MANPRINT
U.S. Army MANPRINT Program
FALL/WINTER 2012

DIRECTOR'S CORNER

By Dr. Michael Drillings

Dr. Michael Drillings

Director of MANPRINT

We recently held a MANPRINT Practitioner's Workshop in September. It was a great event highlighted by a very supportive keynote presentation by MG Harold Greene, the Deputy for Acquisition and Systems Management in ASA (ALT). MG Greene spoke of the importance of Soldier issues in making acquisition decisions and of MANPRINT's contributions to that process. We also heard a second keynote address by BG Dan Hughes, the Director for System of Systems Integration in ASA (ALT). BG Hughes spoke of the Network Integration Exercise (NIE) and the potential role of the MANPRINT community. We have recently been able to follow-up on his comments with BG Dragon, Commander of the Brigade Modernization Command (BMC) at Ft Bliss. As a result of these discussions, I believe that our community has positioned itself much better to use our skills appropriately and effectively at the NIE.

Once again, for me, the Workshop was an excellent opportunity to talk with MANPRINT practitioners about the challenges that they face, to bring them into contact with the people who use their products, to hear of advances in the MANPRINT enterprise, and for me to show practitioners how much I appreciate all they have done for the Army and its Soldiers. I would particularly like to congratulate again the people whose work was specifically recognized for its contributions to the Army. The complete list of MANPRINT award winners is on our web site at http://www.manprint.army.mil and on page 11 of this newsletter. MANPRINT continues to be an essential part of Army acquisition that is widely appreciated both within the acquisition community and in other areas in the Army. The MANPRINT community sets the standard for how HSI should be performed in organizations. Certainly, there remain opportunities for doing our job even better, but if anyone has an example of a more effective HSI program in either government or industry, I would like to know of it.

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In Defense of Future Combat Systems (FCS)

By David Harrah (ARL HRED)
and Stephen Merriman
(Boeing Special Projects Dallas)

INSIDE THIS ISSUE

The FCS program ended over three years ago but negative connotations remain throughout the Army. MANPRINT problems existed also but there were significant positive aspects; many remain beyond its demise.

1. MANPRINT was involved early – In March 1999, four months prior to designation of a Program Manager (PM), Jim Walbert included MANPRINT in his Technical IPT and LTC Von Fosson formally included MANPRINT as the first PM FCS. MANPRINT continued throughout the next 8 years from COL Johnson to MG Bartley. Many issues (such as operations on the move, indirect vision driving, motion effects, multi-functional Soldiers, unmanned system control, Graphical User Interface (GUI) common look and feel and active armor control) were identified that continued all through FCS, the two years of

(Continued on page 3)

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DIRECTOR'S CORNER

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We are all aware that we are within an era of shrinking resources. Prospering in this environment requires not only an excellent product, which we have, but also a practical, dynamic, and ambitious plan for the future. The recent funding increase for moving MANPRINT left (MML) provides a great opportunity for us to leverage on-going efforts and launch new initiatives to quantify the impact of MANPRINT early in the program lifecycle. We are also moving ahead by getting more involved with the Army systems engineering community and the Defense Operational Test & Evaluation (DOT&E) agency. We have just reached a new agreement with ATEC on the conduct of NIEs, which will improve the application of MANPRINT in those exercises. No one can quite be certain of how the coming budget and organizational challenges will be resolved, but I believe that we have positioned ourselves well for the future.

A few months ago, I saw the final report on the cause of the Japanese nuclear plant disaster that was precipitated by the tsunami. The summary sentence said, "Japan's Fukushima nuclear crisis was a preventable disaster resulting from collusion among the government, regulators and the plant operator...." I think of MANPRINT as the community that is charged with making sure that the Army doesn't fool itself into thinking that things work when they don't. In a sense, we are the "regulator." We would never want to be accused of contributing to some disaster by being too easy on those we have to assess. It has been one of the great experiences and honors of my professional life to know that I serve with others who take their professional responsibilities so seriously.

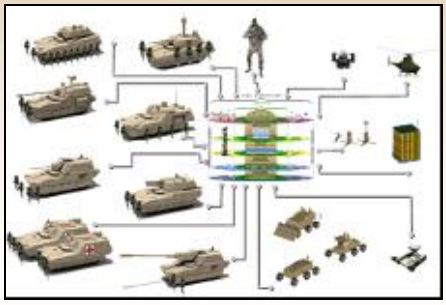
In Defense of Future Combat Systems (FCS)

(from page 1)

Brigade Combat Team Modernization (BCTM), and into current research and development programs. In addition, John Hawley (ARL HRED) identified issues in Manpower, Personnel, and Training that have now become evident in current operations with sophisticated systems like Patriot.

2. Statement of Work (SOW) and Requirements - We included MANPRINT in each of the major IPTs (SOS, MGV, C4ISR, UAV, UGV). The FCS/BCTM contract package served as a model that later aided Cheryl Burns (ARL HRED) with early involvement in Ground Combat Vehicle (GCV). Even though the FCS SOW did not address individual manpower, personnel, human factors engineering and survivability domains directly, the Lead Systems Integrator (LSI) included 100 requirements at the SOS level that flowed into over 1000 requirements in FCS major system specifications

FCS Joint Network System of Systems



Most of our requirements were included; difficult since 300+ of the 550 or so requirements in the Operational Requirements Document impacted MANPRINT.

3. SMICA –Stands for *Soldier Machine Interface Compliance Analysis*. The concept, a giant spreadsheet that contained all MANPRINT aspects for a system, was started by Kristin Little and Dennis Alejandro (Boeing) and developed in detail by Craig Pfledderer (Lockheed).

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In Defense of (FCS) *(from page 3)*

SMICA was used eventually across the whole program thanks to implementation efforts by Dennis Alejandro in conjunction with the process developed by Chris Arbak (Boeing), to assess the extent of MANPRINT incorporation.

4. Soldier Machine Interface Standard (SMI Standard) – We mandated MIL STD 1472 in the contract. We caught tremendous flak from all sides but the requirements in MIL-STD-1472F formed the core of the SMICA for assessing all FCS systems thanks to years of work by Kristin Little (Boeing) that created the SMI Standard.

5. Warfighter Machine Interface (WMI) – Started by Emily Howard (Boeing), WMI provided a complete analysis of information needs across all MOSs in the 3315-Soldier FCS Brigade, that led to a common graphical user interface. WMI would have cut training costs dramatically and eliminated the proliferation of current display interfaces. Matt Hannen's (Boeing) and Mica Endsley's (SA Tech) teams conducted countless coordination sessions with Integrated Product Team MANPRINT leads such as Jeff Powers and Raleigh Little (United Defense), Ralph Seigrist and Nancy Ciapara (General Dynamics), Tom Ball (Boeing), Craig Fong (Boeing), and Oded Flascher and Tom Metzler (SAIC). Late in development, a plan was approved by FCS management to implement MANPRINT-run and Soldier-manned WMI simulator assessments as a final check prior to implementation.

6. JACK – Rick Kozycki (ARL HRED) developed and standardized JACK human figure models outfitted in combat gear with help from Ed Bellandi (UDLP). Similar models are used now on other programs. FCS was one of the first Army programs to implement the "Central 90%" concept as opposed to "5th to 95th" and as with any new concept, required many explanations over many years. We found that the two complement each other. The central 90% "total accommodated percentage" approach has potential to make significant improvements in warfighter safety and performance.

7. IMPRINT - FCS made extensive use of IMPRINT models from Diane Mitchell and teammates at ARL HRED. IMPRINT impacted crew size for manned ground vehicles, Battalion operations, and control of unmanned systems; and frequently pushed the state of the art in modeling Soldier performance.

8. Issue tracking database - Quarterly meetings were held to review the issue tracking database. This meeting took 3 days to review the 140 issues just at the SOS level. At the MGV, UGV, and C4ISR system levels, there were even more extensive databases.

9. MANPRINT Technical Interchange Meeting

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In Defense of (FCS) *(from page 4)*

(TIMs) - We held some of the largest MANPRINT meetings ever as part of a project. At its peak we had 75+ human factors personnel from government and industry at our TIMs.

10. Staff – LSI MANPRINT staff at the SOS level (Larry Segelken, Chris Arbak, Randi Rohrer, Noreen McQuinn, Janice Johnson, Kristin Little, Dennis Alejandro, Leo Brewer, and Nicole Arslanbas - Boeing) plus MGV staff (Glenna Satalich and Mike Dresel – Boeing) were involved in all aspects of FCS design.

11. Research - Due to the all-encompassing nature of FCS, Harrah reviewed every Advanced Technology Objective from a MANPRINT perspective and interacted with large segments of the research community.

12. Test and Evaluation Master Plan (TEMP) - Early in development of the TEMP, Jay Winters (Army Test and Evaluation Command) and Harrah developed a Data Source Matrix for all the potential issues identified. That matrix was entered into the first editions of the TEMP. Later, Rick Tauson, (ARL HRED), integrated government MANPRINT into the test process which carried into the current Network Integrated Evaluations.

13. Program Reviews - MANPRINT was integral to every review. We briefed at SRR, SFR, pre-PDRs and pre-CDRs. At the actual PDRs and CDRs, MANPRINT was embedded in IPT briefings.

14. Hierarchy - MANPRINT was far down the bureaucratic chain at the beginning of the program. With each reorganization, MANPRINT rose up the ranks. We also received help from Dr. Drillings from the G-1 MANPRINT office to get MANPRINT appropriately funded.

15. Manpower Estimates (MEs) - MEs existed from the start of the program. Alan Akman's (Akman Associates) MEs showed the impact for an entire Brigade's equipment, not just a single system; a first for the Manpower and Reserve Affairs office at the Pentagon. Involving the Lead Systems Integrator (LSI) in development of the ME provided LSI MANPRINT specialists with insight into the Army's Manpower and Personnel process. We never had a Target Audience Description (TAD) from TRADOC but Leo Brewer (Boeing) came close late in the program by coordinating with dozens of TRADOC offices for over 100 MOSs and specialties.

16. MANPRINT Documentation - A Human Systems Integration Report (HSIR) was developed and submitted by Boeing SOS prior to

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In Defense of (FCS) *(from page 5)*

each major program milestone. These report document results of MANPRINT analyses, design recommendations and progress. The final HSIR documented the MANPRINT successes on the program. The FCS HSIR served as a primary example for the DOD's HSIR Data Item Description (DID) (DI-HFAC-81833), which was approved for use on 02 March 2011. Although the LSI was not required to submit an SMMP, Boeing prepared and implemented one. This plan served as a model for DOD's Data Item Description for the Human Systems Integration Plan (DI-HFAC-81743), which was originally approved for use on 04 April 2007 and updated on 21 April 2011. In the absence of a DOD-level handbook or standard, these two DOD DIDs currently serve as the primary means for defining HSI/MANPRINT program requirements for contractors.

Few things went smoothly. But FCS MANPRINT was a massive undertaking that involved dozens of good people on both the government and industry sides, and provided lessons learned that are impacting current programs, both development and research, today. And, early involvement doesn't guarantee involvement over a long program. MANPRINT requires hard work to get involved and even more as the program executes; especially on a program the size of FCS.

MANPRINT Support to the Future Vertical Lift/Joint Multi-Role Aircraft Program

Dave Durbin, Richard Kozycki, Jim Faughn, Ron Carty, Jamison Hicks
U.S. Army Research Laboratory, Human Research and Engineering Directorate

The Future Vertical Lift/Joint Multi-Role (FVL/JMR) program is the planned next generation fleet of aircraft for the Department of Defense (DoD). FVL/JMR will include light, medium, heavy, and ultra heavy classes of aircraft with cognitive decision aiding for pilots, multi spectral sensors, capability to operate in degraded visual environments, and increased hover, speed, range, and troop/payload capacities beyond current degraded visual

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FVL/JMR Concept Design

MANPRINT Support to the FVL/JMR *(from page 6)*

environments, and increased hover, speed, range, and troop/payload capacities beyond current aircraft.

Future Vertical Lift refers to the planned program of record for the next generation of aircraft. Joint Multi-Role refers to the science and technology program and two prototype aircraft that will be used to help develop FVL design requirements. The FVL/JMR program is in the early concept phase with milestone A scheduled for 2018.

It is important to conduct MANPRINT analyses early in the concept phase of system development. This helps identify the optimal design solutions for Soldiers and minimizes schedule risk and cost as the system proceeds through development. To address MANPRINT requirements early in the concept phase, the Army Research Laboratory, Human Research and Engineering Directorate (ARL HRED) is conducting human-figure modeling and Soldier-in-the-Loop assessments to identify space requirements and design options for the FVL/JMR aircraft. The modeling and assessments are multi-year efforts and initially focused on the medium class aircraft. ARL HRED is partnering with the Aviation and Missile Research Development and Engineering Center (AMRDEC), Aviation Center of Excellence, Fort Rucker, AL, Maneuver Center of Excellence, Fort Benning, GA, and the Army Medical Department Center, Fort Sam Houston, TX to conduct the modeling and assessments.

Figure 2. Space Requirements for Infantry Soldiers

To date, ARL HRED has conducted modeling to assess cabin space requirements for Soldiers and their combat gear. The modeling has evaluated ingress and egress, seat space, cabin door size, ceiling height, combat gear stowage and cabin configuration requirements. Figures 2 and 3 are examples of the modeling conducted by ARL HRED. Initial results of the modeling have been provided to the government partners and industry to develop cabin dimensions and help ensure Soldiers and their gear will be effectively accommodated in the medium class aircraft.

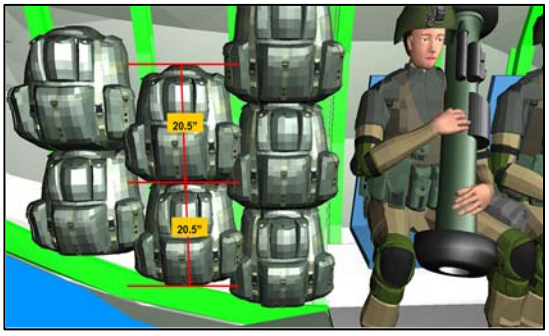

Figure 3. Space Requirements for Combat Gear

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MANPRINT Support to the FVL/JMR *(from page 7)*

To augment the modeling, ARL HRED and the AMRDEC Aeroflight Dynamics Directorate conducted an assessment of space requirements and design options during September 2012 at the Maneuver Center of Excellence, Maneuver Battle Laboratory. The assessment was conducted using a mock-up of the medium class aircraft cabin. Eighteen infantry Soldiers assigned to the Maneuver Battle Laboratory Experimental Force participated in the assessment to evaluate cabin dimensions for seat spacing, ingress, egress, ceiling height and cabin configuration design options and requirements.

The mock-up (Figures 4 & 5) was designed by ARL HRED and AMRDEC. It was constructed of lumber and plywood and consisted of adjustable Plexiglas seat space dividers, an adjustable mesh cabin ceiling, reconfigurable benches, two adjustable width doors at the front of the mock-up, and an aft ramp. Adjustability of the cabin ceiling, seat space dividers, door widths, and benches allowed assessment of different interior dimensions to evaluate space requirements for groups of 9, 14, and 18 Soldiers with their combat gear.

Figure 4. Infantry Soldiers & Gear Seated In Mock-Up

Figure 5. Egress for Infanty Soldiers & Gear

Data from the assessment were analyzed and a report written by ARL HRED. The report was sent to the government partners and industry. It provided recommendations for space requirements and design options. Results from the assessment supported the modeling conducted by ARL HRED and will help ensure that Soldiers are accommodated in the medium class aircraft.

Future MANPRINT efforts will include modeling for all FVL/JMR aircraft classes. ARL HRED will incorporate data from the anthropometric survey II (ANSUR II) study, design of future combat gear for Soldiers and the next generation aviation life support equipment (for pilots) into the human-figure models as they become available. This will help ensure that the FVL/JMR aircraft design addresses current and future Soldier populations and their gear. Additionally, ARL HRED will incorporate MANPRINT requirements into FVL/JMR program documents and assess the requirements during testing of the prototype aircraft.

2012 MANPRINT Practitioners Workshop

On behalf of the MANPRINT Directorate, we would like to thank all who attended and participated in the MANPRINT Practitioners Workshop that was held on 25-26 September 2012 in Alexandria, VA. In addition to a large number of participants from within the Army Community, especially Army Research Laboratory (ARL), Human Research and Engineering Directorate (HRED), there were representatives from all of the services, OSD, several academic institutions, and private industry. The workshop consisted of two days dedicated to presentations that were comprehensive of a variety of topics of interest, current events, and HSI advances designed to exchange information within the MANPRINT community.

Dr. Drillings (front and center, seventh from the left) finds himself surrounded by MANPRINT Practitioners from ARL HRED.

This year's Keynote Speakers included MG Harold Greene, Deputy for Acquisition and Systems Management (DASM) and BG Daniel Hughes, Director System of Systems Integration who provided valuable insight into MANPRINT from a Senior Leadership perspective.

MG Harold Greene, (DASM)
Deputy for Acquisition and Systems Management

BG Daniel Hughes,
Director System of Systems Integration

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2012 MANPRINT Practitioners Workshop Awardees

The following Practitioners received awards for their outstanding achievement and dedication to the Army and the MANPRINT Mission:

Combat Developer/ Functional Proponent:	**Organization**
William Michael McDevitt	US Army Institute of Public Health
Cheryl Burns	ARL HRED

Army Material/ Automated Information System Programs:

Christopher Paulillo	ARL HRED
Diane Quarles	ARL HRED
Richard Kozycki	ARL HRED
Dave Durbin	ARL HRED
Jamison Hicks	ARL HRED
Leticia Pacheco	ARL HRED
Anthony Morris	ARL HRED

Special Achievement:

Sam Middlebrooks	ARL HRED
Jock Grynovicki	ARL HRED

All presentations available for public release can be obtained from www.manprint.army.mil or by contacting Emilie Menefee at emilie.c.menefee.ctr@mail.mil

MANPRINT EDUCATION

MANPRINT FAMILIARIZATION COURSE			
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15-Jan-13	9:30-12:00	Huntsville, AL	Ms. Kelly Hopkins, MANPRINT Education Administrator khopkins@alionscience.com
12-Feb-13	9:30-12:00	Huntsville, AL	Ms. Kelly Hopkins, MANPRINT Education Administrator khopkins@alionscience.com
12-Mar-13	9:30-12:00	Huntsville, AL	Ms. Kelly Hopkins, MANPRINT Education Administrator khopkins@alionscience.com
16-April-13	9:30-12:00	Huntsville, AL	Ms. Kelly Hopkins, MANPRINT Education Administrator khopkins@alionscience.com
14-May-13	9:30-12:00	Huntsville, AL	Ms. Kelly Hopkins, MANPRINT Education Administrator khopkins@alionscience.com
18-June-13	9:30-12:00	Huntsville, AL	Ms. Kelly Hopkins, MANPRINT Education Administrator khopkins@alionscience.com

Soldier Systems & Army Requirements Training & Development Meeting
28-30 January 2013
Crystal City, VA
http://www.soldiertechnologyus.com

AUSA ILW Winter Symposium and Exposition

20-22 February 2013
Ft. Lauderdale, FL
www.ausa.org

AAAA Annual Professional Forum & Exposition
10-13 April 2013
Ft Worth, TX
www.quad-a.org

Joint HSI Pentagon Exhibit

May 2013
Washington, DC
www.manprint.army.mil

The MANPRINT Newsletter is an official bulletin of the Deputy Chief of Staff, G-1, 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 seven key domains: manpower, personnel, training, human factors engineering, system safety, health hazards, and soldier survivability. 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 prepared twice yearly under contract for the MANPRINT Directorate, G-1, under the provisions of AR 25-30 as a functional bulletin.

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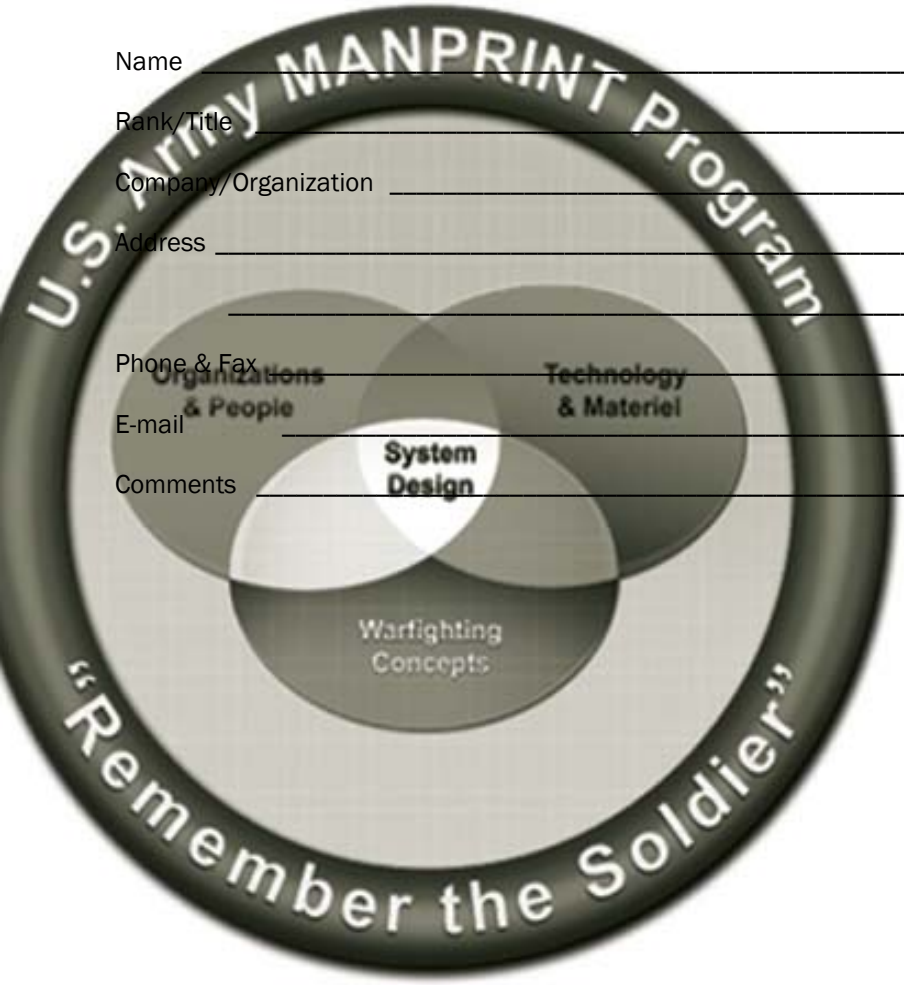

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