

29 OCT 1990

29 OCT 1990

2

AD-A228 290 DOCUMENTATION PAGE

Form Approved
OPM No. 0704-0188

maintaining the data needed, and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503.

1. AGENCY USE ONLY (Leave Blank)		2. REPORT DATE May 89	3. REPORT TYPE AND DATES COVERED Final
4. TITLE AND SUBTITLE MANPRINT/Systems Safety Interface			5. FUNDING NUMBERS NA
6. AUTHOR(S) MAJ Lawyn C. Edwards and CPT Patrick V. Adamcik			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Safety Center ATTN: CSSC-SE Ft. Rucker, AL 36362-5363			8. PERFORMING ORGANIZATION REPORT NUMBER DA SSCP-TSP TR 89-2
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) DA System Safety Coordinating Panel - Technical Subpanel U.S. Army Safety Center ATTN: CSSC-SE Ft. Rucker, AL 36362-5363			10. SPONSORING/MONITORING AGENCY REPORT NUMBER NA
11. SUPPLEMENTARY NOTES None			
12a. DISTRIBUTION/AVAILABILITY STATEMENT Unlimited			12b. DISTRIBUTION CODE
13. ABSTRACT (Maximum 200 words) This report provides guidance for Safety Engineers and Specialists regarding how System Safety and Manpower and Personnel Integration (MANPRINT) should interface throughout the life cycle of a system. It explains what MANPRINT is, what its goals are and how system safety will interface with MANPRINT. This report also provides information regarding responsibilities for specific tasks and documentation throughout the life cycle necessary for the proper functioning of this interface.			
14. SUBJECT TERMS MANPRINT System Safety Acquisition Documents			15. NUMBER OF PAGES 41
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT SAR

DTIC
ELECTE
NOV 05 1990
S E D

GENERAL INSTRUCTIONS FOR COMPLETING SF 298

The Report Documentation Page (RDP) is used in announcing and cataloging reports. It is important that this information be consistent with the rest of the report, particularly the cover and title page. Instructions for filling in each block of the form follow. It is important to **stay within the lines to meet optical scanning requirements.**

Block 1. Agency Use Only. (Leave blank).

Block 2. Report Date. Full publication date including day, month, and year, if available (e.g. 1 Jan 88). Must cite at least the year.

Block 3. Type of Report and Dates Covered. State whether report is interim, final, etc. If applicable, enter inclusive report dates (e.g. 10 Jun 87 - 30 Jun 88).

Block 4. Title and Subtitle. A title is taken from the part of the report that provides the most meaningful and complete information. When a report is prepared in more than one volume, repeat the primary title, add volume number, and include subtitle for the specific volume. On classified documents enter the title classification in parentheses.

Block 5. Funding Numbers. To include contract and grant numbers; may include program element number(s), project number(s), task number(s), and work unit number(s). Use the following labels:

C - Contract	PR - Project
G - Grant	TA - Task
PE - Program Element	WU - Work Unit
	Accession No.

Block 6. Author(s). Name(s) of person(s) responsible for writing the report, performing the research, or credited with the content of the report. If editor or compiler, this should follow the name(s).

Block 7. Performing Organization Name(s) and Address(es). Self-explanatory.

Block 8. Performing Organization Report Number. Enter the unique alphanumeric report number(s) assigned by the organization performing the report.

Block 9. Sponsoring/Monitoring Agency Name(s) and Address(es). Self-explanatory.

Block 10. Sponsoring/Monitoring Agency Report Number. (If known)

Block 11. Supplementary Notes. Enter information not included elsewhere such as: Prepared in cooperation with...; Trans. of...; To be published in... When a report is revised, include a statement whether the new report supersedes or supplements the older report.

Block 12a. Distribution/Availability Statement.

Denotes public availability or limitations. Cite any availability to the public. Enter additional limitations or special markings in all capitals (e.g. NOFORN, REL, ITAR).

DOD - See DoDD 5230.24, "Distribution Statements on Technical Documents."
DOE - See authorities.
NASA - See Handbook NHB 2200.2.
NTIS - Leave blank.

Block 12b. Distribution Code.

DOD - DOD - Leave blank.
DOE - DOE - Enter DOE distribution categories from the Standard Distribution for Unclassified Scientific and Technical Reports.
NASA - NASA - Leave blank.
NTIS - NTIS - Leave blank.

Block 13. Abstract. Include a brief (Maximum 200 words) factual summary of the most significant information contained in the report.

Block 14. Subject Terms. Keywords or phrases identifying major subjects in the report.

Block 15. Number of Pages. Enter the total number of pages.

Block 16. Price Code. Enter appropriate price code (NTIS only).

Blocks 17. - 19. Security Classifications. Self-explanatory. Enter U.S. Security Classification in accordance with U.S. Security Regulations (i.e., UNCLASSIFIED). If form contains classified information, stamp classification on the top and bottom of the page.

Block 20. Limitation of Abstract. This block must be completed to assign a limitation to the abstract. Enter either UL (unlimited) or SAR (same as report). An entry in this block is necessary if the abstract is to be limited. If blank, the abstract is assumed to be unlimited.

May 1989

Report No: TR 89-2

MANPRINT/System Safety Interface

System Safety Coordinating Panel
Technical Subpanel

REPORT



90 11 1989

ABSTRACT

This report provides guidance for Safety Engineers and Specialists regarding how System Safety and Manpower and Personnel Integration (MANPRINT) should interface throughout the life cycle of a system. It explains what MANPRINT is, what its goals are and how system safety will interface with MANPRINT. This report also provides information regarding responsibilities for specific tasks and documentation throughout the life cycle necessary for the proper functioning of this interface.



Accession For	
NTIS GRA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	

INTRODUCTION

For several years, the Army System Safety community has attempted to exert influence in the Army's materiel acquisition process. System Safety has succeeded in developing requirements to ensure safety is considered during the development of systems under Army regulation, AR 385-16, "System Safety Engineering and Management", dated 3 Sep 85. In the second quarter of 1985, the Department of the Army initiated a new process called Manpower and Personnel Integration (MANPRINT). In addition to several other domains, this process encompasses system safety and its policies. MANPRINT is envisioned as an "umbrella" program that will span six domains: manpower, personnel, training, human factors engineering, system safety and health hazards. It is now up to the system safety community (military and industry) to determine exactly how it will interface with MANPRINT. The Department of the Army System Safety Coordinating Panel-Technical Subpanel (SSCP-TSP) recognized this need and initiated this report to help clarify the interface.

DISCUSSION

One objective of this report is to clarify the interface between MANPRINT and System Safety in terms of their functions, organizations involved and relative timing of tasks. This will be accomplished by explaining what MANPRINT is, what its goals are, where system safety fits into the overall process, how system safety will have to interface with MANPRINT, and how MANPRINT will have to interface with system safety. A second objective of this report is to clarify the responsibilities of the system safety engineer/specialist preparing and reviewing documents during the acquisition life cycle of a system. In order to be specific, this report refers to AMC as a specific materiel developer command. Other materiel developers can/should apply this report to their local situations in a like manner (ie, medical materiel, SDI, facilities, information systems).

This report consists of two sections. Section one describes what MANPRINT is and how System Safety is envisioned to interface with MANPRINT in the requirement documents and the Milestone Review process. Section two describes the acquisition cycle documents and tasks for which the system safety engineer/specialist is responsible.

SECTION 1

This section will attempt to answer some of the questions which have been brought about by the creation of MANPRINT. It will explain what MANPRINT is, what its goals are, where system safety fits into the overall process, how system safety will have to interface with MANPRINT, and how MANPRINT will have to interface with system safety.

I. WHAT IS MANPRINT?

A. Increasingly, the Army has found it necessary to rely on engineering and technology to obtain quantum jumps in capability to meet near-term and projected long-term threats. As the Army has become more technology dependent, it has been plagued by mismatches between equipment, soldier operators and maintainers, civilian maintainers at depot level, and the Army force structure. When hearing of this problem, Congress posed the following question to the Department of Defense (DOD): "Are the Armed Forces getting what they are paying for in total weapon system performance or are critical resources being wasted to acquire high-capability technology that exceeds the limits of human capability?". MANPRINT was developed by the Army to answer this question.

B. MANPRINT is a comprehensive management and technical program to enhance human performance and reliability in the operation, maintenance and use of weapon and equipment systems. Its objective is to influence soldier-materiel system design for optimum total system performance by considering manpower (spaces), personnel (faces), training, human factors engineering, system safety, and health hazards before making a functional allocation of tasks between people, hardware and software. In the past, system design was not impacted by MANPRINT design constraints or a disciplined process that insisted on putting "the man-in-the-loop". Instead, the system design process was built on the unstated premise that sufficient numbers of skilled soldiers would always be available to operate, support, and maintain the system. The essence of MANPRINT is to reduce the demand for manpower with unrealistic required skills resulting from the acquisition of new and sophisticated materiel. Dealing with these issues up front assures that the Army force structure and soldier capabilities are reflected in the decisions that affect each individual system development.

C. The Army is implementing MANPRINT as a tailored program for all materiel acquisitions, ranging from major weapon systems to less costly product improvement proposals (PIP)/Materiel Changes (MC) and non-developmental item (NDI) acquisitions (reference AR 602-2, Manpower and Personnel Integration, dated 17 Apr 87). The effort given to a system will depend on the type of system. If a system has little man-machine interface, such as an NDI acquisition of a computer printer, very little MANPRINT involvement will be needed; when

considering a system such as the Light Helicopter Experimental (LHX), a major MANPRINT effort will be needed to ensure all man-machine interface issues are considered.

D. The key players in MANPRINT, as well as the materiel acquisition process, are the combat developer, materiel developer evaluators, testers, researchers, training developers, logisticians, and industry. Each of these key players must play a part in the MANPRINT effort and therefore in each of the six domains. Many people have asked the question: "What distinguishes this program from previous attempts at increasing system performance?". The key difference is that MANPRINT is designed to be Proactive. The old approach was to first build the system and then identify the soldier to man it. The new approach is to identify the "typical" soldier first (and other MANPRINT issues) and build the system to accommodate him. In other words, build the equipment for the soldier (present and future) and not expect to find a soldier to fit the equipment.

E. Second, MANPRINT will attempt to identify issues through Front End Analysis. If a MANPRINT issue can be identified up front, the cost associated with the corrective action can be greatly reduced. Figure 1 illustrates the cost associated with a corrective action on a system prior to prototype development versus a correction applied after fielding a system. Identifying potential problem areas up front is expected to play a major role in the designing of the system. The Army has developed several analytical tools to assist the developers in determining the most significant MANPRINT problems (primarily for manpower, personnel and training issues).

COST VERSUS ACQUISITION LIFE CYCLE

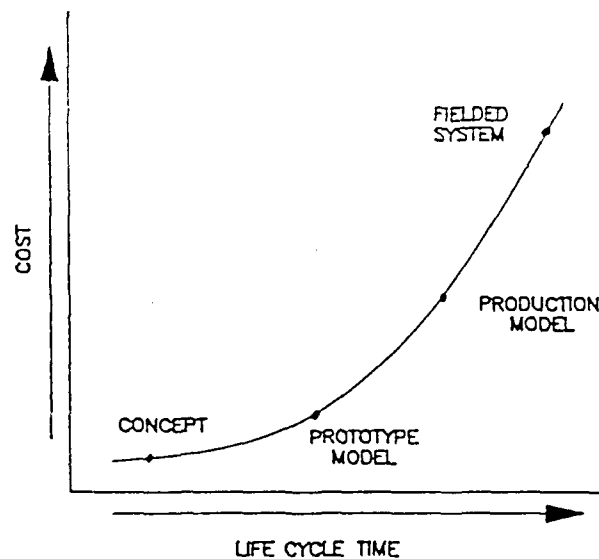


Figure 1

F. Next, MANPRINT is the integrator and representative at the decision reviews of the six domains previously listed. United under the umbrella of MANPRINT, the domains as a group are expected to gain more influence on the Decision Making Authority. However, domains such as System Safety should not be considered subordinate to MANPRINT.

G. MANPRINT analyses are also designed to generate options for design. The results of these analyses will permit MANPRINT to quantify what an option will cost and what benefits are obtained in terms of the six domains and performance -- in other words, to develop tradeoffs.

H. The last difference is that MANPRINT is Performance oriented. MANPRINT will now work alongside Integrated Logistic Support (ILS) managers who have always focused their efforts on personnel supportability issues. MANPRINT plans on focusing its attention on the personnel performance issues not considered by ILS. Yes, there will be overlapping areas of concern, but this will enhance the overall effort.

I. To accomplish the goals mentioned above, the Army must decide what it requires in terms of total system performance. Through intensive front-end analysis, the Army will be able to identify realistic MANPRINT goals and constraints (for all six domains), ultimately appearing as contract design requirements. Based on these requirements, MANPRINT will expect all contractors to answer the following question: "Can this soldier, with this training, perform these tasks, to these standards under these conditions?". The contractor will then be required to employ various predictive and tradeoff design techniques to demonstrate conclusively that design options have accounted for the MANPRINT requirements. The Army will not accept the breaching of MANPRINT goals and constraints without completely understanding the ramifications early in development and without having assurances that the Army can accommodate the changes. Army decision makers will expect clear and convincing evidence from the contractual effort and from Army tests and evaluations to demonstrate that human performance and reliability requirements have been met. Furthermore, decision makers will expect improved human performance to contribute to total system performance.

J. Who must initiate this MANPRINT effort and when? The earlier the MANPRINT effort can be implemented, the greater the effect it will have on system design. The start of any system is the identification of specific mission area deficiencies in the Mission Area Analysis (MAA). This analysis will include a section on MANPRINT deficiencies. Next, the proponent Training and Doctrine Command (TRADOC) combat developer school responsible for a deficient mission area will determine if a materiel solution is needed to resolve the deficiency. If a materiel solution is required, an Operational and Organizational (O&O) Plan will be developed which describes how a new system (whatever it may be) will be used. Just prior to, or in

conjunction with, the initiation of the O&O Plan, the proponent school should charter a MANPRINT Joint Working Group (MJWG). The MJWG should be made up of at least one representative from each of the six domains. In addition, the Army Materiel Command (AMC) as the materiel developer, should have representatives in this group. The group is responsible for planning all MANPRINT inputs and activities for the entire system life cycle. The MJWG manages the MANPRINT issues and provides oversight to ensure that MANPRINT plans are executed and objectives met. The MJWG will meet to develop the System MANPRINT Management Plan (SMMP) which becomes the key document that governs the implementation of MANPRINT requirements for a system (new or modified). The MJWG exists throughout the entire life of the system.

K. The SMMP is the master planning document for MANPRINT activities during system development and is updated by the combat and materiel developer throughout the materiel acquisition process. This plan lays out the MANPRINT goals and constraints, issues, areas of concern, data needs, data sources, analyses, tradeoffs, milestones, and decisions that must be made to ensure that MANPRINT is considered in the acquisition process. The SMMP should also identify any special coordination or interface required among the six domains and MANPRINT. This document will serve as an input document to the O&O Plan, Required Operational Capability (ROC), Test and Evaluation Master Plan (TEMP), key management documents, and finally the Request for Proposal (RFP). Each of these documents requires a MANPRINT section and therefore input from each of the six domains. The input should come from the SMMP which was written by representatives of the domains. Figure 2, Information Flow in Requirements Documents, shows how MANPRINT information flows from the time the mission area deficiency is identified up to the time it is addressed in the system design. Industry will also be required to develop one or more program plans to deal with MANPRINT and its domains. The industry MANPRINT program plans should reflect the contractor's plan and strategies to deliver a system that satisfies the Army's MANPRINT goals and constraints. This does not, however, preclude the domain from imposing their own contractual requirements including program plans which shall be consistent with MANPRINT requirements.

INFORMATION FLOW IN REQUIREMENT DOCUMENTS

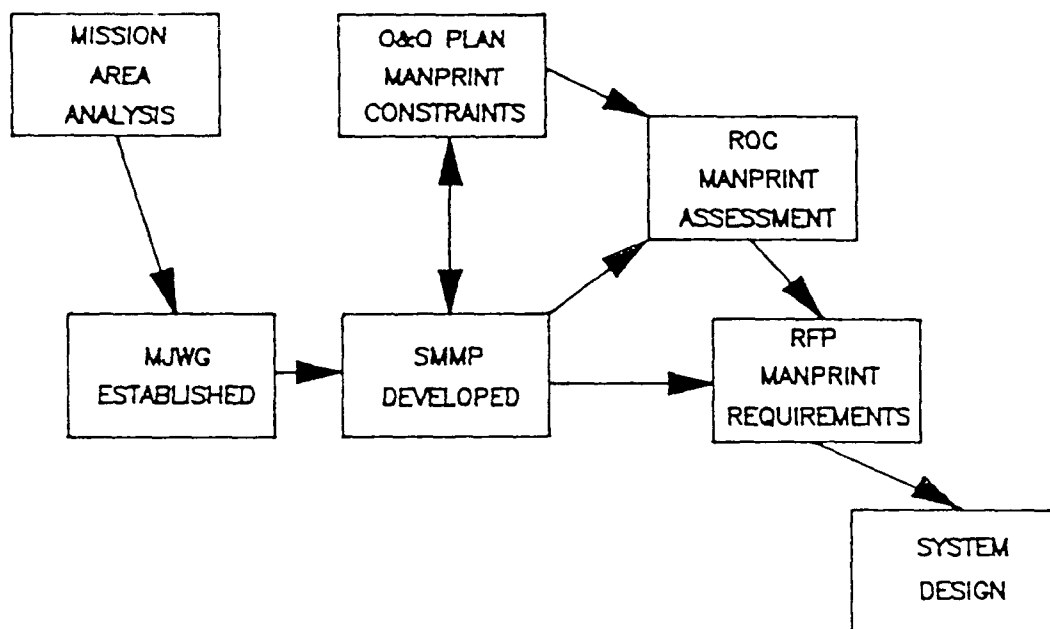


Figure 2

II. SYSTEM SAFETY.

A. System Safety is a process by which the Army maximizes operational readiness and mission protection through accident prevention by ensuring the appropriate hazard control measures are designed into a system in a timely manner and at minimum cost. System Safety attempts to ensure that possible safety and health risks in new designs, materials, processes, and techniques are eliminated through design or controlled to an acceptable level of risk (reference AR 385-16). MANPRINT, as presently defined, does not incorporate all areas that System Safety defines as its responsibility. Certain tasks and processes required to implement system safety must be completed within the system safety function and independent of MANPRINT processes. These areas include, but are not limited to the following: budget requirements, facilities safety, Engineering Change Proposals (ECPs), post fielding safety tracking requirements, materiel only safety deficiencies, and processes. Without going into detail, System Safety will continue with its responsibilities for these areas as defined prior to MANPRINT. What has changed is that MANPRINT has created some additional integration responsibilities for System Safety. MANPRINT will require two things of system safety: ensure that the human is included in safety analyses and tests and that system safety results are coordinated with each of the other domains.

B. System Safety should not consider itself subordinate to MANPRINT. MANPRINT and System Safety coexist and, as such, must be able to interface with each other. To do this, the ground rules must be established from the beginning. The beginning for both the System Safety and MANPRINT programs lies with their respective management plans -- the System MANPRINT Management Plan (SMMP) and the System Safety Management Plan (SSMP).

III. DOCUMENT INTERFACE.

A. Programs get their start from the MAA as do the documents which affect MANPRINT and System Safety. MANPRINT requires a separate section in the MAA with subsections for manpower, personnel, training, human factors engineering, system safety, and health hazards (the six domains). When it is determined that a materiel fix is the answer, the MJWG is formed, and it develops the SMMP. This document should define the necessary interface between MANPRINT and all of its domains, including System Safety.

B. When the MJWG is formed, the TRADOC safety community must ensure they are a voting member and have a representative at the meetings. The first task for this safety person would be to review the MAA for safety issues. With these issues in mind, he or she will then develop lessons learned from predecessor systems (if available). This will require the MJWG, in conjunction with the safety representative, to determine what predecessor system(s) will be considered (if one exists). It is important that all analyses are based on the same predecessor system(s). The safety representative must ensure that adequate system safety support is available to implement the MANPRINT/system safety requirements. Given the predecessor system(s), they will develop lessons learned from their available data sources. The results of this data search will form the basis for the safety lessons learned that will be incorporated in the SMMP.

C. After each of the domains has had an opportunity to develop its lessons learned, the MJWG will meet to write the SMMP. At first this document may be filled with generic statements and a lot of blanks, but this should not stop the group from producing the plan. Since it is considered a living document, it can always be updated, and it will be. The safety representative and the MJWG must ensure that the SMMP will be passed to the associated and interested safety offices for comments. The MJWG safety representative and reviewers of the SMMP should ensure certain System Safety items are included in the document. This includes, but is not limited to the following:

1. Include the System Safety goals in Section 3, MANPRINT Strategy.

2. Ensure the development of a System Safety Management Plan (SSMP) as part of Section 4, Data Sources/Availability, Planned Level of MANPRINT Analysis Effort.

3. Ensure the data sources used by the developers of the lessons learned are included in Tab A (Data Sources).

4. Include Safety issues (lessons learned) found in the data sources in Section 4 (Concerns); and Tab D (Questions to be Resolved).

5. Ensure a level of trade-off authority is established for all MANPRINT issues. This trade-off authority must be consistent with the risk acceptance authority established under the SSMP.

6. Ensure the MJWG and the System Safety Working Group (SSWG) interface responsibilities are included in the SMMP and SSMP.

7. Ensure the appropriate Combat Developer's System Safety representative is a voting member and present at all MJWG meetings.

8. Ensure all MANPRINT safety issues brought to the MJWG are passed to the System Safety Working Group (SSWG) for evaluation and determination of a risk assessment per MIL-STD-882B.

D. Just as MANPRINT has a management document, so does System Safety. This document is called the System Safety Management Plan (SSMP) and is prepared by the SSWG. The SSMP establishes management policies, objectives, and responsibilities for execution of the system safety program for the life cycle of a system. It establishes ground rules for government and contractor interaction with respect to system safety. The SSMP should include the following items concerning System Safety and MANPRINT:

1. Ensure a safety representative from the combat developer is a voting member and present for MJWG meetings.

2. Ensure all identified safety issues are forwarded to the MJWG with evaluations and complete risk assessments.

3. Request that the MJWG pass all safety issues surfaced in the meetings to the SSWG for evaluation and risk assessment.

4. Ensure the SSMP is forwarded to the MJWG for comment.

5. Ensure all lessons learned obtained throughout the system life cycle by the SSWG are input to the MANPRINT lessons learned data base.

E. The SMMP and SSMP form the principal documents that define the interface between the two processes. When all is said and done, the safety process will continue as before but with another player (MANPRINT) to interact with. This player will ensure that system safety and each of the other domains coordinate their actions with each other and document the results for an audit trail and future lessons learned. Figure 3, MANPRINT/System Safety Document Interface, illustrates the coordination necessary to ensure the required information is included in the two management documents.

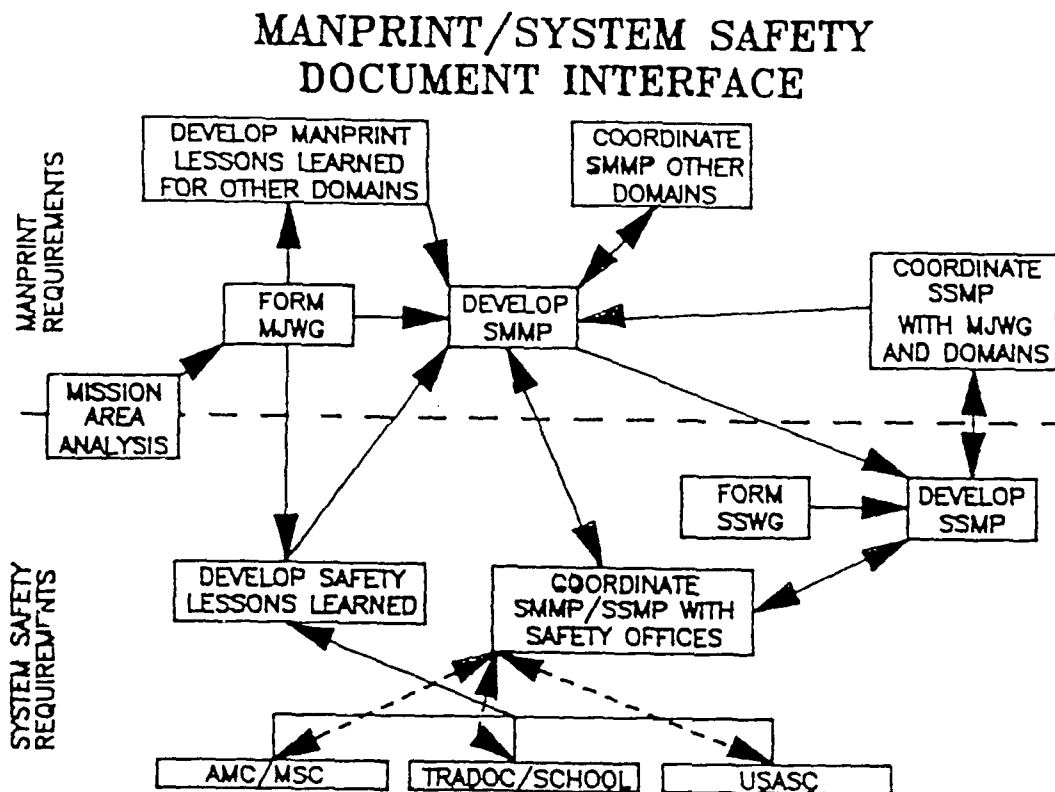


Figure 3

F. One of MANPRINT's objectives is to ensure stronger representation for each of the domains at the decision reviews. The fact that MANPRINT will now represent System Safety at the reviews is a major change from the way safety has done business. System safety will still have an independent route to the decision makers, that being through the U.S. Army Safety Center (USASC). USASC will develop an independent safety assessment for ASARC-level Major Acquisition Decision Programs and provide that to the ASARC co-chairman through the ASARC data book.

IV. DECISION INTERFACE.

A. The Army uses a decision review process to determine problem areas and necessary tradeoffs in the materiel acquisition cycle. System Safety and MANPRINT will use a similar process to address MANPRINT issues and concerns. The process starts when a system or program issue or concern is identified by the SSWG, MJWG, PMO, TRADOC System Manager (TSM), or any of the organizational safety offices. The issue would then be passed to the SSWG (for major systems), AMC Major Subordinate Command (MSC) safety office, or TRADOC safety representative (if no SSWG exists) for hazard classification and risk assessment (reference MIL-STD-882B). This information is then passed on to the MJWG, the TSM, and Project Management Office (PMO) for coordination and input to the SMMP for audit purposes and lessons learned. After review of the hazard and risk assessment, the PMO will determine if there is a feasible fix or whether, based on the risk assessment, the issue should be given to the appropriate authority for risk acceptance. If there is a fix, the proposal will be sent to the SSWG for reevaluation of the hazard based on the proposed fix and then coordinated with the MJWG, and TSM, before going back to the PMO. If the SSWG, MJWG, TSM, or PMO disagree, the issue may have to be passed to the appropriate higher level for arbitration or risk acceptance. Figure 4, System Safety, MANPRINT and PMO Coordination Flow, illustrates how the information should flow.

SYSTEM SAFETY, MANPRINT AND PMO COORDINATION FLOW

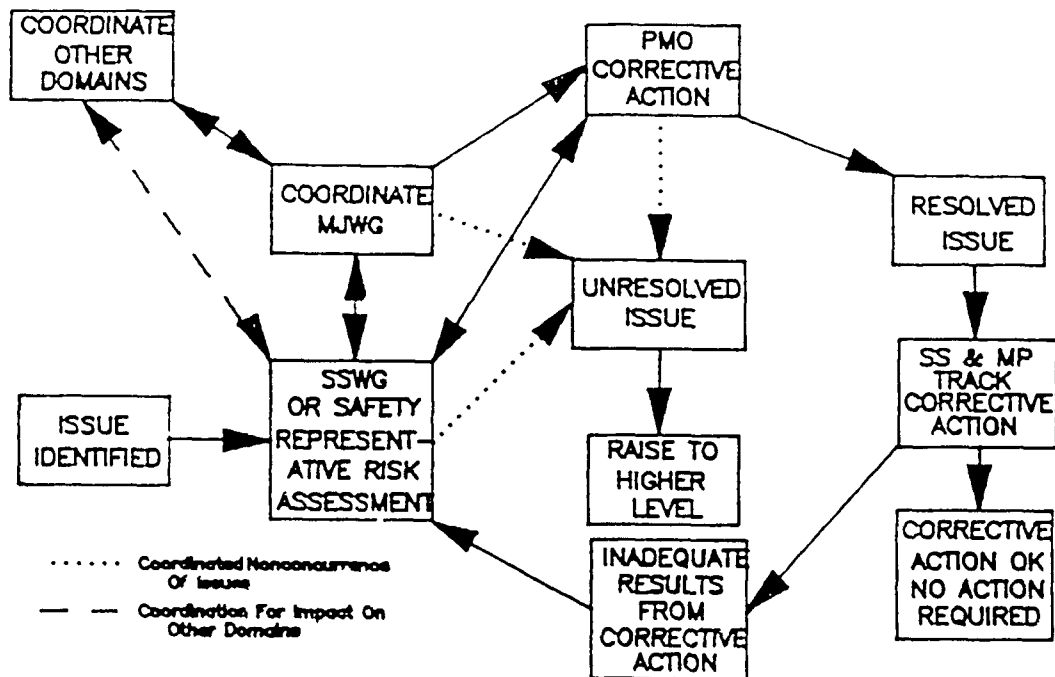


Figure 4

B. Apart from the requirement to pass information to the MJWG, System Safety requirements are not affected. If the fix is unacceptable to the safety representative, or if it is determined that the risk acceptance authority is too low, the safety representative can ask to have the issue surfaced at the Preliminary Army Systems Acquisition Review Council (ASARC) MANPRINT Review (for major systems) or, if not a major system, notify the appropriate safety office for the level of review for the system. The HQ AMC safety representative should make sure that the issue is addressed by the council or board and the results recorded in the minutes of the meeting. The results should also be recorded in the SMMP and SSMP. The SMMP will serve as the audit trail for all MANPRINT issues and concerns. For system safety the Hazard Tracking System and/or Safety Assessment Report (SAR) will serve as the audit trail. Neither MANPRINT nor System Safety responsibilities stop after the review process. These responsibilities continue until the system is disposed of. They must both track the issues or concerns after the system has been fielded. Based on accident data or field reports, hazards may occur more often than predicted and the issue may have to be resurfaced for correction using the Materiel Change (MC) process. Remember, the MANPRINT process applies to the PIP/MC process as well. Figure 5, MANPRINT/System Safety Decision Process for Major Systems, illustrates how the decision process should work.

MANPRINT/SYSTEM SAFETY DECISION PROCESS FOR MAJOR SYSTEM

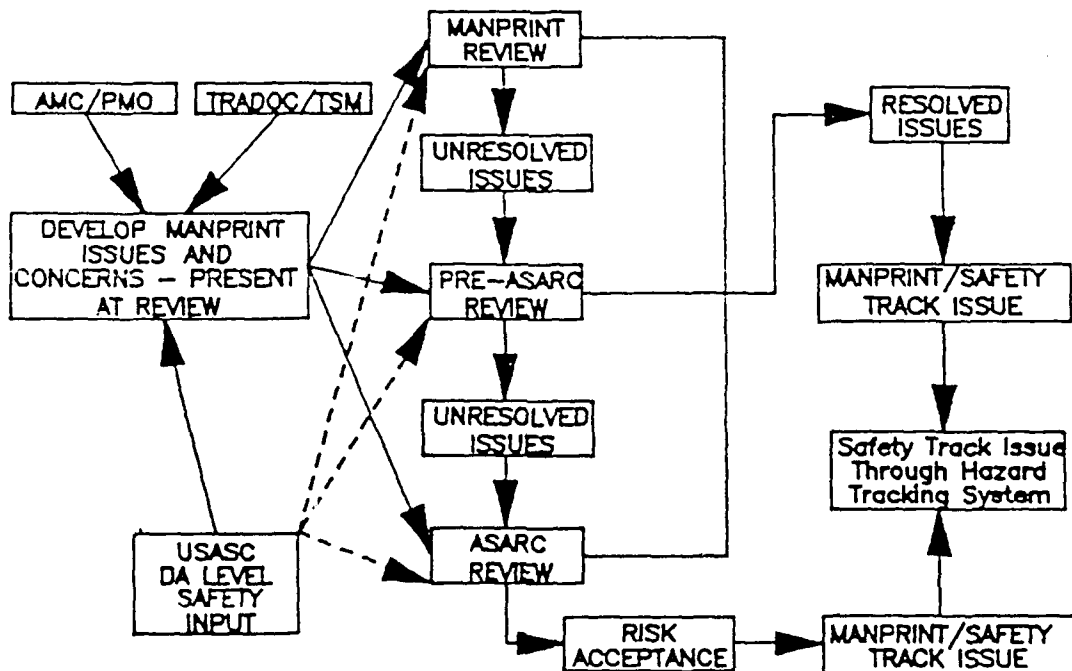


Figure 5

V. SUMMARY.

System safety personnel will continue to meet their responsibilities as stated in AR 385-16. Under MANPRINT, system safety will have additional requirements. These additional requirements include, but are not limited to, the following:

1. Provide a Combat Developer safety representative to MJWG meetings.
2. Provide lessons learned to the MJWG for inclusion into the SSMP.
3. Coordinate safety analyses/tests with each of the other domains.
4. Review analyses/test data from other domains for safety implications.
5. Ensure all safety analyses/tests include the human aspect as well as the materiel aspect of safety.
6. Ensure safety input is given to the MANPRINT briefer for all milestone reviews and ensure the information is presented with all the facts. The safety assessments should be presented to the decision makers in all cases.
7. Ensure safety lessons learned for all systems are forwarded, through the PM or TSM MANPRINT manager, to the Materiel Readiness Support Activity (MRSA) for input to MANPRINT lessons learned data base.

VI. CONCLUSION.

MANPRINT does not eliminate or change, but may add to, the responsibilities of various organizations as stated in AR 385-16, "System Safety Engineering and Management", dated 3 Sep 85. Army requirements for system safety exist in their own right and will be applied (IAW AR 385-16) regardless of MANPRINT requirements. MANPRINT will require two things of system safety: ensure that the human is included in all safety analyses/tests and that all system safety results are coordinated with each of the other domains. Under the MANPRINT "umbrella", system safety will be applied whenever a MANPRINT effort is applied to a system. In the unlikely event that MANPRINT requirements are not applied to a specific system, Army requirements for system safety will still apply unless specifically waived by appropriate authority. The bottom line from the Army perspective is that the MJWG/TSM and SSWG/PM, TIWG, and HEL/HFEA work hand-in-hand to ensure their management plans and objectives are consistent with each other. In addition, certain tasks and processes required to implement system safety must be completed within the system safety function and independent of the MANPRINT process.

SECTION 2

SAFETY PERSONNEL RESPONSIBILITIES

The following information will describe the responsibilities of the safety representative in terms of the acquisition life cycle. It will list the documents or task as they are required by each phase of the cycle. Included will be the requirements for the interface with MANPRINT. It will describe the task or document, indicate what must be done, what are some of the data sources, who is responsible for the requirement, where the information goes after completed, and further references to go to for more help and guidance. The duties identified herein for AMC are intended to indicate support which AMC safety offices would be expected to provide to the PEO/PM in managing his program.

1. **PREPROGRAM INITIATION**

a. Mission Area Analysis (MAA):

(1) Description: MAA identifies MANPRINT issues which can increase capabilities or correct deficiencies. MANPRINT issues will include Safety issues.

(2) Task: Identify safety issues or improvements to safety from predecessor or like systems to be included in the MAA.

(3) Data Sources: Lessons learned, mishap data or advancements in technology.

(4) Responsibility: TRADOC - System Safety Representative for the Proponent School/Center.

(5) Feeds: Operational and Organizational (O&O) Plan, SMMP

(6) References: AR 71-9, AMC/TRADOC 70-2

b. Lessons Learned:

(1) Description: Lessons learned provide the necessary information to ensure a system is improved or does not repeat the same mistake as the predecessor system.

(2) Task: Identify and review all potential procurement data sources. The purpose is to build a knowledge base of system safety and health hazards associated with the predecessor system. The safety issues are to be then added to the requirement documents.

- (3) Data Sources :
- (a) Mishap data predecessor system - US Army Safety Center (USASC), AMC proponent Major Subordinate Command (MSC).
 - (b) Issues considered during evaluation of technology base products in the research and development phase - Army Materiel Command (AMC), LABCOM Safety Office and Proponent MSC Safety Office.
 - (c) Maintenance Data Base - US Army Materiel Readiness Support Activity (MRSA).
 - (d) Early Comparability Analysis (ECA) - Soldier Support Center-National Capital Region (SSC-NCR), Proponent Combat Developer.
 - (e) Human Factors Engineering Analysis (HFEA) Report - Human Engineering Lab.
 - (f) Safety Assessment Report (SAR) - AMC Proponent MSC Safety Office or Contractor.
 - (g) Health Hazard Assessment Report (HHAR) - The Surgeon General (TSG), AMC Proponent MSC Safety Office, or Contractor.
 - (h) Development Test (DT) and Operational Test (OT) Reports - TRADOC Combat Developer (Test and Evaluation Division), Technical and Operational Independent Evaluation Reports (IERs), AMC-Army Materiel Systems Analysis Activity (AMSAA), Test and Evaluation Command (TECOM), Proponent MSC Program Manager (PM).
 - (i) Data Bases of other services - Air Force Acquisition Logistics Center, Navy Safety Center.
 - (j) Contractor Tests, Studies, Development Efforts, Industry Research.
 - (k) Any other documents or data bases which may provide safety issues.
- (4) Responsibility: TRADOC - System Safety Representative Proponent School/Center for the system.
- (5) Feeds: O & O Plan, System MANPRINT Management Plan (SMMP), Preliminary Hazard List (PHL), and Preliminary Hazard Analysis (PHA).
- (6) References: AR 40-5, AR 40-10, AR 385-16, AR 700-127, DA PAM 385-16.

c. System MANPRINT Management Plan (SMMP):

(1) Description: The SMMP is the management device used by the proponent school/center to ensure that MANPRINT issues are identified and addressed as early as possible. The SMMP is a living document and updated as needed throughout the materiel acquisition process.

(2) Task: Ensure System Safety is included in the SMMP. This includes but is not limited to the following:

(a) Include the System Safety goals in section 3, MANPRINT Strategy, of the SMMP.

(b) Ensure the development of a System Safety Management Plan (SSMP) as part of section 4, Data Sources/Availability, Planned level of MANPRINT analysis effort, of the SMMP.

(c) Ensure the above data sources (para 1b(3)) are included in Tab A, Data Sources, of the SMMP.

(d) Include safety issues found in data sources (2.c.) listed above are included in section 4, Concerns; and Tab D, Questions to be Resolved, of the SMMP.

(e) Ensure a level of tradeoff authority is established for all MANPRINT issues. This tradeoff authority must be consistent with the risk acceptance authority established under the SSMP.

(f) Ensure the MANPRINT Joint Working Group (MJWG) and the System Safety Working Group (SSWG) interface responsibilities are included in the SMMP and SSMP.

(g) Ensure the SSMP is reviewed by the MJWG and comments passed to the SSWG.

(h) Ensure a System Safety representative is a voting member and present at all MJWG meetings.

(i) Ensure the SSMP is updated following each update of the SMMP if safety issues are addressed.

(j) Ensure all safety issues defined by the SSWG are passed to the MJWG with risk assessments. All MANPRINT safety issues brought to the MJWG will be passed to the SSWG for evaluation and determination of a risk assessment.

(k) Ensure projected accident costs (materiel and personnel) are included in the Cost and Operational Effectiveness Analysis (COEA).

(3) Data Source: Lessons Learned (para 1b), MAA (para 1a)

(4) Responsibility: TRADOC - Proponent School/Center Safety Representative; Coordination with MSC and AMC Safety Offices.

(5) Feeds: O & O Plan, JMSNS

(6) References: AR 385-16, AR 602-2, DA PAM 385-16, SMMP Procedural Guide (prepared by SSC-NCR)

d. Preliminary Hazard List (PHL):

(1) Description: PHL is a list of hazards that may be inherent in the design or which may require special management emphasis. These hazards may be identified from the predecessor system and should be designed out of the new system.

(2) Task: Examine the system concept shortly after the concept definition effort begins and compile a PHL identifying possible hazards that may be inherent in the design. Assistance should be requested from TRADOC and AMC/MS safety offices.

(3) Data Sources: Lessons learned, design concept.

(4) Responsibility: TRADOC - Combat Developer or contractor.

(5) Feeds: Preliminary Hazard Analysis (PHA), O & O Plan.

(6) References: AR 385-16, DA PAM 385-16, MIL-STD-882B

e. Preliminary Hazard Analysis (PHA):

(1) Description: PHA is an analysis to identify safety critical areas, evaluate hazards and identify the safety design criteria to be used.

(2) Task: Perform and document a PHA to obtain an initial risk assessment of a concept or system. Based on the PHL and lessons learned, hazards associated with the proposed design or function shall be evaluated for hazard severity, hazard probability, and operational/maintenance/support constraints. Safety provisions and alternatives needed to eliminate hazards or reduce their associated risk to a level acceptable to the risk acceptance authority should be established in the SMMP and SSMP. This effort should be started early enough to be included in the trade-off studies and design alternatives. Assistance should be requested from TRADOC and AMC/MS safety offices.

(3) Data Sources: PHL, Lessons Learned, Design Concept, Input from AMC and MSC Safety Offices and USASC.

(4) Responsibility: TRADOC - Safety Representative of the Proponent School/Center or contractor.

(5) Feeds: O&O Plan, SMMP, COEA, Trade Off Analysis (TOA), Trade Off Determination (TOD), SSMP, System Safety Program Plan (SSPP), Request For Proposal (RFP), Statement Of Work (SOW).

(6) References: AR 385-16, DA PAM 385-16, MIL-STD-882B

f. Operational and Organizational (O&O) Plan:

(1) Description: The O&O Plan is written when specific mission deficiencies are identified which appear to warrant development of a new or improved materiel system. The document describes how a system will be integrated into the force structure, deployed, operated, and supported in peacetime and wartime.

(2) Task: Ensure MANPRINT is incorporated in the O&O Plan. System Safety, as part of MANPRINT, must then be written into the O&O Plan. A statement requiring that all safety hazards be eliminated by design, if not possible to eliminate, reduce or control the hazard to a level accepted by the risk acceptance authority should be added to the System Constraints section. Specific critical safety issues addressed in the MAA shall also be included in the Operational Characteristics section of the O&O Plan. If possible, include to what standard/degree the hazard must be controlled if not eliminated.

(3) Data Sources: MAA, Lessons learned, PHL, PHA, SMMP

(4) Responsibility: TRADOC - Safety Representative Proponent School/Center

(5) Feeds: Required Operational Capability (ROC), Test and Evaluation Master Plan (TEMP), RFP, SOW, Temporary Required Operational Capability (TROC).

(6) References: AR 40-10, AR 70-1, AR 71-9, AR 385-16, AR 602-2, DA PAM 385-16.

g. Milestone 0 - Program Initiation/Mission-Need Decision:

(1) Description: The Milestone 0 decision determines mission-need and approves program initiation and authority to budget for a new major program. Normally, a concept exploration/definition phase follows this approval. Primary consideration during this milestone include:

(a) Mission area analysis.

(b) Affordability and life-cycle cost.

(c) The ability of a modification to an existing US or Allied system to provide needed capability.

(d) Operational utility assessment.

(2) Task: Ensure System Safety issues in the MAA are addressed.

(3) Data Sources: MAA, Lessons Learned, PHL, PHA, SMMP

(4) Responsibility: TRADOC - Safety Representative Proponent School/Center

(5) Feeds: Concept Exploration documents and tasks.

(6) References: DoD Directive 5000.1, DoD Directive 5000.43, DoD Directive 5000.49, DoD Instruction 5000.2, AR 15-14.

2. CONCEPT EXPLORATION

a. Program/Project/Product Manager (PM) Charter:

(1) Description: The PM Charter designates the PM for a Program/Project/Product. It lists his/her authority and responsibilities.

(2) Task: Ensure MANPRINT responsibilities are addressed in the document. Ensure System Safety responsibilities are addressed as a subsection under MANPRINT or better, as a separate item of responsibility. Items to be addressed under PM responsibilities for System Safety are, but are not limited to, the following:

(a) Ensure that hazards associated with the design, production, test, operation, maintenance, serving, support and disposal of the system are resolved through the application of system safety management and engineering.

(b) Establish a chartered System Safety Working Group.

(c) Ensure all contractual documentation includes requirements for the contractor to deliver (for review and approval by the government) results of hazard analyses and risk assessments or, when using the NDI procurement strategy, ensure the system has been fully evaluated to assure optimum safety requirements have been met.

(d) Specific system safety issues will be identified for UT and TT and considered by the Test Integration Working Group (TIWG) in test planning. When using an NDI procurement strategy, include the essential safety characteristics, as specified in the requirements document, as the minimum safety elements required during the market investigation.

(e) Provide for hazard identification and tracking throughout the life of the system.

(f) Ensure Engineering Change Proposals (ECPs) are evaluated for safety impact.

(g) Ensure Product Improvement Proposals (PIPs)/Materiel Changes (MC) will be evaluated for safety implications. Safety PIPs will be subjected to risk assessments and handled commensurate with the degree of risk.

(h) The PM will report the results of risk assessments for all residual hazards and provide recommendations for risk acceptance or resolution at each milestone review and in-process review.

(i) The status of all hazards and corrective actions planned will be provided to the following offices in sufficient time to perform independent evaluations prior to major milestone reviews:

1 Headquarters (HQ), AMC Safety Office

2 HQ, TRADOC Safety Office

3 TRADOC System Manager

4 US Army Safety Center

(3) Data Sources: AR 385-16, AR 602-2, DA PAM 385-16

(4) Responsibility: PEO/PM

(5) Feeds: RFP, SOW, System Safety Working Group Charter, Product Improvement Management Information Report (PRIMIR), Market Investigation, DT Plan, OT Plan, Test and Evaluation Master Plan (TEMP).

(6) References: AR 385-16, DA PAM 385-16

b. Update SMMP, O&O Plan:

(1) Description: Update SMMP and O&O Plan

(2) Task: Review SMMP and O&O Plan to ensure all new safety information and requirements are included. This should include new directives or constraints imposed by DA.

(3) Data Source: SMMP, O&O Plan

(4) Responsibility: TRADOC - Safety Representative of Proponent School/Center

(5) Feeds: Required Operational Capability (ROC), Test and Evaluation Master Plan (TEMP), RFP, SOW, Letter of Agreement (LOA).

(6) References: AR 40-10, AR 70-1, AR 71-9, AR 385-16, AR 602-2, DA PAM 385-16 SMMP Procedural Guide.

c. Health Hazard Assessment (HHA):

(1) Description: The HHA is the application of biomedical knowledge and principles to identify, evaluate, and control the risk to the health and effectiveness of personnel who test, use or service Army systems.

(2) Task: The MANPRINT coordinator should request The Surgeon General's (TSG) office to do an HHA for the system. Review the HHA for safety implications.

(3) Data Source: HHA

(4) Responsibility: OTSG, TRADOC - Safety Professional Proponent School/Center, agency associated with item development.

(5) Feeds: SHA, HFEA, TOD, TOA, COEA

(6) References: AR 40-10, AR 385-16, DA PAM 385-16, & TRADOC/AMC PAM 70-2.

d. Safety Hazard Analysis (SHA):

(1) Description: SHA is accomplished to determine the safety problem areas of the total system design including potential safety critical human error.

(2) Task: Perform and document a system hazard analysis to identify hazards and assess the risk of the total system design, including software, and with special emphasis on the subsystem interfaces. The results of the analysis will be sent to HEL for inclusion in the HFEA. MSC Safety Office should contact TRADOC and AMC Safety offices for input.

(3) Data Source: PHL, PHA, HHA

(4) Responsibility: PM Safety POC; Combat Developer Safety Representative prior to PMO formation.

(5) Feeds: HFEA, TOD, TOA, COEA

(6) References: AR 40-5, AR 40-10, AR 40-13, AR 40-46, AR 40-583, AR 70-25, AR 70-61, AR 385-10, AR 385-16, AR 602-1, AR 602-2, DA PAM 385-16, MIL-STD-882B

e. Human Factors Engineering Analysis (HFEA):

(1) Description: An HFEA is a review of an acquisition program to determine whether any critical or major HFE, safety, or other MANPRINT issues exist that would preclude the scheduled transition of the program to the next phase of the materiel acquisition cycle.

(2) Task: Provide SS input by submitting the SHA to HEL. Review the HFEA to ensure all critical safety issues are included in the document.

(3) Data Source: SHA, HHA, SMMP, HFEA

(4) Responsibility: TRADOC - Safety Representative Proponent School/Center

(5) Feeds: Milestone Decision Review (MDR), SMMP, O&O Plan, ROC

(6) References: AR 40-10, AR 385-16, AR 602-2, DA PAM 385-16

f. Cost and Organizational Effectiveness Analysis (COEA):

(1) Description: The COEA is an analysis which compares the effectiveness of alternative means of eliminating or reducing a force or mission deficiency against the defined threat and the cost of developing, producing, distributing, and sustaining each alternative system in a military environment for a time preceding combat application.

(2) Task: Ensure a safety substudy is performed in support of the COEA. It should provide projected accident rates and cost (materiel and personnel injury) for input to the COEA. The safety subgroup should ask for assistance from the AMC proponent MSC to provide a technical safety assessment of each candidate system.

(3) Data Source: Accident/Mishap Data (cost and rate of accident/mishap of predecessor system), Safety Assessment of candidate system, SHA, HHA, HFEA.

(4) Responsibility: TRADOC - Safety Representative for Proponent School/Center.

(5) Feeds: COEA, Concept Formulation Package (CFP), ROC, MDR I

(6) References: AR 40-10, AR 70-1, AR 71-9, AR 385-16, DA PAM 385-16

g. Trade Off Determination (TOD):

(1) Description: The TOD is prepared to convey the apparent technical feasibility of potential systems, including technical risks associated with each approach, estimated RDT&E and production cost and schedules.

(2) Task: Ensure Safety requirements are included in the TOD. Prepare information necessary to determine the tradeoffs associated with meeting the safety requirements.

(3) Data Source: Accident/Mishap Data (Predecessor Systems), SMMP, Lesson Learned, SHA, HHA, HFEA

(4) Responsibility: AMC - MSC Proponent Safety Office

(5) Feeds: CFP, ROC, MDR I

(6) References: AR 70-1, AR 71-9, TRADOC/AMC PAM 70-2

h. Trade Off Analysis (TOA):

(1) Description: The TOA is prepared to determine which technical approach(es) offered in the TOD are best.

(2) Task: Review TOD and ensure all safety requirements were evaluated. Coordinate a joint safety evaluation of the TOD and recommendation for TOA.

(3) Data Source: TOD, O&O Plan, SMMP, Lessons Learned

(4) Responsibility: TRADOC - Safety Representative for Proponent School/Center and AMC - MSC Safety Office; Coordinate with HQ TRADOC and AMC Safety Office.

(5) Feeds: CFP, ROC, MDR I

(6) References: AR 70-1, AR 71-9, TRADOC/AMC PAM 70-2

i. Test and Evaluation Master Plan (TEMP):

(1) Description: The TEMP is a broad plan that relates test objectives to required system characteristics and critical issues, and integrates objectives, responsibilities, resources, and schedules for all T&E to be accomplished.

(2) Task: Review TEMP and ensure safety issues/concerns are include in the TEMP for both development and operational testing.

(3) Data Source: SMMP, SHA, HHA, HFEA, O&O Plan,

(4) Responsibility: AMC MSC Safety Office

(5) Feeds: Master Evaluation Plan, Test Design Plan, Detailed Test Plan, Outline Test Plan, RFP, SOW, Test and Independent Evaluation Reports

(6) References: DODD 5000.3, AR 40-10, AR 40-14, AR 70-10, AR 71-3, AR 71-9, AR 385-16, AR 602-2, DA PAM 385-16.

j. Integrated Logistics Support Plan (ILSP):

(1) Description: The ILSP provides a composite of all support considerations necessary to assure the effective and economical support of a system for its life cycle and serves as the source document for summary and consolidated information required in other documents of the Program Management Documentation (PMD).

(2) Task: Review ILSP for safety considerations. Ensure consideration is made for the storage, transportation, handling, and disposal of a system as well as other support equipment required for the system.

(3) Data Source: HHA, SHA, SMMP

(4) Responsibility: AMC MSC and TRADOC

(5) Feeds: ROC, RFP, SOW

(6) References: AMC-R 700-15

k. Draft Required Operational Capability (ROC):

(1) Description: The draft ROC is a document which concisely states the minimum essential operational, technical, logistic, cost, and MANPRINT information necessary to initiate Full-Scale Development or Procurement of a materiel system.

(2) Task: Review O&O Plan, LOA, SAR, System Specifications, and SMMP for critical safety issues which should be included in the ROC. Provide input to MANPRINT coordinator for input to ROC. Review ROC to ensure the critical safety issues are included.

(3) Data Source: O&O Plan, JMSNS, LOA, SAR, SMMP, System Specifications

(4) Responsibility: TRADOC - Safety Representative Proponent School/Center

(5) Feeds: RFP, ROC

(6) References: AR 71-9, AR 702-3, AMC/TRADOC PAM 70-2,

1. Request For Proposal (RFP):

(1) Description: The RFP informs potential contractors of the total system requirements and request that the contractor provide a proposal to meet all the requirements.

(2) Task: Provide the safety constraints or assessments in the O&O Plan, SMMP or ROC for input to RFP. Review RFP prior to submission to contractors to ensure all safety input is included.

(3) Data Source: O&O Plan, SMMP, SAR, ROC

(4) Responsibility: AMC - MSC Safety Office; Coordinate with TRADOC System Manager (TSM) and HQ TRADOC Safety Office

(5) Feeds: HFEA, UT, TT, MDRs

(6) References: AR 385-16, DA PAM 385-16, MIL-STD-882B

m. Statement Of Work (SOW):

(1) Description: The SOW is part of the RFP, but is important enough to list as a separate document. It list the requirements of the contractor to the government.

(2) Task: Ensure the tasks listed below from MIL-STD-882B are applied. It should be noted that all system requirements are not the same and therefore the tasks required must be tailored to the individual system. Check Contract Data Requirements List (CDRL) to ensure the proper number of required documents are delivered to the government.

(a) Ensure the following documents (deliverable) are required from the contractor as appropriate:

- 1 System Safety Program Plan (task 101)
- 2 Hazard Tracking and Risk Resolution (task 105)
- 3 Preliminary Hazard List (task 201)
- 4 Preliminary Hazard Analysis (task 202)
- 5 Subsystem Hazard Analysis (task 203)
- 6 System Hazard Analysis (task 204)
- 7 Safety Assessment Report (task 209)
- 8 Software Hazard Analysis (task 212)
- 9 Operating and Support Hazard Analysis (task 205)

(b) Ensure the following tasks apply: 100, 102, 103, 104, 106, 108, 206, 207, 208, 211, 213

(3) Data Source: MIL-STD-882B

(4) Responsibility: AMC-PEO/PM, with input from MSC Safety Office

(5) Feeds: HFEA, UT, TT, MDRs

(6) References: AR 385-16, DA PAM 385-16, MIL-STD-882B

n. System Safety Working Group (SSWG) Charter

(1) Description: The SSWG Charter establishes a technically qualified advisory group for the PM for System Safety management as a means to enhance safe design and operation of the system.

(2) Task: Prepare a charter which list the responsibilities of the SSWG. The charter will include, but is not limited to, the following:

(a) Review of all requirements documents for safety implications.

(b) Review and evaluate the following documents: CFP, System Specification, RFP, SSPP.

(c) Response to request from the PM for recommendations on program matters potentially influencing system safety.

(d) Development of Source Selection Evaluation Board (SSEB) selection criteria for system safety.

(e) Development of a System Safety Management Plan (SSMP).

(f) Development of a PHL.

(g) Collection and evaluation of lessons learned pertaining to system safety and inputting the information to the MANPRINT lessons learned data base.

(h) Assist the PM at safety reviews at the contractor's facility. Provide PM with comments or recommendations for corrective action.

(i) Review and evaluate all safety documents.

(j) Development of a hazard tracking system to identify, eliminate if possible, rank, estimate a likelihood of occurrence, and track hazards throughout the life cycle of the program. Recommend corrective action as necessary.

(k) Membership will be as determined by PM and MSC Safety Office.

(3) Data Sources: PM Charter

(4) Responsibility: AMC - PM/Safety Representative

(5) Feeds: SSMP, SSWG

(6) References: AR 385-16, MIL-STD-882B

o. System Safety Management Plan (SSMP):

(1) Description: The SSMP establishes management policies, objectives, and responsibilities for execution of a system safety program for the life cycle of the system. It establishes ground rules for government and contractor interaction with respect to system safety.

(2) Task: Develop an SSMP for the PM Office. The SSMP should include the following concerning Safety and MANPRINT:

(a) Ensure a safety representative is voting member and present for MJWG meetings.

(b) Ensure all safety issues are forwarded to the MJWG with evaluations and risk assessments.

(c) Request that the MJWG pass all safety issues surfaced in the meetings to the SSWG for evaluation and risk assessment.

(d) Ensure the SSMP is forwarded to the MJWG/TSM for comment

(e) Ensure the lessons learned generated by the SSWG are inputted to the MANPRINT lessons learned data base.

(3) Data Sources: SSWG Charter

(4) Responsibility: PEO/PM

(5) Feeds: RFP, SSPP

(6) References: AR 385-16, DA PAM 385-16, MIL-STD-882B, PM Charter

p. Milestone I - Demonstration/Validation Decision:

(1) Description: The Milestone I decision approves proceeding with the Demonstration/Validation Phase. Primary considerations during this milestone include:

- (a) Program alternative trade-offs
- (b) Performance, cost and schedule trade-offs, including the need for a new development program versus buying or adapting existing US or Allied military or commercial systems
- (c) Appropriateness of the acquisition strategy
- (d) Prototyping of the system or selected system components
- (e) Affordability and life-cycle costs
- (f) Potential common-use solutions
- (g) Cooperative development opportunities

(2) Task: Ensure unresolved safety issues are addressed by the decision makers.

(3) Data Sources: All documents and tests from previous sections.

(4) Responsibility: Function of the type of program. MSC has responsibility for IPR and lower level systems.

(5) Feeds: Demonstration & Validation documents and tasks.

(6) References: DoD Directive 5000.1, DoD Directive 5000.43, DoD Directive 5000.49, DoD Instruction 5000.2, AR 15-14.

3. DEMONSTRATION & VALIDATION

a. Update SMMP, O&O Plan, TEMP, COEA, and ILSP:

- (1) Description: Update SMMP, O&O Plan, TEMP, COEA, and ILSP
- (2) Task: Review above documents to ensure all new safety information and requirements are included in the documents. This should include new directives or constraints imposed by DA.
- (3) Data Source: SMMP, TEMP, COEA, O&O Plan, Milestone Review Minutes (ASARC).
- (4) Responsibility: TRADOC - Safety Representative for Proponent School/Center and AMC MSC Safety Office

(5) Feeds: Required Operational Capability (ROC), Test and Evaluation Master Plan (TEMP), RFP, SOW, Letter of Agreement (LOA).

(6) References: AR 40-10, AR 70-1, AR 71-9, AR 385-16, AR 602-2, DA PAM 385-16 SMMP Procedural Guide.

b. Required Operational Capability (ROC):

(1) Description: The ROC is a document which concisely states the minimum essential operational, technical, logistic, cost, and MANPRINT information necessary to initiate Full-Scale Development or Procurement of a materiel system.

(2) Task: Review O&O Plan, LOA, SHA, System Specification, and SMMP for critical safety issues which should be included in the ROC. Provide input to MANPRINT coordinator for input to ROC. Review ROC to ensure the critical safety issues are included.

(3) Data Source: O&O Plan, JMSNS, TROC, SHA, SMMP, System Specification

(4) Responsibility: TRADOC - Safety Representative for Proponent School/Center

(5) Feeds: RFP, TEMP, Test Plans

(6) References: AR 71-9, AR 702-3, AMC/TRADOC PAM 70-2

c. Independent Evaluation Plans (IEP) Technical/Operational:

(1) Description: IEPs are formal documents prepared by the Technical and Operational Evaluators which address all aspects of evaluation responsibilities relative to an item or system. The IEP defines what questions/issues will be asked and how they will be addressed in the IER. It defines the scope of the evaluation; the scope, amount, and type of testing required to support a milestone decision review; simulations to be performed; and the evaluation procedures and data analysis plan contemplated. It is the basis for the development of subsequent test and evaluation (T&E) documents (ie., the TDP, TR, and IER). It is revised and updated after each decision point in the acquisition cycle.

(2) Task: Review the Technical and Operational IEPs to ensure safety critical issues will be evaluated. Ensure that the evaluation plans will provide for adequate safety testing as part of the evaluation.

(3) Data Sources: TEMP, SMMP, SSMP, SHA, HHA, O&O Plan, ROC, Operational Issues and Criteria.

(4) Responsibility: TECOM Safety Office for technical evaluations and TRADOC Safety Office for operational evaluations

(5) Feeds: TDP (UT/TT), IER (Technical/Operational), HFEA

(6) References: AR 70-1, AR 70-10, AR 71-3, DA PAM 71-3

d. Test Design Plan (TDP) UT/TT:

(1) Description: The TDP is a formal document developed by the test organization which states the circumstances under which a test and/or evaluation will be executed, the data required from the test, and the methodology for analyzing test results.

(2) Task: Review the TDP to ensure safety critical issues are tested and evaluated. Ensure the plan covers safety requirements to ensure safe testing of the new system.

(3) Data Sources: TEMP, SMMP, SHA, HHA, O&O Plan, ROC

(4) Responsibility: Test and Evaluation Command (TECOM) Safety Office for Technical Test (TT), TRADOC Safety Office for User Test (UT), OTEA, MANPRINT

(5) Feeds: SR, UT, TT

(6) References: AR 70-10

e. Update SSPP:

(1) Description: Update the SSPP written during concept exploration by the contractor.

(2) Task: Update contractor's SSPP. Contractor review above documents to ensure all new safety information and requirements are included in the documents. This should include new directives or constraints imposed by DA.

(3) Data Sources: SSPP

(4) Responsibility: PEO/PM, Contractor Safety Office

(5) Feeds: SSPP

(6) References: AR 385-16, DA PAM 385-16, MIL-STD 882B

f. Prepare Safety Documents:

(1) Description: The documents to be prepared are Health Hazard Assessment, Safety Assessment Report, Safety Verification, Software Hazard Assessment

(2) Task: Prepare the above documents for government approval prior to UT/TT.

(3) Data Sources: PHL, PHA, SHA,

(4) Responsibility: PEO/PM, Contractor's Safety Office; AMC - MSC Safety Office Acceptance Authority. HHA completed by the Office of the Surgeon General.

(5) Feeds: UT/TT, TDP, SR

(6) References: AR 40-10, AR 385-16, DA PAM 385-16, MIL-STD 882B

g. Safety Release (SR):

(1) Description: The SR documents the safety precautions to be taken for all troop tests by the operational tester to avoid system damage and personnel injury based on development testing and/or a Safety Assessment Report (SAR). It is required for all troop tests even if not conducted by operational tester.

(2) Task: Prepare SR 30 days prior to test.

(3) Data Sources: HHA, SAR, HFEA, O&O Plan, ROC, SMMP

(4) Responsibility: AMC/TECOM Safety Office for TT and UT.

(5) Feeds: UT and TT

(6) References: AR 385-16, DA PAM 385-16

h. Test Reports UT/TT:

(1) Description: The Test Report contains the data obtained from executing the test and describes the conditions which prevailed during the test execution and data collection.

(2) Task: Review the reports for MANPRINT/safety issues. Provide results from review to SSWG. SSWG provide issues with risk assessment to MJWG and PM.

(3) Data Sources: TDP, SHA, HHA, HFEA, SR

(4) Responsibility: TECOM, TRADOC, USASC, AMC, PEO/PM

(5) Feeds: Independent Evaluation Report (IER),

(6) References: AR 71-3, DA PAM 71-3

i. Independent Evaluation Reports (IER) Technical/Operational:

(1) Description: Reports which assess a system's technical performance, operational-effectiveness/suitability, military utility and completeness of development, including adequacy of testing to that point in development and also assesses compatibility with fielded equipment.

(2) Task: Review IERs for safety issues. Input safety issues to MDR through PM, TSM, HEL, the Personnel System Staff Officer (PERSSO) and MANPRINT Office of DCSPER.

(3) Data Sources: TDP, SHA, HHA, HFEA, SR, Test Reports

(4) Responsibility: AMC and USASC System Safety Engineer

(5) Feeds: Milestone Review

(6) References: AR 385-16, DA PAM 385-16

j. Milestone II - Full-Scale Development Decision:

(1) Description: The Milestone II decision approves proceeding with the Full-Scale Development (FSD) Phase. This decision establishes more specific cost, schedule, and operational effectiveness and suitability goals and thresholds. Primary considerations are:

(a) Affordability in terms of program cost versus the military value of the new or improved system and its operational suitability and effectiveness

(b) Program risk versus benefit of added military capability

(c) Planning for the transition from development to production

(d) Realistic industry surge and mobilization capacity

(e) Factors that impact program stability

(f) Potential common-use solutions

(g) Results from prototyping and demonstration/validation

(h) Milestone authorization

(i) Manpower, personnel, training and system safety assessments

(j) Procurement strategy appropriate to program cost and risk assessments

(k) Plans for integrated logistics support

(l) Affordability and life-cycle costs

(m) Associated command, control, communication, and intelligence requirements, including communications security

(2) Task: Ensure unresolved safety issues are addressed by the decision makers.

(3) Data Sources: All documents and tests from previous sections.

(4) Responsibility: PEO/PM, USASC, AMC HQ - Safety Office, TRADOC HQ - Safety Office, AMC MSC safety office depending on type of system (ie, IPR).

(5) Feeds: Demonstration & Validation documents and tasks.

(6) References: DoD Directive 5000.1, DoD Directive 5000.43, DoD Directive 5000.49, DoD Instruction 5000.2, AR 15-14.

4. **FULL SCALE DEVELOPMENT**

a. Document Requirements:

The requirements for Full Scale Development are the same as for Demonstration & Validation Phase. Normally, one contractor's system is chosen for continued evaluation. All changes and improvements are applied prior to further testing. The system then goes through the testing requirements as already stated in the Demonstration & Validation Phase.

b. Milestone III - Full Scale Production Decision:

(1) Description: The Milestone III decision approves proceeding with the Full Scale Production/Deployment Phase. Primary considerations are:

(a) Results of completed operational test and evaluation

(b) Threat validation

(c) Production or construction cost verification

(d) Affordability and life-cycle costs

(e) Production and deployment schedule

(f) Reliability, maintainability and plans for integrated logistics support

(g) Producibility as verified by independent assessment

(h) Realistic industry surge and mobilization capacity

(i) Multi-year procurement or milestone authorization

(j) Manpower, personnel, training, and safety requirements

(k) Cost effectiveness

(l) Associated command, control, communication, and intelligence requirements

(2) Task: Ensure unresolved safety issues are addressed by the decision makers.

(3) Data Sources: All documents and tests from previous sections.

(4) Responsibility: USASC, AMC HQ - Safety Office, TRADOC HQ - Safety Office

(5) Feeds: Production and Deployment documents and tasks.

(6) References: DoD Directive 5000.1, DoD Directive 5000.43, DoD Directive 5000.49, DoD Instruction 5000.2, AR 15-14, AR 385-16, DA PAM 385-16.

5. PRODUCTION & DEPLOYMENT

a. Materiel Release:

(1) Description: At Materiel Release, the Materiel Developer transfers ownership of the system to the user. Materiel Release actions can take the form of;

(a) Training releases

(b) Conditional releases

(c) Full release

Training releases and conditional releases are utilized when all the criteria for a full release are not met but the benefit of early availability of the system to the user exceeds the risk or negative factors. Typical causes for less than a full release are lack of full

logistic support, lack of finalized manuals or the existence of safety hazards identified after Milestone III decision.

(2) Task: Assure unresolved hazards are identified to decision makers and users; critical safety licenses, authorizations, hazard classification, fuze certifications, EOD procedures, range safety fans, and the system disposal/demilitarization procedures, are in place; and user acceptance statements are completed prior to transfer of the systems.

(3) Data Sources: Initial production tests reports; first article tests; independent evaluator's report, user acceptance statements; system safety risk assessments; health and safety data sheets; final health hazard assessments, NRC radioactive material licenses and authorizations; DOD final hazard classifications; range safety fans; EOD procedures; system disposal/demilitarization plans PM safety related get well plans.

(4) Responsibility: AMC MSC Safety Offices; AMC HQ - Safety Office; TRADOC HQ - Safety Office; accepting user safety office.

(5) Feeds: Materiel release decisions

(6) References: AR 40-10, AR 40-14, AR 385-63, AR 700-127, TB 700-2, AMC-R 385-21, AMC-R 700-34.

b. Production:

(1) Description: Production initiation decision results in approval of production process.

(2) Tasks: Assure production hazards are identified and resolved prior to production initiation and required licenses, authorizations, explosive sites plans and explosive related SOPs are granted or approved and conditions of such have been met prior to initiation of production.

(3) Data Sources: DDESB final explosive site approval; NRC radioactive material licenses; DA radioactive material authorizations; SOPs of hazardous operations; quality control plans for critical safety components; facility and process hazard analysis.

(4) Responsibility: AMC MSC Safety Offices

(5) Feeds: Production initiation decision.

(6) References: DOD 6055.9-STD, AR 385-11, AMC-R 385-100, DARCOM-R 385-3

6. Postfielding

a. Milestone IV - Logistics Readiness and Support Review:

(1) Description: The Milestone IV decision identifies actions and resources needed to ensure that operational readiness and support objectives are achieved and maintained for the first several years of the operational support phase. The Milestone IV review will normally occur 1 to 2 years after initial deployment. The primary considerations are:

- (a) Logistics readiness and sustainability (peacetime and wartime)
- (b) Weapon support objectives
- (c) Implementation of integrated logistics support plan
- (d) Capability of logistics activities, facilities, and training and manpower to provide support efficiently and cost-effectively
- (e) Disposition of displaced equipment
- (f) Affordability and life-cycle cost

(2) Task: Track all safety issues not corrected before fielding. Record and track all new issues arising after fielding. Develop lessons learned from these issues. Provide all safety information to the appropriate level for resolution. Unresolved issues should be presented to the Milestone IV review board.

(3) Data Sources: Same as data sources for lesson learned.

(4) Responsibility: PEO/PM, Combat Developer Safety Offices, command with readiness management responsibility

(5) Feeds: Future system development and modifications on existing systems, MAA.

(6) References: DoD Directive 5000.1, DoD Directive 5000.43, DoD Directive 5000.49, DoD Instruction 5000.2, AR 385-16, DA PAM 385-16.

b. Milestone V - Major Upgrade or System Replacement:

(1) Description: The Milestone V decision encompasses a review of a system's current state or operational effectiveness, suitability, and readiness to determine whether major upgrades are necessary or hazards warrant consideration of replacement. This milestone decision normally will occur 5 to 10 years after initial deployment. The primary considerations are:

(a) Capability of the system to continue to meet its original or evolved mission requirements

(b) Potential necessity of modifications and upgrades to ensure that mission requirements are met and that the useful life is extended

(c) Changes in the threat that require increased capability

(d) Changes in technology that present the opportunity for a significant breakthrough in system worth

(e) Disposition of displaced equipment

(f) Decision as to whether concerns (to include safety) are critical enough to warrant major modification, retirement, and/or new start considerations

(2) Task: Track all safety issues not corrected before fielding. Record and track all new issues arising after fielding. Develop lessons learned from these issues. Provide all safety information to the appropriate level for resolution. Unresolved issues should be presented to the Milestone IV review board.

(3) Data Sources: Same as data sources for lesson learned.

(4) Responsibility: PM/PEO, Combat Developer Safety Offices, command with readiness management responsibility

(5) Feeds: Future system developments and modifications on existing systems, MAA.

(6) References: DoD Directive 5000.1, DoD Directive 5000.43, DoD Directive 5000.49, DoD Instruction 5000.2, AR 385-16, DA PAM 385-16.

ACRONYM LIST

AMC	Army Materiel Command
AR	Army Regulation
ASARC	Army Systems Acquisition Review Council
COEA	Cost and Operational Effectiveness Analysis
DOD	Department of Defense
IAW	In Accordance With
ILS	Integrated Logistics Support
LHX	Light Helicopter Experimental
MAA	Mission Area Analysis
MANPRINT	Manpower and Personnel Integration
MC	Materiel Changes
MCM	Materiel Changes Management
MIL-STD	Military Standard
MJWG	MANPRINT Joint Working Group
MSC	Major Subordinate Command
NDI	Non-Developmental Items
O&O	Operational and Organizational
ODCSPER	Office of the Deputy Chief of Staff for Personnel
OTSG	Office of the Surgeon General
PIP	Product Improvement Proposal
RFP	Request for Proposal
ROC	Required Operational Capability
SDI	Strategic Defense Initiative
SMMP	System MANPRINT Management Plan
SSMP	System Safety Management Plan

SSWG	System Safety Working Group
TEMP	Test and Evaluation Master Plan
TRADOC	Training and Doctrine Command

REFERENCE LIST

DEPARTMENT OF DEFENSE DIRECTIVES (DODD)

- 5000.1 Major System Acquisition.
- 5000.3 Test and Evaluation.
- 5000.36 Systems Safety Engineering and Management.
- 5000.43 Manpower, Personnel, Training, and Safety (MPTS) in the Defense System Acquisition Process.

DEPARTMENT OF DEFENSE INSTRUCTIONS (DODI)

- 5000.2 Major Systems Acquisition Process.

ARMY REGULATIONS (AR)

- 15-14 Systems Acquisition Review Council Procedures.
- 40-5 Health and Environment
- 40-10 Health Hazard Assessment Program in Support of the Materiel Acquisition Decision Process.
- 40-13 Medical Support - Nuclear/Chemical Accidents and Incidents.
- 40-14 Control and Recording Procedures for Exposure to Ionizing Radiation and Radioactive Materials.
- 40-46 Control of Health Hazards from Lasers and Other High Intensity Optical Sources.
- 40-583 Control of Potential Hazards to Health from Microwave and Radio Frequency Radiation.
- 70-1 Systems Acquisition Policy and Procedures.
- 70-10 Research, Development, and Acquisition - Test and Evaluation.
- 70-25 Use of Volunteers as Subjects of Research.
- 70-61 Type Classification of Army Materiel.
- 71-3 User Testing
- 71-9 Materiel Objectives and Requirements.
- 385-10 Army Safety Program.
- 385-11 Ionizing Radiation Protection (Licensing, Control, Transportation, Disposal, and Radiation Safety).
- 385-16 System Safety Engineering and Management.
- 385-63 Range Safety
- 602-1 Human Factors Engineering Program.
- 602-2 Manpower and Personnel Integration (MANPRINT).
- 700-127 Integrated Logistic Support.
- 702-3 Army Materiel Systems Reliability, Availability, and Maintainability (RAM).

DEPARTMENT OF THE ARMY PAMPHLETS (DA PAMs)

- 71-3 Operational Testing and Evaluation Methodology and Procedures Guide.
- 385-16 System Safety Management Guide.

AMC REGULATIONS (AMC-R/DARCOM-R)

385-3 Hazard Analysis for Facilities, Equipment, and Process
Development.
385-21 Hazard Classification.
385-100 Standard Operating Procedures.
700-15 Integrated Logistic Support.
700-34 Release of Materiel for Issue.

AMC/TRADOC PAMPHLET

70-2 Materiel Acquisition Handbook AMC/TRADOC 1987.

MILITARY STANDARDS (MIL-STD)

882-B System Safety Program Requirements.

OTHER REFERENCES

DOD 6055.9-STD, Ammunition and Explosives Safety Standard.

TB 700-2, DOD Explosives Hazard Classification Procedures.

Draft MANPRINT Primer, Department of the Army, Washington D.C.,
20 April 1987.

System MANPRINT Management Guide, Department of the Army,
Washington D.C., July 1986.