

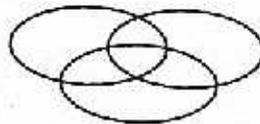


---

# MANPRINT BULLETIN

---

Vol. III No. 4



January/February 1989

## Operator Workload Research Program

Richard E. Christ, Ph.D.  
Army Research Institute, Ft. Bliss Field Unit

John P. Bulger  
Analytics, Inc.

Advanced technology holds the promise of substantially increased system and human productivity. These productivity enhancements are carried into Army weapons systems in terms of a system's ability to do more, such as service more targets, collect more data, or monitor a broader area. Task analyses, based on mission scenarios and system characteristics, generally indicate that these productivity enhancements are temporally feasible; however, these potential enhancements may not be realized if the new technology overloads human operator capabilities. In fact, advanced technology frequently increases human perceptual, cognitive and psychomotor requirements to the point where there are serious limitations in system performance. As a result of these concerns, the Army Research Institute (ARI) has initiated a research program to evaluate and mitigate the impact of operator workload in system design and performance.

The ARI work unit, "Controlling Operator Workload in Army Systems Design and Evaluation," specifically addresses the need for guidance in this area. This project is a two-phase, three-year effort now entering its final year. Phase 1, which was

*Continued on page 2*

## View from the Top



This issue's "View from the Top" features an interview with Major General Stephen R. Woods, Jr., Commander, Soldier Support Center. This exclusive interview with the Army's proponent for MANPRINT training can be found on page 6. Also in this issue, you will find inside...

Memorandum from the Deputy Secretary of Defense: New DOD Directive . . . . .	3
Research Supporting Health Hazard Assessment LTC Bruce C. Leibrecht . . . . .	4
Air Force Analytical Tools Cpt. David Freeman . . . . .	9
Air Force Blue Two Visit Program . . . . .	10
MANPRINT Computer Conferencing Net . . . . .	10
ASAP: A View from the Other Side David G. Kirkpatrick . . . . .	11
Developing Degraded Mode Operational Capabilities via MANPRINT Theodore Marton and James Edwards . . . . .	13
SSC-NCR: Today's Army MANPRINT Integrator Diana D. Lueker . . . . .	14

---

*"Remember the Soldier"*

## Workload (continued from page 1)

completed in the fall of 1987, examined operator workload concepts and measures, formulated an operator workload model, identified Army operator workload evaluation requirements, and assessed techniques for measuring operator workload. Concurrently, plans were made to apply workload assessment techniques to on-going Army system development projects.

Phase II, which commenced in the fall of 1987, applied operator workload assessment techniques to Army systems. Detailed plans were developed to assess workload using both analytical (predictive) and empirical (man-in-the-loop) methods. Empirical results provided a basis for validation of analytical estimates. Data collection and analysis efforts were tailored to provide useful products for system development managers as well as to achieve research objectives.

Three systems were selected for workload assessment based on phases of the materiel life cycle and mission area. Available windows for collection of system data had to be compatible with the research program schedule. Systems selected for evaluation were the Line-of-Sight-Forward (Heavy) (LOS-F[H]) element of the Forward Area Defense System (FAADS), the Aquila Remotely Piloted Vehicle (RPV), and the Black Hawk Utility Helicopter (UH-60).

In addition to information of specific value to materiel and combat developers for the evaluated systems, this research work unit is producing a number of products which will be of great value to the MANPRINT community. In early 1989, ARI will publish the technical report, "Operator Workload: Comprehensive Review and Evaluation of Operator Workload Methodologies," a major product of Phase I workload research effort. Phase II has already yielded a number of research papers which are available in the proceedings from the 1987 and 1988 Human Factors Society meetings. These and other results of the Phase II efforts have been briefed to materiel and combat developers and have augmented MANPRINT analyses of the evaluated systems.

Phase II will result in two valuable products for the MANPRINT community: (1) an operator workload pamphlet for Army managers and (2) an interactive, computer-based system for assessing operator workload. The pamphlet will assist combat

and materiel developers at the management level in integrating operator workload issues into their development programs. In addition, the pamphlet will help project managers, TRADOC system managers, and other program principals understand the importance of operator workload, and enable them to formulate programs which provide appropriate emphasis on operator workload issues.

The operator workload expert system will provide system designers and evaluators with an effective means for developing appropriate batteries of operator workload assessment techniques to meet the needs of development programs. An operator workload assessment handbook will accompany the expert system; this handbook will present information concerning assessment methods. Together, these tools will assist MANPRINT principals in addressing operator workload in future system developments by recommending workload assessment methods tailored to specific user requirements.

For more information, contact Dr. Richard E. Christ at AV 978-4491 or COM (915) 568-4491.



## DID YOU KNOW ...

...that the paper, "Hazard from Weapons Impulses: Histological and Electrophysiological Evidence," by Drs. Price (HEL), Lim Kim, and Dunn, was accepted for publication in The Journal of the Acoustical Society of America? The paper reports on the cooperative work done between researchers at HEL and Ohio State University Medical School. The primary finding was that all the measures of damage, using real ears, were in agreement that, in contrast with current criteria for hazard and equal peak pressures, large caliber weapons impulses are less hazardous than those from smaller criterion for weapons. (SLCHE-BR/DR. PRICE/AV 298-5976)

...that the second **MANPRINT/Industry Executive Seminar** is to be held on January 11, 1989 in Alexandria, VA? Chaired once again by LTG Allen K. Ono, Deputy Chief of Staff for Personnel, the seminar will feature a keynote speech by GEN Arthur E. Brown, Jr., Vice Chief of Staff of the Army. Look for a report on the seminar in the next issue of the MANPRINT Bulletin. (LTC LAINE/AV225-9213)

**MEMORANDUM**  
**from the Honorable William H. Taft, IV,**  
**Deputy Secretary of Defense**

30 December 1988

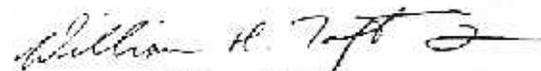
**SUBJECT:** DoD Directive 5000.53, Manpower, Personnel, Training and Safety (MPTS) in the Defense System Acquisition Process

I have recently approved a DoD Directive on MPTS [DoD Directive 5000.53], an action which culminates more than one year of your collective efforts to improve the current process of designing, procuring, and fielding DoD weapons systems. As you implement the provisions of this much-needed policy guidance, please bear in mind that it was established to improve the integration of MPTS in all stages of the acquisition process, to increase the rigor of the Department's manpower planning process, and to ultimately field more capable Defense weapon systems.

As a major and increasingly expensive part of any weapon system, manpower issues must be fully addressed at the outset of the design process. The skills, grades, and total numbers of personnel needed to field a system must be identified early in the process so that we may address from a total system cost perspective, as well as assess our capability to field the system from a manpower availability standpoint. Frank appraisals of these issues, coupled with accurate documentation, will not only improve the internal process, but also will greatly enhance the likelihood of support for our acquisition needs.

The Directive formally establishes the MPTS criteria that must be addressed at the various stages of the acquisition process. It requires the DoD components, in cooperation with industry, to establish the methods and means to conduct and accommodate MPTS analyses along with other systems design criteria. The practicality of accommodating the MPTS profiles and manpower estimate report requirements—by offsetting additional requirements in other areas, adding end strength, or both—must be reviewed and substantiated at the various acquisition milestones. Areas in MPTS profiles which are notably disparate from comparable systems or earlier MPTS profiles must also be reviewed and justified as part of the acquisition process. At the Defense Acquisition Board (DAB) milestone reviews, the key factors which yielded those disparities must be identified and validated by the [Assistant Secretary of Defense (Force Management & Personnel)] ASD (FM&P). The ASD (FM&P), as the DAB member with oversight responsibility for MPTS issues, shall report this information to the DAB, along with a recommendation for milestone approval. In addition, the ASD (FM&P) will be responsible for preparing and forwarding through the Deputy Secretary to the Congress all manpower estimate reports required by Title 10, U.S.C., section 2434, including those for delegated major systems.

The above changes to the manpower requirements determination process represent potentially significant refinements of the planning, programming and budgeting system. By addressing manpower trade-offs earlier in the planning cycle and reflecting those trade-offs in the budget documents, we can more accurately assess our ability to field those systems in a fiscally constrained environment, and more credibly defend our needs to the Congress. In the final analysis, we will field better designed and more easily operated and maintained systems which can realistically be supported by reasonable levels of well-trained members of the total force—a force multiplier of enormous potential, and one we can all endorse.



William H. Taft, IV  
Deputy Secretary of Defense

# Research Supporting Health Hazard Assessment

LTC Bruce C. Leibrecht  
U.S. Army Aeromedical Research Laboratory

**Editor's Note:** This is the final installment in a series of articles addressing the Army's Health Hazard Assessment Program. The Bulletin staff would like to thank LTC Leibrecht for the time and effort he has spent over the past year researching and writing this outstanding series.

Though often operating behind the scenes, research plays a vital, active role in the Army's Health Hazard Assessment (HHA) Program. In fact, it plays three major roles: in developing new tools, conducting special studies, and performing medically-related test and evaluation.

Routine functioning of the HHA Program relies on key tools such as biomedical databases, methods for evaluating protection, prediction models, improved protection, and troop health indicators (see table below). Some or even all of these tools may be deficient or lacking for any given health hazard. Research serves to develop new or improved tools in order to advance HHA capabilities. Such research usually consists of laboratory investigations (using animals and humans), technology or methodology development, mathematical modeling, and may also involve field evaluations and epidemiological surveys. Because these types of research normally require multiphase programs, substantive resources, and long-term commitment, they depend on formal planning, programming, and budgeting to provide a stable funding environment.

HHA TOOLS	
Type	Description
Health Standards	Documents specifying conditions of acceptable risk for individual hazards.
Biomedical databases	Systematic collections of empirical data on basic bioeffects, exposure injury relationships, mechanisms of injury, and material characteristics.
Prediction models	Mathematical or analog models for predicting extent of injury based on quantitative exposure characteristics.
Protection technology	Systems, components, and subsystems for reducing exposure to acceptable levels, given unacceptable source levels.
Methodology for:	Equipment, facilities, and procedures for:
a) Protective device evaluation	Measuring effectiveness of protective systems.
b) Hazard measurement	Quantifying material health hazard characteristics.
c) Health monitoring	Assessing key personnel health characteristics.

What happens when existing tools prove inadequate to address current questions, yet system-specific answers are needed before new tools will be

available? Biomedical research can step in with special studies such as laboratory investigations and direct hazard assessments. A system-specific laboratory investigation harnesses an actual or simulated system or component to determine its hazardous effects in the laboratory, usually using animal models. In contrast, direct hazard assessment involves the study of soldiers and actual weapons exposures in the field. As a classic example of direct hazard assessment, consider the case of the M198 Towed Howitzer. In order to determine the adequacy of available hearing protection, investigators exposed volunteer troops to actual howitzer firings, monitoring hearing as noise intensity increased. The direct hazard assessment is a court of last resort, however, because it answers only narrow questions, is resource intensive, and takes excessive time to plan and coordinate.

Another type of special study is the health survey, which captures data on the status of selected health indicators, such as hearing ability. Survey methodology usually involves measuring soldiers in the field, though it can involve reviewing health records or computerized databases. Health surveys provide valuable information about how well the HHA Program is working, as well as baseline data against which to gauge future weapons effects and protective technology. Survey results can also influence health policy issues, including selection and retention standards.

The final category of health hazard research is medically-related test and evaluation (T&E). This T&E focuses on measuring pertinent characteristics of two types of material: those systems/components which generate health hazards, and those which protect against health hazards. In the first case, nonmedical T&E organizations normally collect health hazard data for subsequent review by a medical organization. Occasionally, however, an Army Medical Department (AMEDD) organization collects data using special instrumentation or data analysis capabilities. In discerning how well a protective system actually protects, an evaluator performs standard measurements to quantify hazard reduction. An excellent example of this is the routine

*Continued on page 5*

### HHA (continued from page 4)

evaluation of helmets for impact and noise attenuation efficacy. Such evaluation occurs during prototype development, first article and initial production, and routine production.

By regulation, The Surgeon General (TSG) is responsible for the primary health hazard research mission. In reality, the U.S. Army Medical Research and Development Command (USDAMRDC)—a Field Operating Agency of TSG—performs health hazard research as part of its larger medical research and development programs. TSG staff establishes and prioritizes health hazard research requirements, and provides technical input to specific objectives. USAMRDC plans, programs, and budgets for recognized research efforts, generally by problem area. Five of USAMRDC's laboratories, described in the table below, participate in executing the health hazard research program.

USAARL	WRAIR	USABRDL	LAIR	USARIEM
BOP* Noise Vibration Shock Thermal Stress O <sub>2</sub> Deficit	BOP* Microwaves MM-Waves	Smokes Obscurants Combustion products Toxic effluents	Lasers Light	Heat Cold Overexertion Altitude

\*Note: BOP=Blast overpressure

USAMRDC, of course, maintains primary contracts to help achieve its health hazard research objectives. These contract activities span the entire spectrum of health hazard research categories. Prime contractors and subcontractors who are developing new systems collect health hazard data and may support special studies by the Government. Thus, effective health hazard research for the Army requires a close-knit partnership of in-house organizations, both medical and nonmedical, as well as extramural participants.

The funding base for health hazard research relies heavily on Research, Development, Test and Evaluation (RDT&E) funds programmed and budgeted by the Army or by nonmedical organizations. At the same time, some health hazard research directly supports a specific developmental system; this forms the basis for the materiel developer to provide customer funds to the performing organization. Health hazard research funds for a specific system

should be identified as early as possible in key management documents, including the System MANPRINT Management Plan (SMMP), to assure adequate resources will be available in a timely manner.

How are health hazard research requirements established? Ideally, the Army's long range planning process should indicate health hazard research needs alongside appropriate deficiencies and requirements identified in key planning documents (e.g., Mission Area Analyses, the Battlefield Development Plan). Incorporating these research requirements into planning documents demands close coordination between planning agencies, especially TRADOC, USAM, and OTSG. In practice, requirements more typically result from formal or informal dialogue between a combat or materiel developer and an element of the AMEDD. As the MANPRINT Program matures, MANPRINT Joint Working Groups (MJWG) should be documenting health hazard research requirements in SMMPs. The MJWG offers an excellent arena for coordinating research requirements across all of the MANPRINT domains. Combat, system and technology developers, T&E personnel, and human factors and system safety personnel should all notify OTSG when potential health hazard research requirements come to their attention. Such requirements must be identified and planned for as early in a system's life cycle as possible.

By developing new tools and providing specialized support, health hazard research constitutes a key link in enhancing the effectiveness and efficiency of the HHA Program. In turn, this enhances the responsiveness and vitality of the larger MANPRINT Program, which binds together HHA with the other constituent domains. In this togetherness lies MANPRINT's true strength: the whole is greater than the sum of its parts. As a member of the MANPRINT team, the HHA Program, by capitalizing on the "multiplier" effect resulting from integration, can accomplish more than it could in a stand-alone mode. MANPRINT participants everywhere should strive for cooperation and integration, for cohesiveness will bring maximum impact. And maximum MANPRINT impact means maximum benefit to the Army.

*The author of this series welcomes questions, comments, suggestions, and just plain dialog. Contact LTC Bruce C. Leibrecht, U.S. Army Aeromedical Research Laboratory, P.O. Box 577, Ft. Rucker, AL, AV 558-6800 or COM(205) 255-6800.*

# VIEW FROM THE TOP

An Interview with Major General Stephen R. Woods, Jr.  
Commander, Soldier Support Center

*Editor's Note: On December 13, 1988, MG Stephen R. Woods, Jr., was interviewed exclusively for the MANPRINT Bulletin by Richard Patrick of Automation Research Systems, Ltd.*



**Q: General Woods, as Commander of the Soldier Support Center (SSC), how would you describe your role in the MANPRINT program?**

**A:** I am the soldiers' advocate. My job is to make sure that the manpower, personnel, and training (MPT) aspects of materiel acquisition are realized and addressed. SSC has always been responsible for assessing MPT issues, however, under MANPRINT, the impact of these domains has been expanded, formalized, and intensified. I'm also the proponent for MANPRINT training Army-wide.

**Q: You mentioned training. How are the MANPRINT training programs progressing?**

**A:** From all indications, training is going quite well. To date, over 1700 people have received formal MANPRINT training. Among these are the uniformed personnel from all the Services, government civilians and industry. That's a pretty good mix of people, but there are over 1 million men and women in the Army, and in order to get more people trained, I want to get some MANPRINT modules in the POI [program of instruction] for as many of our professional development courses as is possible and appropriate. That is no easy task. We'll have to compete for time and demonstrate that the inclusion of MANPRINT modules is of overwhelming benefit to the Army at large. That's a long term goal.

Right now we're teaching a few hours of MANPRINT at the Combat Developer and Training Developer courses, and the Army Logistics Management Center [ALMC] includes MANPRINT training in some of its courses. By the way, the new Army Staff Management College, the civilian equivalent of C&GSC [Command and General Staff College], also has a couple hours of MANPRINT. My people at SSC-NCR are looking at the possibility of introducing

a MANPRINT correspondence course. We've come a long way toward getting our people trained but we've still got a long way to go.

**Q: What is SSC-NCR's role in implementing the MANPRINT program?**

**A:** SSC-NCR [Soldier Support Center-National Capital Region] is my eyes and ears in the Washington, D.C. area. As you know, my headquarters is in Fort Benjamin Harrison, Indiana. SSC-

NCR's strategic location allows me to extend my influence to the other people and agencies, like the DCSPER of the Army and the Total Army Personnel Command. The folks at SSC-NCR have operational responsibility for the day-to-day management of our training programs and serve as the TRADOC-wide point of contact for MANPRINT. Aside from training management, NCR reviews requirement and program documents, conducts MPT assessments and, within TRADOC, serves as the proponent for MANPRINT methodologies. Colonel Frank Wise, who commands SSC-NCR, works closely with the ODCSPER MANPRINT office. He and his people are really the heart and soul of our MANPRINT effort.

**Q: General Woods, is it very costly to accomplish the MANPRINT program goals? Is the Army willing to continue resourcing MANPRINT in the face of budget cuts and competing demands for resources?**

**A:** To put it bluntly, we can't afford to not resource MANPRINT. In my last four years at the Pentagon, I witnessed a retrenchment in resources that was unprecedented. It is hard to appreciate the magnitude of the budget cuts—we're talking about reductions in the realm of \$220 billion...and that's money that the Army was told it could have. Those funds were to support programs that have since been cut, and more will be cut in the future.

As available resources continue to dwindle, it is more important than ever that we maximize the returns we receive for every dollar invested in an

*Continued on page 7*

**Woods** (continued from page 6)

acquisition, and MANPRINT plays an integral part in the optimization process. MANPRINT can help save us a lot of money in the future...so it is imperative that we do MANPRINT and do it right. The Army has known for some time that we couldn't first design a system and then try to jam people into it. When that happens, you are putting the cart before the horse, and it flat won't work. In today's fiscal environment, we just won't get the dollars needed to redesign equipment, so we have to do things right the first time.

MANPRINT has got to be driven by believers. And how do you make them believers? By doing MANPRINT training; by getting the requirements guy and the developer to sit down together and talk through the MANPRINT process. Then you demonstrate the dollar savings and increased warfighting capability that MANPRINT brings. That's how you make the system work.

One of the best examples I can think of right now is the T-800 engine for the LHX, where we used soldiers early on to show the designers what would and would not work.



**Q: LHX is a high-visibility, high-dollar program. Do smaller programs get the same scrutiny?**

**A:** Well, the AAWS-M [Advanced Anti-tank System (Medium)] program comes to mind. Those of us in the requirements business have got to avoid the things that got us into trouble with the Dragon. We've got to make sure that the requirements are realistic and attainable. That requires us sitting down with industry, LABCOM or the AMC Commodity Command and having someone say "you can't get

there from here." That what we want isn't realistic and isn't good for soldiers. We may have to fall off a stated requirement that we kill a tank from all aspects at "x" range or whatever.

General Thurman and General Wagner just spent a week at Fort Belvoir with the two-stars from TRADOC and AMC talking about how we can collectively do our respective jobs better given concerns on the outside about industry, and concerns inside the Army about requirements development and the ability of AMC to deliver the finished product. MANPRINT surfaced in that session on several occasions. We had one day that we spent with the CEOs [Chief Executive Officers] of some very big companies, and they mentioned the positive effect MANPRINT is having on their programs.

So you can make it happen. You can make MANPRINT happen on large and small programs if the requirements are there and if you educate the organization. That is what I'm trying to do.

**Q: How do you propose to sustain the program's momentum? Do you see your role expanding?**

**A:** I am not an empire builder. I want to do my job correctly, and I want everyone else to do their jobs correctly. If that happens, things will work out.

Sustaining MANPRINT's momentum requires a collective effort between the DCSPER, me and the rest of the folks in the requirements business, and the folks in the materiel business. But if you're asking me if MANPRINT will die in TRADOC when General Thurman retires, or whether MANPRINT will die in AMC when General Wagner retires, the answer is no for two reasons. First, OSD is convinced of MANPRINT's importance and is in fact trying to develop a Defense-wide program based on what MANPRINT is all about. Second, Industry believes in the program, and I think they'll keep us on our toes.

There are a lot of people in and out of government who are looking for answers to MANPRINT kinds of questions. The program is now so strong that I think MANPRINT is ready to take on a life of its own.

**Q: SSC has been very involved in the FOOTPRINT and CROSSWALK projects. Can you briefly describe these initiatives as well as any recent progress that has been made?**

*Continued on page 8*

**Woods** (continued from page 7)

**A:** FOOTPRINT and CROSSWALK involve a huge data base that describes target populations. We can query that data base to determine if and how a change in a system will affect the grades and skills of the people who are a part of that system.

FOOTPRINT will provide the MPT profile of an MOS [Military Occupational Specialty] for use in developing a target audience description. CROSSWALK uses the data contained in FOOTPRINT to link MOSSs with end-items of equipment. The result is a system-specific report which provides critical manpower, personnel, and training information. SSC-NCR, ODCSPER, the Defense Manpower Data Center, and the Training and Performance Data Center are working together on these projects.

I'm very pleased with what I've seen so far. Just last month we [SSC-NCR] began providing FOOTPRINT reports on request. Our ultimate goal is to electronically link the MANPRINT community with FOOTPRINT via the Army's Decision Support System. FOOTPRINT should benefit the entire acquisition community by improving our ability to quantify MPT costs and describe the target audience—those people who will operate, maintain and support the equipment being designed.

**Q:** The Army suffers a tremendous turnover in people. How does the personnel community keep track of MANPRINT-trained people?

**A:** Well, we use an ASI Six Sierra (6S) to track our officers, and we're in the process of developing a similar system for the NCOs and Warrant Officers. Eventually we'll develop a system to track civilians. We need that tracking system to make sure that we get the maximum use of our trained people. Lately, I've been getting calls from commanders saying they have no MANPRINT-trained personnel. My people researched the problem and discovered in every case that trained personnel were available but the local commanders didn't know who they were. We need to improve our tracking systems, perhaps through a semi-annual listing, by command, of all MANPRINT-qualified people. We're working on it.

**Q:** Are there any parting thoughts you would like to share with our readers?

**A:** I want them to read the MANPRINT Bulletin, and I want them to attend MANPRINT training! And as soon as we put together a workable correspondence course, I want to see alot of folks signing up for it.

I also want to say that we, both government and industry, have got to understand why it's so important that people and our requirements drive the design of equipment—not the technology and not the designer. When the Army started this massive modernization program about ten years ago, we had equipment coming off the production line and going into the field before we were certain of the grades and skills of the people who would operate and maintain the weapons. When we turned to the RDA [research, development and acquisition] community for help, their response was, "We're not in the manpower business." That's when we started to realize that we had some major disconnects. In today's resource constrained environment, the Army can not afford to wait until fielding to fix problems because the funds needed probably won't be available. That's why we must apply MANPRINT at the front end of system design and development—that's the only way we'll be able to survive.

All the high tech equipment in our inventory is worthless if it is beyond the capabilities of the soldiers who will use it and maintain it. We must never forget the soldier when we state our requirements for new equipment. That is what MANPRINT is all about.

## **MANPRINT RULES OF THUMB**

- 1. Soldier Performance Affects System Performance.**
- 2. Skill is a Function of Aptitude and Training.**
- 3. Measure Soldier Performance by Time and Accuracy.**
- 4. Equipment Design Determines Soldier Tasks.**
- 5. Make the Designer Responsible for Soldier Performance.**



## Air Force Analytical Tools

Compiled by Cpt. David Freeman  
United States Air Force, Aeronautical Systems Division

**IMPACTS** (Integrated Manpower, Personnel and Comprehensive Training and Safety) is the new Air Force program for ensuring the integration of the interrelated "people" issues of manpower, personnel, training, safety and human engineering into weapon system design and acquisition. As part of IMPACTS implementation efforts, the Air Force is attempting to employ and integrate both existing and emerging MPTS (Manpower, Personnel, Training, and Safety) analytical tools. Some of the tools currently being considered, as well as the programs sponsoring their development, are described below.

### ***Advanced Training System (ATS)***

ATS is a new computer-based training system being developed by the Human Systems Division (HSD) at Brooks Air Force Base, Texas. This system should provide for better training by increasing instructor productivity, reducing student attrition, and by allowing instructors to spend more quality time with the 175,000 students who attend Air Training Command (ATC) courses each year. The amount of time required to perform administrative chores will be substantially reduced from present levels. ATS is expected become the backbone of ATC's future training program.

### ***Computer Supported Network Analysis System (CSNAS)***

The CSNAS is a government owned and operated project management/network analysis software package. This system includes government-developed software that operates on a VAX 11/780 or on a personal computer and is capable of moving files between these systems. Network analysis aims to identify and schedule the tasks to be accomplished during a specific phase of an acquisition program, determine the critical path, identify which jobs have slack time, and integrate the separate project schedules. Networks for manpower, personnel, and training (MPT) acquisition activities are currently being updated by ASD/ALH personnel.

### ***CROSSWALK***

The CROSSWALK program will provide an automated lookup table capability that links operational system/subsystem data to occupational specialties data. In essence, the table will provide a quick reference for identifying weapon systems/subsystems operated or maintained by a given specialty or, conversely, what specialties are needed to operate or maintain a given weapon system or subsystem.

### ***FOOTPRINT***

The FOOTPRINT project, undertaken by the Defense Training and Performance Center (TPDC), aims to develop an automated MPT data integration technique in support of front-end comparability analysis. This tool would utilize existing data bases and quickly display the MPT-related characteristics of an existing weapon system or end item. A series of standard MPT reports, aggregated either by predecessor system or Air Force Specialty (AFS) Code, could be produced from the compiled data.

### ***Reliability and Maintainability 2000 (R&M 2000)***

R&M 2000, directed by a special office of USAF/LE-RD, will help to ensure that future weapon systems are more reliable and more easily maintained. With more reliable systems, the numbers and skill levels of personnel needed to maintain a system can be reduced. The Air Force has established manpower goals for existing and future systems; these goals are published in R&M 2000 policy guidance.

### ***Rivet Workforce (RWF)***

RWF aims to create a more flexible, mobile, and survivable work force which will help meet future operations concepts and maximize personnel utilization and training investments. RWF attempts to consolidate the responsibilities of certain AFSs and tie maintenance AFSs to specific aircraft systems through the five journeyman and seven supervisory

*Continued on page 10*

### Analytical Tools (continued from page 9)

skill levels. This consolidation requires maintainers to become generalists on a wider variety of aircraft systems. As a consequence, AFSs are being assigned new tasks, and existent training courses are being restructured. The move to the new RWF AFS structure is now taking place and will continue over the next three to four years.

#### Rivet Train

Rivet Train (the complement to the Rivet Workforce Program) aims to make maintenance training programs more effective, more efficient and less burdensome to unit supervisors. This effort aims to develop a total systems approach to maintenance training in order to integrate each element of the training process into a coherent, synergistic whole.

#### Training Analysis Support Computer System (TASCS)

TASCS, a computer-based Instructional Systems Development (ISD) tool, will be used by ISD and subject matter experts to more quickly define training requirements and design supporting training systems. This computer-based tool will also facilitate training system revisions and updates.

#### Small Unit Maintenance Manpower Analysis (SUMMA)

SUMMA is an applied research effort sponsored by the Air Force Human Resources Laboratory in conjunction with the Directorate for Manpower, Personnel and Training, Aeronautical Systems Division, Wright-Patterson AFB, Ohio. SUMMA theorizes that maintenance manpower utilization can be improved and a more economical distribution of workload achieved by altering traditional USAF occupational specialization. These changes would allow wartime flying schedules to be met from dispersed operating locations with less dramatic increases in manpower than would be required with existing AFS structures. This research effort is developing a more empirically-based method of determining the impact of real time as well as a computer-based decision support system capable of augmenting current manpower analysis. SUMMA will permit a tandem evaluation of both operational capability and MPT support issues.

For more information, contact Cpt. David Freeman, ASD/ALHP, Wright-Patterson AFB, OH 45433, AV 785-9750.

### Other Services

#### Air Force Blue Two Visit Program

In 1983, the Air Force started on the road to commitment for improving the reliability and maintainability of field and future weapons systems by approving the Air Force Blue Two Visit Program (BTV). The BTV program, managed by the Air Force Coordinating Office for Logistics Research (AFCOLR) at Wright-Patterson AFB, Ohio, exposes corporate program managers, design engineers, and Air Force acquisition personnel to "real world" operation and maintenance procedures and constraints. Direct interface and communication are encouraged between the designers and the day-to-day maintainers of current Air Force systems through visits to Air Force base flight-line operations and shops. Such visitation allows hands-on access to design and engineering problems created during development/employment of the weapon system. On the acquisition side, BTV exposes Air Force acquisition personnel to "real world" problems in an operational environment.

For additional information, contact Col. Dick Ennis, Director of AFCOLR, Wright-Patterson Air Force Base, OH 45433.

#### MANPRINT Computer Conferencing Net Established

A MANPRINT computer conferencing net was established last year by the MANPRINT Directorate, HQDA, as a subnet of the Army Forum Net. This net will allow MANPRINT practitioners and other interested individuals the opportunity to discuss issues, concerns, development, and general information related to MANPRINT. Membership is open to all individuals who feel they can contribute to as well as benefit from this net. There is no charge for participation; however, the net is dependent upon active participation to ensure success.

In addition to computer conferencing capability (members simply post items for which they wish participants to respond), the MANPRINT net provides an electronic mail capability.

If you wish to participate, contact Rudy Laine, AV 225-9213 or COM (202) 695-9213, to receive an invitation packet and LOGON ID.

# ASAP: A View from the Other Side

David G. Kirkpatrick  
Advanced Technology Inc.

*Editor's Note: The following is a shortened version of an article that first appeared in the June/July 1988 issue of Army RD&A Bulletin.*

Some people are wary of government initiatives to improve the materiel acquisition process; they've seen them come, they've seen them go. But the acquisition streamlining initiatives being used by the Army in its three-pronged approach to streamlining business practices, acquisition strategies, and requirements are different. Not only do the initiatives make sense but they are being prompted by the Army's growing attitude that it must get quality equipment into the hands of the soldier more quickly and at less cost. This calls for the streamlining of acquisition programs wherever feasible.

The Army Streamlined Acquisition Program (ASAP) has often been assessed from the Army's point of view. Industry's point of view is not likely to be radically different since both parties will benefit from improvements to the acquisition process. While this article is only the perspective of one person associated with one corner of industry, it can give a different slant on ASAP and perhaps illustrate where increased benefit can be gained.

The streamlining state of mind and the streamlining initiatives rely on two key ingredients: common sense and trust. The need for common sense is fairly obvious and has been widely discussed with respect to acquisition streamlining. Lack of trust has helped create the incredibly complex acquisition process that streamlining is attempting to simplify. Any streamlining of the acquisition process must include the assumption that we are all reasonably competent and motivated by the desire to do the best job possible. This trust does not preclude management oversight; however, it should reduce intensive management within the Department of Defense (DOD) and between DOD and industry.

Equivalent management relationships within industry are generally far less intense and complex; unnecessary management means unnecessary costs that can dull a company's competitive edge. Perhaps the commercial sector of the acquisition process best illustrates the proper balance between

trust and oversight in management relationships.

Of the Army's three approaches to streamlining, many in industry would consider streamlining business practices to be their primary concern. The Army's effort in this area covers a broad set of initiatives, including changes in its management structure, and streamlining the contractual process and the contractual vehicle.

The objective of streamlining the contractual vehicle is to make it more comprehensible; streamlining will help industry better understand the Army's needs and, by extension, increase the likelihood that a quality product will be provided. The inconsistencies, redundancies, vagueness, obscure tiers of references and sheer volume of a typically bad RFP are daunting to those in industry who must determine what the government wants, if their company can provide it, and at what cost.

Concern with the size of RFPs has sometimes resulted in an effort to reduce the number of pages. Page count, however, isn't necessarily a measure of streamlining—clarity is. If a solicitation clearly communicates the Army's needs to industry, it is streamlined. On the other hand, the idea of placing a reasonable page limit on the offeror's proposal makes sense. The ability to communicate effectively in writing with a minimum of verbiage and logical organization of work and ideas is a measure of competence. Shorter proposals should result in reduced evaluation time, and can serve as a source selection discriminator and administrative lead-time reducer.

As with business practices, some areas of acquisition streamlining strategies are of more interest to industry than others. Choosing the path of minimum development to satisfy a materiel need makes sense in the context of streamlining as long as we don't neglect the research and development role that industry shares with government and academia in seeking out those technologies that will provide a "leap ahead" in our combat capabilities.

A common streamlining strategy is to rely on concurrent development testing and operational

*Continued on page 12*

ASAP (continued from page 11)

testing. This strategy can be very effective as long as the test community accepts the fact that the contractor may have difficulty in meeting the needs of all the testers, especially since their test objectives are likely to be widely divergent. The test community must sometimes be willing to work with less.

Likewise, concurrent production and testing can work well only if critical test issues are identified and resolved before beginning production—not an easy task to do. Coordinated efforts by the test community, the materiel developer and the contractor are required to identify potential "show stoppers." These issues can then be addressed with a test program that finds and fixes the problems that do exist prior to production.

Another streamlining initiative, Continuous and Comprehensive Evaluation, provides the developer with early feedback on a system's operational capabilities through user testing. The operational assessments that result from such testing help the contractor to correct problems early in development when changes are usually cheaper and easier to make. The price the contractor pays for this obvious benefit is premature exposure. Exposing the system to critical examination when it still has a lot of rough edges may earn it an undeserved reputation as a problem system. It is therefore critical that the results of early user testing be placed in the context of the system's stage of development.

The third thrust of the Army's streamlining approach is to streamline user, contract, and test requirements so that unnecessary and unrealistic requirements or requirements that add only marginal value to the final product are eliminated. Industry is perhaps least interested in this aspect of streamlining because the contractor gets paid if he meets the requirements, whether or not they are correct. Contractors, however, have an abiding interest in producing quality products, for obvious reasons, so it is in their interest to ensure that they are working the correct requirements. Requirements that don't make sense or that provide only marginal benefit to the final product must be challenged.

Another aspect of requirements and streamlining is the problem of changing requirements. During requirements and technology base activities, the prospective acquisition program must be fully defined

and all individuals or activities that are concerned with the acquisition must be committed to the program as it is defined. This requires a massive amount of up-front coordination, cooperation and selling of the program. Selling the program must then continue throughout development, otherwise, the up-front effort to streamline requirements (or the acquisition strategy) might be negated by changes that could eventually lead to cost overruns, schedule slips and test failures that operate against the ultimate objective of satisfying the user's needs.

#### Four Rules

The above points boil down to four simple rules:

- **Don't let "better" be the enemy of "good enough."** Success in streamlining rests in large part on willingness to limit objectives—to stick to mature technology when the temptation is to go for a high technology breakthrough.
- **Maximize coordination and cooperation.** Streamlining will not make the job easier, rather, it requires additional effort to ensure that all bases are covered and everyone is in agreement with the program.
- **Minimize verblage.** William Strunk, Jr., coauthor of the book, *The Elements of Style*, probably said it best, "vigorous writing is concise." Don't waste words.
- **If it doesn't make sense, don't do it.** In streamlining, nothing is sacred. Too many requirements exist only because they were in a previous solicitation or program. Challenge them. If they provide little or no benefit to a program, they should be eliminated.

The above rules, coupled with common sense and trust, form the basis of effective streamlining. They apply equally to government and industry because both have the same fundamental goal—to get quality equipment into the hands of the soldier more quickly and at a reduced cost. Streamlining can make it happen.

*For more information, contact David G. Kirkpatrick, Advanced Technologies, Inc., 12005 Sunrise Valley Drive, Reston, VA 22091, (703) 620-8196.*

## Developing Degraded Mode Operational Capabilities via the MANPRINT Process

Theodore Marton, Ph.D.  
and  
James Edwards, Ed.D.  
Dynamics Research Corporation

Major manned weapon and military support systems are expected to sustain significant levels of mission-related functions following substantial, but less than catastrophic, levels of system failure generated by normal usage or combat-generated damage. To achieve this objective, all critical aspects of the system (man, hardware, software, operations and doctrinal protocols, etc.) must be identified and configured to support degraded but acceptable levels of mission-related system performance during any loss of key system functions. It is not feasible to make provisions for all potential failures, therefore, considerations must focus on those failure modes presumed to be critical to the achievement of mission objectives and that have a reasonable probability of occurrence during the system's peacetime/wartime life cycle.

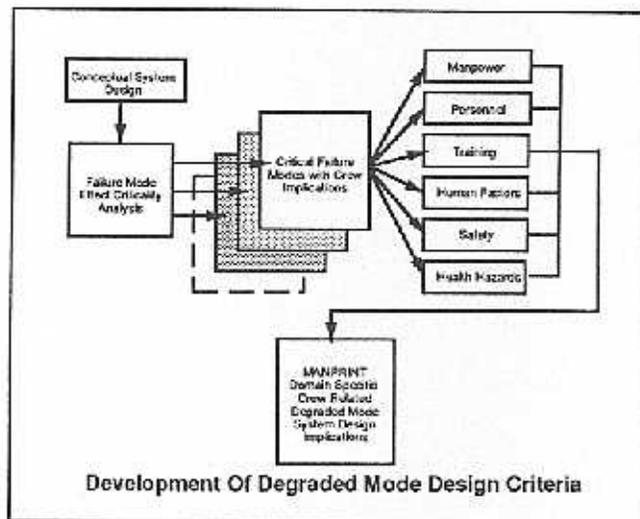
The human is usually the single most flexible and adaptable component of a manned system. Efforts aimed at sustaining system mission capabilities during varying levels of "degraded" or "failure" conditions must therefore consider and accommodate man's unique ability to reprogram or modify his system input-output roles in "real time." In order to effectively identify and provide the alternate manned interfaces and operational options needed to assure the broadest, most flexible symbiotic relationship between man and a degraded system, one must:

- a) Identify the locus, mode, and probability of occurrence, and functional implications of those failure modes determined to be critical to the implementation of key mission capabilities.
- b) Identify where and how the human may:
  - 1) be used to eliminate, minimize, manage, or prevent the impact of key system failures, and
  - 2) be protected from unacceptable levels of health hazards or reduced safety.

These two basic requirements can be met by

the integrated application of MANPRINT and Failure Mode Effects Criticality Analysis (FMECA) processes.

After the initial system design concepts are formulated during the Concept Development phase of the acquisition process, they should be analyzed via the FMECA procedure in order to identify potentially significant system failure modes that could impact on or be impacted by the presence of a human crew. These potential interactions may be fed into the developmental analyses associated with the design considerations for each of the six MANPRINT domains (manpower, personnel, training, human factors, safety, and health hazards) for appropriate consideration and accommodation.



By examining each of the potential significant failure modes in light of each domain, the design team can ensure that the principal man-related interactions associated with degraded and emergency systems operations are identified and considered in the overall systems development process.

For more information, contact Ted Marton or Jim Edwards, Dynamics Research Corp., 1755 Jefferson Davis Hwy., Arlington, VA 22202, (703) 521-3812.

## SSC-NCR:

### Today's Army MANPRINT Integrator

Diana D. Lueker

Soldier Support Center-National Capital Region

The MANPRINT community has grown significantly over the past several years. During this growth period, the U.S. Army Soldier Support Center, TRADOC's proponent for MANPRINT training and implementation, has led the effort to institutionalize MANPRINT throughout the Army. Soldier Support Center-National Capital Region (SSC-NCR), a subordinate command responsible for all MANPRINT initiatives, has provided the assistance necessary to incorporate MANPRINT into the materiel acquisition process. SSC-NCR's primary mission is to provide the field with the blueprint to make MANPRINT happen and to train those individuals who will use that blueprint to ensure that the systems development process addresses man/machine integration.

In 1984, SSC-NCR initiated and managed the first major front-end analysis using the Hardware vs. Manpower (HARDMAN) Comparability Methodology, which was adopted from the Navy for Army use by the U.S. Army Research Institute for Behavioral and Social Sciences (ARI). In HARDMAN analysis, a notional system is developed using real components and actual data. Estimations of the proposed system's effect on manpower, personnel, and training (MPT) are madewhile the system is still on the drawing board; if the system adversely impacts MPT, changes can be made easily and without expensive modification. HARDMAN has been applied to 15 separate major weapons systems.

SSC met the need for appropriate guidance to document the MANPRINT mission with the publication of the "System MANPRINT Management Plan (SMMP) Procedural Guide." This guide provides a detailed description of how to plan, develop, manage, and document a system's MANPRINT actions. SSC-NCR continues to refine and streamline the guide to ensure its usefulness to the MANPRINT community.

SSC-NCR developed and is the proponent for the Early Comparability Analysis (ECA) methodology. ECA assesses MPT and human factors through a "lessons learned approach, emphasizing qualitative soldier issues. The "Early Comparability Analysis Procedural Guide" provides the user with a detailed description of how to perform this MANPRINT-oriented data management tool.

In September 1987, the "MANPRINT Risk Assessment Guide" was published to assist in the identification and evaluation of the MANPRINT risk associated with the development of an emerging materiel system, a system under Materiel Change Management, or a Non-Developmental Item. Although it was designed primarily for the Materiel System Project Officer, the "MANPRINT Risk Assessment Guide" is an effective tool for many in the acquisition community.

A TRADOC supplement to AR 602-2, soon to be published, will provide the first definitive guidance on MANPRINT roles and responsibilities within the TRADOC community. This supplement, in answer the numerous requests from the field, should serve as the key MANPRINT directive for the TRADOC MANPRINT community.

Since 1987, SSC-NCR has been the proponent for MANPRINT training. The MANPRINT Staff Officers Course (MSOC), conducted at Fort Belvoir, Virginia, is a three-week course for action officers involved in the MANPRINT effort. The MANPRINT Senior Training Course (MSTC), a one-week course designed for senior-level executives and managers, is conducted on-site alternately at TRADOC and AMC installations. These courses are available to military, civilian and industry participants.

SSC-NCR continues to contribute to the MANPRINT effort by assessing the manpower and personnel implications of materiel requirements and program documents; participating in the TRADOC Materiel Evaluation Committees (TMECs) and in MANPRINT Joint Working Groups (MJWGs); providing Contracting Officer Representatives (CORs) for contractual applications of MANPRINT methodologies and guidance to proponent CORs; and conducting independent MPT analyses of materiel systems for the Office of the Deputy Chief of Staff for Personnel.

Since the inception of MANPRINT, SSC has provided TRADOC proponents with the guidance, training and tools necessary to accomplish their MANPRINT missions. As MANPRINT evolves and is institutionalized, procedures to facilitate the incorporation of new and improved MANPRINT initiatives into the materiel acquisition process will be developed and distributed. Responsiveness has become a hallmark of SSC-NCR's involvement in MANPRINT.

*For more information, contact Ms. Diana D. Lueker, SSC-NCR, AV221-2091.*



## Schedule of MANPRINT Courses for FY89

### MANPRINT Senior Training Courses

13 Feb 89 - 17 Feb 89 (Rock Island, IL)  
20 Mar 89 - 24 Mar 89 (Ft. Benning, GA)  
17 April - 21 April 89 (Orlando, FL)

### MANPRINT Staff Officers Courses\*\*

06 Mar 89 - 24 Mar 89	05 Jun 89 - 23 Jun 89
03 Apr 89 - 21 Apr 89	10 Jul 89 - 28 Jul 89
01 May 89 - 19 May 89	11 Aug - 25 Aug 89

\*\*All courses will be held at the Casey Bldg., Humphrey's Engineer Support Activity Complex, Ft. Belvoir, VA.

## MANPRINT INFORMATION

**POLICY** - MANPRINT Directorate, HQDA (DAPE-MR), Washington, DC 20310-0300. AV 225-9213, COM (202) 695-9213.

**MANPRINT TRAINING** - Soldier Support Center-National Capital Region, ATTN: ATNC-NM, 200 Stovall St., Alexandria, VA 22332-0400. AV 221-3706, COM (703) 325-3706.

**PROCUREMENT & ACQUISITION** - US Army Materiel Command, ATTN: AMCDE-PQ, 5001 Eisenhower Ave., Alexandria, VA 22333-0001. AV 284-5696, COM (202) 274-5696.

**HUMAN FACTORS ENGINEERING STANDARDS AND APPLICATIONS** - Human Engineering Laboratory - MICOM Detachment, ATTN: SLCHE-MI, Redstone Arsenal, AL 35898-7290. AV 746-2048, COM (205) 876-2048

**MANPOWER, PERSONNEL AND TRAINING RESEARCH** - Army Research Institute, ATTN: PERI-SM, Alexandria, VA 22333-5600. AV 284-9420, COM (202) 274-9420.

LTG Allen K. Ono, Deputy Chief of Staff for Personnel

MG Stephen R. Woods, Jr., Commander, Soldier Support Center (Proponent for Army MANPRINT Training)

Mr. Harry Chipman, ODCSPER Coordinator

Ms. Nan B. Irick, Editor



14-16 February 1989

**Tactical Vehicles Conference.** Orlando, FL.  
Contact: COL William King, (USA, Ret.), American Defense Preparedness Assn., TMAS, Rosslyn Center, Suite 900, 1700 N. Moore St., Arlington, VA 22209. Telephone: (703) 522-0416.

20 February - 2 March 1989

**Test and Evaluation Symposium V, "Testing in the 90's."** White Sands Missile Range, NM.  
Contact ADPA, TMAS, Rosslyn Center, Suite 900, 1700 N. Moore St., Arlington, VA 22209. Telephone: (703) 522-1820.

6-10 March 1989

**Technology and Innovations in Training and Education Conference (TITE '89).** Atlanta, GA.  
Contact: Cpl. Nelson Jackson, (USN, Ret.), American Defense Preparedness Assn., TMAS, Rosslyn Center, Suite 900, 1700 N. Moore St., Arlington, VA 22209. Telephone: (703) 522-0416.



## GENERAL INFORMATION



• Proposed articles, comments, and suggestions are welcomed, and should be mailed to: MANPRINT Bulletin, ATTN: HQDA (DAPE-MR), Washington, DC 20310-0300. Telephone: AV 225-9213, COM (202) 695-9213.

Harold R. Booher  
Director for MANPRINT

The MANPRINT Bulletin is an official bulletin of the Office of the Deputy Chief of Staff for Personnel (ODCSPER), Department of the Army. The Manpower and Personnel Integration (MANPRINT) program (AR 602-2) is a comprehensive management and technical initiative to enhance human performance and reliability during weapons system and equipment design, development, and production. MANPRINT encompasses the six domains of manpower, personnel, training, human factors engineering, system safety, and health hazard assessment. The focus of MANPRINT is to integrate technology, people, and force structure to meet mission objectives under all environmental conditions at the lowest possible life-cycle cost. 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 bimonthly under contract by Automation Research Systems, Ltd., 4480 King Street, Suite 500, Alexandria, Virginia 22302, for the MANPRINT Directorate, Office of the Deputy Chief of Staff for Personnel under the provisions of AR 310-2 as a functional bulletin.