J. Page and William J. Potter, in Proceedings of the ESA Symposium June 26-29, 1990, ESA SP-308, October 1990. Call Number 91N22222.

Mars: A Generic Mission Planning Tool
by A. Killner, N. Schielow, F. Zapp, in Proceedings of the ESA Symposium June 26-29, 1990, ESA SP-308, October 1990.
Call Number 91N22238.

Manager's Handbook for Software Development Revision 1
November 1990, Goddard Space Flight Center, Software Engineering Laboratory Series, SEL-84-101.
Call Number 91N15773.

Book Reviews

Government-Industry Project Management Terminology and Documentation Manual
(HD 69 .P75 G68 1991)

This 130-page manual is compiled by an Air Force support contractor in order to serve as a course training tool and to propose standard terminology for the project office, contractor, subcontractor and user. Presumably, when they all speak the same language and mean the same things, teamwork will result.

The loose-leaf *Terminology and Documentation Manual* begins with a rather odd "List of Acronyms and Abbreviations" with only one abbreviation: "Synth." for Synthesizer. Some you will find nowhere else (such as "WAG" for "wild anatomical guess"), while more standard acronyms, such as WAD for Work Authorization Document, or WAN for Wide Area Network, are missing.

Section 2 is a 60-page "Definition of Terms," again somewhat arbitrary and incomplete. Definitions range from the obvious ("Teamwork. Working together to achieve a common goal.") to the oblique ("Tiger Team. Focused visibility, evaluation and recommendations by objective specialists relative to an identified area of concern."). In its "System Hierarchical Structure," a "part" is ranked as lowest and "system" as highest, above "element" and "segment."

Section 3 is "Control State Descriptions," beginning with Source Selection Initiation Review (SSIR) and ending with Operational Readiness Review (ORR). This is perhaps the most valuable part of the manual because of its Q/A format and detail. Section 4, "System Documentation: Content and Outlines," however, is least helpful because of its sketchiness. Section 5, "Symbols," is a mere couple of pages on arbitrary symbols and a master schedule.

This manual, despite its shortcomings, is a start towards a reliable, consistent and comprehensive glossary for project management. A better

one may be the *PPMI Lexicon* by Dennis E. Fielder, available through the PPM Library collection.

Defense Acquisition Management Policies and Procedures
(DoD Instruction 5000.2: February 23, 1991)

In the past, Department of Defense acquisition management policies and procedures were published in dozens of separate directives and instructions. While they were all cross-referenced, they "defied practical use" by managers and contractors alike. This instruction consolidates 45 such documents into about 500 pages for the program manager, milestone decision authorities and their staffs along functional and organizational lines.

Besides general acquisition policies and procedures, DoD Instruction 5000.2 covers requirements planning, risk management, systems engineering, configuration and data management, contracts, program control and test and evaluation activities in support of the acquisition process.

Acquisition in the DoD has been an issue of keen interest in the past decade. Understandably, part of the problem has been the maze of laws, directives and instructions that go in and out of effect. The instruction would go a long way towards fair, consistent and coordinated acquisition in defense programs were it not for its dense, abstract writing.

Systems Engineering Handbook. 2 Volumes
(Systems Analysis Division: Marshall Space Flight Center, 1991)

Faced with the impending retirement of many experienced engineers, MSFC saw the need "to capture their knowledge and make it available to the next generation of systems engineers." The result is two well written, well organized volumes, nicknamed "roadmap" and "toolbox."

Volume I, completed in February 1991, is 117 pages entitled "Overview and Processes," showing "how MSFC does it." After a brief overview of the NASA phased project planning process (phases A to D), Volume I covers the entire systems engineering process from planning and definition to post-mission evaluation. Tying it all together in an elaborate process flow chart, the "roadmap," which is reduced and highlighted in each section to show how the topic fits in the larger scheme of systems engineering.

The "toolbox" of Volume II was completed in May 1990 and is twice as thick. This volume consists of documentation, applicable specifications and standards, analyses and checklist, processes and checklist, and summary of systems engineering tools and models, and a fascinating list of lessons learned from past programs. Each area is replete with templates and fact sheets which explain the tools, techniques, analyses and documentation formats. This volume is not as tightly organized as Volume I, but contains useful, valuable information.

While the text is readable and the figures are clear, some of the schematics in Volume II are overly complicated and the Volume I introduction refers wrongly to the "roadmap" as Figure 12 (not 11). Nevertheless, MSFC's *Systems Engineering Handbook* is a good start in an increasingly important and detailed discipline.

The Space Station Decision: Incremental Politics and Technical Choice
by Howard E. McCurdy
(Baltimore: Johns Hopkins University Press, 1990)

Under contract with NASA, American University public affairs professor Howard E. McCurdy has produced the second in the *New Series in NASA History*. (Henry Cooper's *Before Lift-off* about Shuttle astronauts was first in the series.) It comes right on the heels of Levine and Narayanan's *Keeping the Dream Alive,* which covers much the same time period. Both accounts rely heavily on the NASA History Office and its then director, Dr. Sylvia Fries (spelled "Fires" in McCurdy's acknowledgements) as well as interviews with some of the Space Station Task Force members.

McCurdy's study, by far the most extensive to date, focuses on that "one brief shining moment"

in NASA between Apollo and the present which has captured the imagination of aerospace writers and researchers. The 1984 decision to build the space station says so much about NASA's past and future, but so far none of the original task force members has attempted to tell "the inside story." That story, not fully told in official documents, has been patched together with interviews, usually pointing to a particular theory or thesis.

Professor McCurdy's thesis is implied in the subtitle: "Incremental Politics and Technological Choice," with the further implication that the former affects or even shapes the latter. The thesis is simple: The Apollo decade had focus, purpose and commitment; during the next two decades, the civil space program "settled into the swamp of incremental politics." There was no vision, no goal.

Technological choice is another matter. NASA came up with a way to get Americans to the moon just 14 months after President Kennedy approved the program. President Nixon got a Shuttle configuration in March 1972, within three months of approval. But for space station, "NASA slogged through a series of designs." Remember the power tower, dual keel, single boom, revised baseline and rephasing?

What happened this go-around? McCurdy points to two inherent problems which suggest deception. First was cost. The original $8 billion cost estimate was not at all realistic. Not even a stripped-down station could be launched for that. Secondly, the original space station promised too much to too many. Defense may have wanted an observation post but the Europeans did not want military presence; life scientists people wanted a large, active crew, but materials scientists needed microgravity and Mars-mission people preferred a service station for refueling. The reader is left wondering whether the present-day problems with funding and configuration are a result of raw, deceptive politics or bad technological choices made in the past. Perhaps either or both would be gross oversimplification, as a strong case could be made for other debilitating factors such as history (especially the impact of the Challenger disaster), management (personnel and methodology), age distribution (the natural aging of Apollo-era employees), not to mention public relations or the 1981 tax cut.

Elsewhere, for example, McCurdy has argued that Apollo-era NASA was "hands-on" technologically competent, but later became noted for its contracting out. (See *Space Policy*, November 1989, for example.) Such a theory would either enhance or disprove his thesis in *The Space Station Decision*, but it would more than likely alter the book's subtitle. Perhaps the problem is what appears to be long gap between research and writing. The book came out in late 1990, but most of the firsthand interviews took place in 1985 and 1986.

Nevertheless, the decision to build Space Station Freedom is fraught with intense interest, scrutiny and even mystery. Additional studies of this 1984 decision are forthcoming, and each one will understandably add another perspective, other insights. For now, though, McCurdy's book is *the* book on the subject; for how long depends on insiders or Task Force members who take up the pen.

Project Management Tools for Engineering and Management Professionals
by Adediji B. Badiru
(Norcross, GA: Industrial Engineering and Management Press, Institute of Industrial Engineers, 1991)

This assistant professor of industrial engineering at University of Oklahoma describes his book as "a collection of project management tools . . . for the engineering and management professional." It presumes prior knowledge and previous study of most of these "tools" for none is described or explained in any detail. MBO, for example, is given two thin paragraphs; so is Maslow's Hierarchy of Needs; McGregor's Theory X and Theory Y gets three paragraphs; TQM four. However, an awful lot of "tools" are mentioned in the 428 pages of text and appendices, and in about 150 figures and tables. The tools receiving the most attention are WBS, CPM, PERT, Gantt charts and MARR (minimum attractive rate of return) methods.

If Badiru has a theme or point of view in his compilation, it would be this: "In the real world, there are no right answers. There are only options." He explains that new engineers quickly find that the theoretical and quantitative techniques of project management learned in school do not necessarily apply in the "real" world. More often than not, the practical mana-ger must settle for a "near-optimal" alternative in lieu of a perfect solution. H.A. Simm discovered this reality nearly 40 years ago and dubbed it "satisficing." Badiru applies the concept to project management decision making.

The author is strong on the economic aspects and quantitative analysis of project management, but his most original approach is the area of software tools for project managers. He evaluates 19 software programs, from Microsoft Project to Control Project, most of which can run on personal computers. However, this rather unique effort may also date the book quickly as new software for project management comes on the market and old programs are updated and improved. Even in the time it took to finish the book, prices changed dramatically. Artemis Project, for example, is listed at $5,000 for a single copy in the text but at $3,500 in the Appendix. Likewise, Harvard Project Manager software is listed at $695 in the text but a hundred dollars less 50 pages later. To compensate, another handy appendix supplies addresses and telephone number for major software developers in the field of project management.

Beyond the Myths and Magic of Mentoring: How to Facilitate an Effective Mentoring Program
by Margo Murry, with Marna A. Owen
(San Francisco: Jessey-Bass Publishers, 1991)

A lot of people are talking about "mentoring" these days, yet little is written about it, even though it is an ancient concept. It dates back at least to Homer, who chronicles the appointment of Mentor who looks after Telemachus for a decade until the boy's father, Odysseus, returns from the siege of Troy. Today it is perhaps the latest buzzword in management circles.

Yet, as the authors of this book note, mentoring "has been applauded as the best and criticized as the worst thing that can happen in one's career." They state flatly, "some organizations and some people will never be ready for mentoring."

The authors are president and senior associate of a firm called "MMHA-The Managers' Mentors, Inc.," although the acronym is not spelled out. In trying to explain mentoring, they say it has nothing to do with role models, "distant stars" or sponsors. Rather, they call it "facilitated mentoring" which involves a mentor and a protege in a formal but willing relationship of sharing skills or experience, systematically.

Perhaps the clearest example of a successful mentoring program cited is at Trinity College in Washington, D.C. Here, undergraduate students are paired with alumnae in the same professional field who together negotiate a set of activities they will share over the semester. Companies and government agencies are also cited as having formal or informal mentoring program. The IRS mentoring program in Kansas City, for example, encourages professional and personal growth.

To make mentoring work, the authors suggest a pilot program first, then plenty of planning, training, coordination and evaluation. They are not blind to gender and culture issues in the workplace, such as sexism and racism. Unions are seen as more of a help than a hindrance in the mentoring process, providing grievance procedures and due process when problems arise. They also recognize the Yankee streaks of independence in American business: "We do not have the patience of the Japanese nor the true team spirit of the Scandinavians . . . Meanwhile, divorce statistics in the United States prove that we are becoming worse at managing relationships." The key, the authors say, is "persistence" to bring about the benefits of facilitated mentoring.

So far, "facilitated mentoring" seems to work best in schools and charitable organizations where supports systems are already in place to compensate for the greed, sabotage and selfishness often attributed to people climbing the lad-

der in corporate America. Whether mentoring takes hold in government or industry may depend upon whether the concept is presented in trendy workshops or in serious studies. This book is a modest start.

Engines and Innovation: Lewis Laboratory and American Propulsion Technology
by Virginia P. Dawson
(Washington: NASA SP-4306, 1991)

In 1982 it looked like the beginning of the end for Lewis Research Center (LeRC). Staffing was down from 4,200 in 1971 to just 2,690 in ten years. The 1983 aeronautics budget had been halved by the Reagan budget trimmers. The then-influential Heritage Foundation marked Lewis for extinction in their blueprint, *Agenda for Progress*, by recommending the abolition of all of NASA's civil aeronautics programs. The city of Cleveland had recently declared bankruptcy. And the newly appointed Center Director resigned.

Within five years, Lewis phased out its famed energy research and was no longer a basic research laboratory where most of the work was done in-house. But it was still alive. In fact, employment picked up considerably at Lewis with several new programs, including the Shuttle-Centaur program and the space power system work package for the Space Station Freedom Program. In the words of division chief William "Red" Robbins, "It was a damn miracle!"

Although *Engines and Innovation* is part of the NASA History Series, author-historian Virginia Dawson modestly disclaims this is neither "an administrative history of LeRC nor a chronicle of its achievements." Rather, she says, "I hope that my book is a contribution to the current effort among historians of technology to understand technological innovation as a social activity or process." In that, she succeeds admirably in a well-written book which captures the essence of technology transfer in the NACA and NASA eras. For example, she notes that Case Institute of Technology was on the receiving end of LeRC's expertise in gas turbine and rocket technology until it developed graduate programs and the situation reversed.

Dawson thematically traces the rise and fall and rise again of Lewis Research Center from its creation in 1941 as the NACA Aircraft Engine Research Laboratory (AERL) by NACA Director (from 1924-1947) George Lewis. By the end of the war it became known as the Flight Propulsion Research Laboratory to reflect jet propulsion and rocket research. NASA was formed in 1958 and the lab took on its present name as it began crucial research in nuclear rocket systems at the old Plum Brook Station 50 miles west.

Dawson, a Ph.D. in the history of science and technology from Case Western Reserve, began work on this project in 1984 under contract to the NASA History Office, virtually from scratch. Only one book had been published on the topic, and that covered only liquid hydrogen propulsion at LeRC from 1945 to 1959. An unpublished M.A. thesis helped with the war years, along with personal interviews with such LeRC legends as Abe Silverstein, Ben and Irving Pinkel, and Bruce Lundin. However, the fascinating story, published in 1991, virtually ends in 1984; neither Andrew Stofan nor John Klineberg was even interviewed. She concludes that the challenge for LeRC is to restore "a balance between research and development."

To Engineer is Human: The Role of Failure in Successful Design
by Henry Petroski
(New York: St. Martin's Press, 1985)

"To understand what engineering is and what engineers do is to understand how failures can happen and how they can contribute more than success to advance technology." Thus, Henry Petroski, an engineering professor at Duke University, begins his now-classic study of the human side of engineering.

You do not need to be an engineer to understand, appreciate and enjoy this slim, illustrated book of 250 pages. He begins with a clear account of the 1981 collapse of the Kansas City Hyatt Regency Hotel skywalks and ends with his telling search of a famous Santayana quotation: "Those who cannot remember the past are condemned to repeat it."

Much of the early part of the book is taken up with fairy tales (Goldilocks, the Three Little Pigs) and poetry (Oliver Wendell Holmes' "The Deacon's Masterpiece," about "the wonderful one-hoss shay, that was built in such a logical way") to illustrate his point that "success is foreseeing failure." No engineer wants to learn by mistakes, says Petroski, but there is not enough to learn from successes to go beyond the state-of-the-art.

The hero-engineers are the Roebling brothers (Brooklyn Bridge) and Joseph Paxton, who built the Crystal Palace in Hyde Park. They were engineers who had vision and creativity. His bridge stories are most memorable, especially the undulating Tacoma Narrows Bridge.

In the final chapters, however, Petroski reveals himself as a stick-in-the-mud, an incurable romantic. His narrative "from slide rule to computer" suggests that the latter can be attributed to "computer-aided disasters" such as the roof collapse of the Hartford Civic Center, while the former forces an engineer to rely upon common sense and conventional wisdom in design. Nevertheless, as Petroski admits, it would be impossible to design or build a megaproject, like a nuclear power plant, without computer technology.

One event that makes *To Engineer Is Human* a classic is the fact that a 50-minute film was subsequently made by Films Incorporated, bearing same title, starring the author. In the film version, Petroski begins with the Challenger disaster and ends with a successful night time launch of the Shuttle. Again, the focus is upon bridges, but his humanistic ideas are illustrated nicely with shots of pyramids and cathedrals. The PBS-quality film and book are complementary in showing failure and fatigue as useful design concepts.

Computer Applications for Project Management: An Overview
by Robert Mead, (Huntsville, AL: Carnber Corporation, February 1991)

This brief, 50-page outline of computer applications is a resource for a project manager who seeks information on some very basic computer applications. It is not for the expert. No one needs to be convinced that "computer systems can help the project manager/planner by doing some project management functions better, faster, more accurately." Choosing the systems is the main thrust of this presentation, but, as the author observes, "This is an area of dynamic change." Better to seek out advice from periodicals, professionals, user groups and consultants.