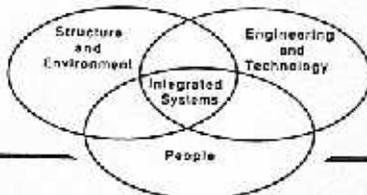




MANPRINT BULLETIN



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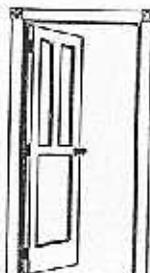
The SMMP Development Process at the Infantry School

by
Beth Redden

When the requirement to write system MANPRINT management plans (SMMPs) first surfaced at the U.S. Army Infantry School (USAIS) at Ft. Benning, many combat development personnel turned to the Human Engineering Laboratory (HEL) field representative to prepare them because they thought that MANPRINT was synonymous with HEL. As the MANPRINT education process became more complete, they began to realize that although human factors engineering is an important part of MANPRINT, other areas, such as manpower, personnel, training, systems safety, and health hazards, are also important. It became apparent that the system project officer would have primary responsibility for SMMP preparation with input from the MANPRINT Joint Working Group (JWG), which includes representatives from the HEL field office and experts in other disciplines.

Because a SMMP had never been written at USAIS, the HEL field representative, the Analysis and Studies Office Chief from the Directorate of Training and Doctrine (DOTD), and a Directorate of Combat Development (DCD) project officer took the lead in preparing the first SMMPs coming out of Ft. Benning. Using the experience and knowledge gained from their initial efforts, this group has been able to assist with and provide input to subsequent SMMP development efforts at the school.

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Attention Graduates of MANPRINT Staff Officer Course!

Your response to the questionnaire sent to you in December has been outstanding. Your comments and suggestions are being used to design the seminar scheduled for 21 - 22 April in Alexandria, VA. Details to follow in separate correspondence.

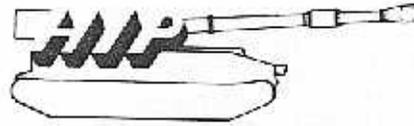
USAIS (continued from page 1)

The following SMMP development methodology is being used at USAIS and has worked effectively:

- Step 1: The DCD project officer develops a "strawman" SMMP by drafting the summary, description, acquisitions strategy, and agencies and guidance sections. He also begins to write objectives, to discuss concerns, and to cite data sources. This "strawman" SMMP is then distributed to USAIS JWG members.
- Step 2: The project officer calls a MANPRINT JWG meeting so that the members can comment on the "strawman" SMMP and discuss the MANPRINT strategy that will be used. The JWG members are then asked to complete their sections of the SMMP (i.e., the HEL representative writes human factors concerns and objectives, the human factors tasks for TAB C, the human factors milestones for TAB B, the human factors data sources for TAB A, and so forth).
- Step 4: After incorporating the internal staffing comments, the project officer distributes the final draft SMMP for worldwide coordination.
- Step 5: Finally, a MANPRINT JWG meeting is called to discuss and accept or reject worldwide comments. The completed SMMP is then presented to the commandant for approval and signature.

This procedure is still new at USAIS and will be modified as the need arises. However, for now it is efficient and effective. We have learned that because MANPRINT is multidisciplinary and requires the diverse talents of experts in human factors engineering, training, system safety, health hazards, manpower, and personnel, no one person can possibly have all the knowledge needed to develop a complete SMMP.

For additional information, contact Beth Redden, HEL Field Office, USAIS, Ft. Benning, GA 31905. Telephone: (404) 545-7414 or Autovon: 835-7414. ●



What Have We Learned on HIP?

by Larry Durham, Peter Cherry,
and Toni Hodges

BMV Corporation, located in York, Pennsylvania, recently completed the first year of a three-year contract to design an improved M-109, 155mm, self-propelled howitzer. The Howitzer Improvement Program (HIP) was one of the first and possibly the largest of the product improvement programs to specify MANPRINT analysis as part of the contract requirements. BMV, a division of Harsco Corporation, was assisted by Essex Corporation of Alexandria, Virginia, and Vector Research Incorporated of Ann Arbor, Michigan, in addressing the HIP MANPRINT effort. This article describes the basic methodologies employed by the HIP MANPRINT team and presents some of the lessons learned from this effort. Various levels of government, including the Offices of the Deputy Chief of Staff for Personnel and the Vice Chief of Staff of the Army, have been briefed on these lessons.

The HIP MANPRINT effort began in October 1985 before any major MANPRINT guidelines or documentation had been implemented. But the effort was started on sound footing: there was a thorough understanding of the MANPRINT goals, which were based on the early HIP HARDMAN analysis completed in 1984. The major HIP MANPRINT goals and constraints, which are also inherent design goals, are as follows:

- To reduce crew size
- To reduce maintenance requirements
- To increase operational availability
- To allow semiautonomous operation

(Continued on page 3)

HIP (Continued from page 2)

- To allow operations in a nuclear biological chemical (NBC) environment
- To streamline training requirements.

The HIP MANPRINT team established some straightforward goals of its own:

- To provide a pragmatic application of the MANPRINT initiative
- To maintain a total system perspective
- To influence the total system design
- To keep the Army informed.

The HIP MANPRINT lessons learned could easily fill this bulletin or a volume of bulletins; perhaps in the future we'll have the opportunity to review some specific analytical areas on these pages. The major lessons learned can best be stated as follows:

- MANPRINT issues must be considered at the time of system design.
- MANPRINT is a team effort.
- Existing tools and data are available and can be used to support MANPRINT analysis.
- MANPRINT can affect design.
- MANPRINT must maintain an engineering focus rather than a theoretical focus.
- People are key to successful MANPRINT analysis.

As stated above, MANPRINT issues must be considered at the time of system design and must be an integral part of the design authority process, both at the engineering level and at the management level. For the HIP project at BMY, MANPRINT (under the direction of the systems engineering manager) is on an organizational par with the hardware and software design elements. By being physically co-located with the design engineers, the MANPRINT team is also integrated into the design engineering process.

MANPRINT impacts on design alternatives are evaluated daily by design engineers and MANPRINT specialists and at formal design review meetings, where these impacts are evaluated equally with hardware weight, cost, size, and speed issues.

For MANPRINT to succeed, the MANPRINT team must involve both the various elements of the contractor design team and the relevant government commands that support the weapon system design. The MANPRINT concept is to compare and balance design alternatives with system cost, manpower requirements, personnel quality constraints, operator/maintainer usability and performance, training requirements, life cycle support costs, and overall system performance and availability. This places a tremendous burden on the MANPRINT personnel coordinating the analysis and on the design team members supplying the data for analysis. Each team member needs to be informed about the goals and objectives of MANPRINT and how the data he or she supplies affects the analysis. Furthermore, the results of the analysis and how these results benefit the design effort must be clear to each team member.

People are the key to effective MANPRINT analysis. All too frequently we hear talk about MANPRINT in very abstract terms; however, we strongly believe that MANPRINT is a people process. People design the hardware and software; people conduct the safety and HFE evaluations; people design the training and build the training equipment. And after the cost data are allocated, the design alternatives put on paper, and the training impacts assessed, it is people who do the real comparisons, balance the alternatives, consider the consequences, and make the final decisions, based on the experience and data available. MANPRINT data analysis and coordination tools exist; they are being refined, and they will continue to be expanded. But the real emphasis must be placed on selecting and training people who understand the whole design and can encourage the design engineer to talk to the safety engineer, the RAM engineer, and the manpower analysts. Whatever the tools, models,

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HIP (continued from page 3)

and data bases used, people who correctly understand MANPRINT's integration role will make MANPRINT work and affect the system design.

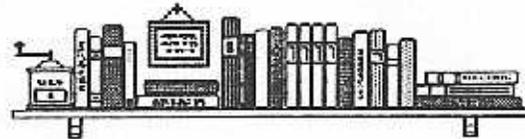
No one could have anticipated the amount of government time and resources that MANPRINT consumes. The HIP project never could have progressed as it has without the cooperation and hard work of the responsible government coordinators: Maj. William Ehy, ILS/MANPRINT Coordinator, PM-Combat Artillery Weapons System; Dr. Sue Bogner, Army Research Institute; and Maj. Keith Fender, ODCSPER.

Existing tools and data are available and can be used to support MANPRINT analysis today. We have found that MANPRINT implementation is not a single process, methodology, or analytical technique. Effective MANPRINT implementation is concurrent with system design and occurs at numerous levels: at the component level, at the functional system level, and at the weapons systems level. Thus it is essential to have access to data and to coordinate the data needed to evaluate the impacts of design alternatives at all levels. There are numerous data management systems available that will allow MANPRINT specialists and design engineers access to manipulate data. There is frequently more data available than one may realize or even need. The challenge is to be able to locate, access, and input the data in a cost-effective manner. Better MANPRINT tools and methodologies will continue to be developed as MANPRINT begins to mature. A critical issue that must be remembered, however, is that the tools and methodologies must produce results, reports, conclusions, or recommendations that are presented in a format that is usable by the intended receiver (i.e., the design engineer, the MANPRINT specialist, or the government evaluator).

In conclusion, we believe that MANPRINT has had an impact on the design of the Howitzer Improvement Program and that MANPRINT is worth the effort for improving weapons systems performance. The key is to initiate MANPRINT early in the design process and to maintain an engineering focus—not a theoretical one. Keep the approach pragmatic, so that the entire

engineering team clearly understands the goals, objectives, focus, and processes being used. Develop and use the tools necessary to coordinate and manipulate the data, but use your resources only to aid the personnel conducting the analysis. They are, after all, the real key to effective MANPRINT and effective change.

If you have any questions concerning MANPRINT or HIP, please call any of the following: Mark Johnson, BMY, (717) 225-4781; Larry Durham, Essex Corporation, (703) 548-4500; or Peter Cherry, Vector Research Inc., (313) 973-9210. ●



BOOK REVIEW

'Specing' the Specs

by Kent Myers, Ph.D.

Jonathan D. Kaplan, and William H. Crooks, *A Concept for Developing Human Performance Specifications*, U.S. Army Human Engineering Lab, HEL-TM-7-80, April 1980, 45 pp. (Prepared by Perceptronics, Inc., PTR-2020-80-3.) DTIC or NTIS accession #AD-A084617.

In their study *A Concept for Developing Human Performance Specifications*, Kaplan and Crooks summarize traditional failings of military "design specifications." These specifications tend to describe particular hardware features without focusing either on system performance with respect to missions or on the contribution of humans to system performance. As a result they needlessly limit the consideration of hardware options and can produce systems that fail in their mission.

To correct this deficiency the authors describe a procedure for preparing specifications oriented to performance rather than to design for the whole system and for the human component. The

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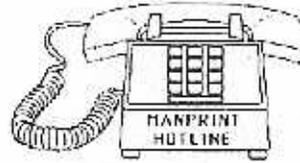
'Specing' (continued from page 4)

authors essentially borrow an approach that they have used before to formulate operational tests for fully developed systems. First, the mission of the system is isolated. The authors admit that this is a not a simple task, but they offer little guidance in achieving it aside from the hint that some missions are not well defined and need to be brought out. They also recommend breaking the system down, first to a functional level and then to a task level, finishing with descriptions of the task environment. Task statements will not be completely accurate for an undesigned system, but most new systems will follow a pattern set by predecessors.

Their procedure is not well grounded in theory nor fully developed, but the authors succeed in making several important points. First, a hierarchical approach is needed to maintain a link between accomplishing a mission and performing a task. Another point is that a specification statement must be balanced between the need for generality and relevance on the one hand, and specificity and measurability on the other.

One of the weaknesses of this account is that humans are considered strictly as equivalents for machine components and not in their capacity for supervisory roles, diagnostic thinking, or purposeful behavior. Another weakness is that the authors misapply narrow concepts useful in human factors engineering studies to more general levels. For example, they recommend stating human performance in terms of time and accuracy, thereby excluding other relevant measures of efficiency and effectiveness.

The appendices list performance specifications for many typical combat systems. These are stated at the level of mission, function, and task (for operator and for maintainer), followed by a list of environmental conditions that might be considered. These checklists can be useful in preparing a reasonably complete human performance specification for any particular system. ●



MANPRINT Questions ? Call Toll-Free

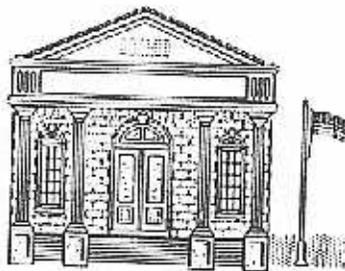
The MANPRINT Information Hotline will be operational from 9:00 a.m. to 4:00 p.m. Eastern Time, Monday through Friday. The phone numbers are: outside Virginia, (800) 262-1626; inside Virginia, (800) 327-1626. The hotline is operated by Automation Research Systems, Ltd. (ARS), under contract to the Office of the Deputy Chief of Staff for Personnel. Depending on the nature of your question, ARS will either provide an immediate answer, research the answer and call you back, or refer you to the appropriate agency or person for a response. ●

MANPRINT Considerations in Requirements Documents

The U.S. Army Materiel Command has hosted five MANPRINT video conferences, which Col. William V. Murry, Chief of the Acquisition Assessment and Policy Division in the Directorate of Development Engineering and Acquisition, calls "successful in promoting communication about MANPRINT implementation." An issue raised in almost all of these conferences concerns how MANPRINT considerations are to appear in the TRADOC and AMC requirements documents (ROCs and RFPs, respectively).

The earliest guidance on how to address MANPRINT issues in the scope of work of an RFP was released by AMC letter on 14 June 1985. Although this guidance was theoretically complete, users found that it was not very relevant to the system specification and to certain other well-established Army programs, such as training

(Continued on page 6)



Schedule of MAN- PRINT Courses for FY 87

MANPRINT Staff Officer Courses

| <u>Date</u> | <u>Location</u> |
|-----------------------|-----------------|
| 20 Oct 86 - 7 Nov 86 | Leesburg, VA |
| 1 Dec 86 - 19 Dec 86 | Washington, DC |
| 26 Jan 87 - 13 Feb 87 | Ft. Belvoir, VA |
| 2 Mar 87 - 20 Mar 87 | Ft. Belvoir, VA |
| 30 Mar 87 - 17 Apr 87 | Ft. Belvoir, VA |
| 4 May 87 - 22 May 87 | Leesburg, VA |
| 15 Jun 87 - 2 Jul 87 | Ft. Belvoir, VA |
| 27 Jul 87 - 14 Aug 87 | Ft. Belvoir, VA |
| 14 Sep 87 - 2 Oct 87 | Ft. Belvoir, VA |

One-Week MANPRINT Courses

| <u>Date</u> | <u>Location</u> |
|--------------------|--------------------------|
| 6 - 10 Oct 86 | Ft. Belvoir, VA |
| 17 - 21 Nov 86 | Aberdeen Proving Gd., MD |
| 12 - 16 Jan 87 | Ft. Belvoir, VA |
| 23 - 27 Feb 87 | Ft. Lee, VA |
| 27 Apr - 1 May 87 | Ft. Belvoir, VA |
| 1 - 5 Jun 87 | Ft. Leavenworth, KS |
| 13 - 17 Jul 87 | Ft. Belvoir, VA |
| 17 - 21 Aug 87 | Ft. Harrison, IN |
| 31 Aug - 4 Sept 87 | Ft. Belvoir, VA |

GO/SES MANPRINT Seminars

All located in Washington, DC

| <u>Dates</u> | |
|--------------|-----------|
| 30 Oct 86 | 23 Apr 87 |
| 2 Dec 86 | 21 May 87 |
| 15 Jan 87 | 23 Jun 87 |
| 25 Feb 87 | 22 Jul 87 |
| 26 Mar 87 | 20 Aug 87 |

→ Please note change in date.

Information on course allocations can be obtained from HQDA (DAPE-ZAM), Washington, DC 20310-0300. Telephone: AV 225-9213 or COM (202) 695-9213.

ODCSPER-Sponsored MANPRINT Training Courses Open to Industry

The Office of the Deputy Chief of Staff for Personnel sponsors three MANPRINT training courses: (1) a one-day general officer/Senior Executive Service MANPRINT seminar; (2) a one-week MANPRINT manager's course; and (3) a three-week MANPRINT staff officer's course. These courses are open for attendance by industry representatives. There are no tuition fees except costs for room and board incurred by the attendees. A course schedule appears on this page.

Industry participation in these courses is important to improve communication and understanding between the Army and industry. Teamwork is needed to fully integrate human performance and human reliability considerations into the design process to maximize total system performance. The Army must adequately describe the soldier in terms of skills, aptitudes, operating environment, and so forth, while industry must design and build the equipment to accommodate these considerations. ●

MANPRINT in Requirement Docs (continued from page 5)

development and integrated logistic support (ILS). As a result, those who have worked on specific development projects have had to determine on their own how to integrate MANPRINT considerations into requirements documents.

Three new documents are available to assist MANPRINT practitioners in this effort:

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MANPRINT in Requirements Docs (continued from page 6)

- The July draft of AR 602-2, MANPRINT. This document has been widely distributed and will soon appear in final form. Specific MANPRINT parts of TRADOC requirements documents are named in subparagraph 2-8e (illustrated on page 11.124 and 11.125 of the 6 August 1986 draft of chapter 11 of TRADOC/AMC Pamphlet 70.2). Subparagraph 2-9j requires that AMC development contracts include MANPRINT provisions.
- The December draft of the *MANPRINT Handbook for RFP Development*. This 150-page handbook was released for review and comment by AMC headquarters on 22 December. It is a guide for AMC employees responsible for writing the first draft of an RFP for a major system (in any phase of development). The handbook explains (in chapters 1 and 2) what MANPRINT is and what sources of technical assistance are available in the Army. Chapter 3 contains guidance on what MANPRINT provisions go where in an RFP, what purpose they serve, and how those provisions are adapted from TRADOC requirements and other sources. Chapter 4 contains an example of an RFP that integrates MANPRINT requirements for a weapon system. The handbook is expected to be issued in loose-leaf form, and there is a sheet at the end for users to request automatic distribution of changed pages as they are issued.
- The December draft of the *MANPRINT Source Selection Criteria Guide*. This guide was released for review and comment by ODCSPER on 5 December. It explains how MANPRINT should be included in a source selection evaluation (SSE), and suggests how the MANPRINT panel should be organized and how criteria should be prepared for the integration of each of the six domains into the source selection process. The guide covers source selection under both nondevelopment items and the Army streamlined acquisition process (ASAP).

MANPRINT policymakers in both ODCSPER and AMC anticipate completing reviews of the handbook and guide in January. Final publication of both documents is planned for no later than the third quarter of 1987. ●

Meetings of Interest in 1987

9 - 13 February

Technology Strategies--1987. Alexandria, VA. *

17 - 18 February

Tactical Vehicles Conference. Monterey, CA. *

4 - 5 March

SDI Technical Achievements Symposium. Washington, DC.*

8 - 9 April

Guns and Ammunition Meeting. Monterey, CA.*

11 - 13 May

Manpower, Personnel, and Training in Systems Acquisition Conference. San Antonio, TX. Contact Air Force Human Resources Lab, Attn: AFHRL/MOD (LTCol. Short), Brooks AFB, TX 78235-5601. Telephone: (512) 536-3942 or Autovon: 240-3942.

12 - 14 October

Association United States Army Meeting. Washington, DC.

19 - 23 October

Human Factors Society Annual Meeting in New York City, NY. Contact: Human Factors Society, P.O. Box 1369, Santa Monica, CA 90406. Telephone: (213) 394-1811.

30 November - 2 December

9th Interservice/Industry Training Systems Conference (IITSC). Washington, DC.*

* Sponsored by the American Defense Preparedness Association. Contact: American Defense Preparedness Association, Rosslyn Center, Suite 900, 1700 N. Moore Street, Arlington, VA 22209-1942, Attn: TMAS. Telephone: (703) 522-1820.

Contract Awarded for Crew Station/Turret Motion Base Simulator

The Tank-Automotive Command (TACOM) has awarded a \$3.9 million, 27-month incrementally funded competitive contract for a six degree-of-freedom crew station/turret motion base simulator (CS/TMBS). This high-resolution facility is designed to test and evaluate critical componentry, human interface, and controls of existing and prototype turrets and crew stations within a laboratory setting. The CS/TMBS will support TACOM's systems integration mission by providing real-time man and hardware analysis and accepting complete crew compartment mockups for addressing MANPRINT issues. The first major application will support the next generation of armored family of vehicles.

For more information on the CS/TMBS, contact Dr. Beck, telephone: (313) 574-6228 or Autovon: 786-6228. ●



Future Articles

The following articles are planned for future issues of the MANPRINT Bulletin:

- ✓ MANPRINT Preparation for ASARC/JRMB
- ✓ Analytical Techniques
- ✓ Book Review: *Human Productivity Enhancement (Volume 1)* by Joseph Zeidner (ed.)
- ✓ Test and Evaluation
- ✓ Lessons Learned on Developing RFPs

Lt. Gen. Robert M. Elton, Deputy Chief of Staff for Personnel

Mrs. Patricia Colliver, ODCSPER Coordinator

Ms. Karon Spear, Editor

Harold R. Booher,

Special Assistant to the Deputy Chief of Staff for Personnel (MANPRINT)

The MANPRINT Bulletin is an official bulletin of the Office of the Deputy Chief of Staff for Personnel (ODCSPER), Department of the Army. Information contained in this bulletin covers policies, procedures, and other items of interest concerning the MANPRINT Program. Statements and opinions expressed are not necessarily those of the Department of the Army. This bulletin is published monthly under contract by Automation Research Systems, Ltd., 4401 Ford Avenue, Suite 400, Alexandria, Virginia 22302, for the Office of the Special Assistant to the Deputy Chief of Staff for Personnel (MANPRINT) under the provisions of AR 310-2 as a functional bulletin. Proposed articles, comments, or suggestions should be mailed to MANPRINT Bulletin, Attn: HQDA (DAPE-ZAM), Washington, DC 20310-0300. Telephone: Commercial (202) 695-9213 or Autovon: 225-9213.