# LOAN DOCUMENT

**AD-A276 974**

DTIC ACCESSION NUMBER

LEVEL

INVENTORY

ASC-TR-94-5017

DOCUMENT IDENTIFICATION

Aug 93

DISTRIBUTION STATEMENT A
Approved for public release
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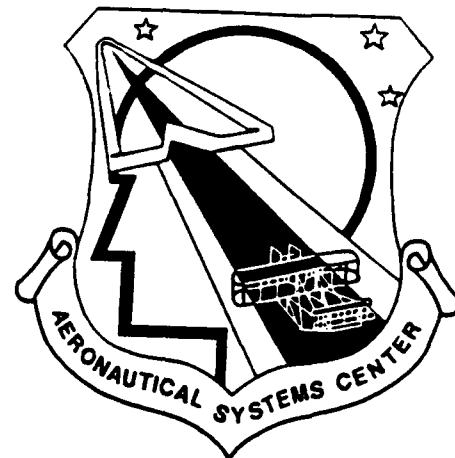PREVIOUS EDITIONS MAY BE USED UNTIL
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## LOAN DOCUMENT

ASC-TR-94-5017

MODULAR SIMULATOR SYSTEM (MSS)

SYSTEM/SEGMENT SPECIFICATION FOR THE GENERIC
MODULAR SIMULATOR SYSTEM - WEAPONS MODULE
VOLUME 7

K KELLY, J BROWN,
G KAMSICKAS, W TUCKER

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SIMULATION AND TRAINING SYSTEMS
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AUGUST 1993

FINAL REPORT

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.

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| 1. AGENCY USE ONLY (Leave blank) | 2. REPORT DATE 13 Aug 93 | 3. REPORT TYPE AND DATES COVERED FINAL |
|---|---|---|

| 4. TITLE AND SUBTITLE System/Segment Specification for the Generic Simulator System-Weapons Module Volume 7 | 5. FUNDING NUMBERS F33657-86-C-0149 64227F |
|---|---|

**6. AUTHOR(S)** R. Kelly, J. Brown G. Kamsickas, W. Tucker

| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Boeing Defense and Space Group Simulation and Training Systems 499 Boeing Blvd Huntsville, AL 35824 | 8. PERFORMING ORGANIZATION REPORT NUMBER S495-10400D |
|---|---|

| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Aeronautical Systems Center Systems Engineering Division Bldg 11 2240 B St Ste 7 Wright-Patterson AFB, OH 45433-7111 | 10. SPONSORING/MONITORING AGENCY REPORT NUMBER ASC-TR-94-5017 |
|---|---|

**11. SUPPLEMENTARY NOTES**

| 12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited. | 12b. DISTRIBUTION CODE |
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**13. ABSTRACT** (Maximum 200 words)

This is the Weapons portion of the generic Modular Simulator System (MSS) specification. It is designed to be tailored to specify the requirements for a specific aircraft training device or family of aircraft training devices. This specification contains specific tailoring instructions for each paragraph. When the tailoring process is complete, the italicized tailoring instructions should have been replaced by application specific text or deleted from the specification. It is suggested that the user read the "Modular Simulator Engineering Guide" and the "Modular Simulator Management Guide" prior to tailoring this volume.

| 14. SUBJECT TERMS Modular Simulator System (MSS) | 15. NUMBER OF PAGES 30 |
|---|---|
| | 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 UL |
|---|---|---|---|

NSN 7540-01-280-5500

Standard Form 298 (Rev 2-89)
Prescribed by ANSI Std Z39-18
298-102

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## PREFACE

*This generic Modular Simulator System (MSS) segment specification has been developed in accordance with DI-CMAN-80008A, Data Item Description for System/Segment Specifications. This specification meets or exceeds the requirements for MIL-STD-490, Type A, specifications. This specification is designed to be tailored to specify the requirements for a specific aircraft training device or family of aircraft training devices. Training devices may consist of Weapon System Trainers (WST), Operational Flight Trainers (OFT), Cockpit Procedures Trainers (CPT), Part Task Trainers (PTT), etc.*

*Tailoring will be necessary to meet specific application requirements. The tailoring must be accomplished so as not to violate the goals and intent of the MSS concept. It is assumed that the user of this document has a familiarity with the MSS design concepts and architecture, the application aircraft training requirements, and general working knowledge of aircraft training systems. It is suggested that the user read the "Modular Simulator System Engineering Design Guide" (D495-10440-1) and the "Modular Simulator System Management Guide" (D495-10439-1) prior to tailoring this specification. These guides provide an overview of the MSS architecture, an in-depth discussion on its application, and lessons learned from previous applications.*

*Each segment in the MSS architecture provides a portion of the overall system functionality. Similar functions and operations were grouped in each segment based on past experience, areas of design expertise, and management of intersegment communication. To promote reuse of the segments and gain the maximum benefits of using the MSS approach, it is suggested that user adhere to the generic functional allocation. Interfaces between the segments should remain relatively constant from application to application. The application vehicle is considered to be an air vehicle (e.g. fixed wing, variable geometry, or rotary wing), although the MSS architecture and concepts may be applied to either ground or sea vehicles.*

*This specification contains specific tailoring instructions for each paragraph. The instructions are contained within the paragraphs, and are identified by blank spaces and/or italicized text. When the tailoring process is complete, the italicized tailoring instructions should have been replaced by the application specific text or deleted from the specification. Paragraphs which do not apply to a particular application should not be deleted. They should be identified as "Not Applicable" to maintain paragraph numbering consistency between volumes and various MSS applications.*

# 1. SCOPE

## 1.1 Identification.

This segment specification establishes the requirements for the Weapons segment of the _____ *(insert application aircraft type)* Modular Simulator System (MSS). This volume is one of ___ *(insert number of volumes in the application system/segment specification)* volumes which comprise the system/segment specification for the _____ *(insert application aircraft type)* MSS. Volume I of this specification contains system level requirements such as MSS structure, communication architecture, network interface performance, system level diagnostic and test requirements, Ada programming language applicability, adaptability and expandability, and other requirements which pertain to all volumes.

## 1.2 System Overview.

The purpose of the Weapons segment is to simulate the offensive weapon system functions employed on the _____ *(insert application aircraft type)* aircraft. The Weapons segment interfaces with other MSS segments as described in the _____ *(insert application aircraft type)* Interface Design Document (IDD), _____ *(insert IDD document number)*. Each of the Weapons functions identified in this volume are to be processed within the Weapons segment.

*(This paragraph should be modified to specify the types of offensive weapon systems employed on the application aircraft. Weapon systems may include various types of air-to-air missiles, air-to-ground missiles, bombs.)*

## 1.3 Document Overview.

This segment specification defines Weapons segment unique requirements for the _____ *(insert application aircraft type)* MSS. It contains requirements for the functions performed within the segment including communication interface requirements, segment performance requirements, segment diagnostic and test requirements, and expandability and adaptability requirements as applicable to the Weapons segment.

## 2. APPLICABLE DOCUMENTS

2.1 Government Documents. The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

The Government documents, applicable to the _____ (insert application aircraft type) MSS, are listed in Volume I of this specification. The following Government documents are in addition to those documents, and are specifically applicable to the _____ (insert application aircraft type) MSS Weapons segment.

SPECIFICATIONS:

    Federal - (Identify applicable federal specifications)
    Military - (Identify applicable military specifications)
    Other Government Agency - (Identify applicable government specifications)

STANDARDS:

    Federal - (Identify applicable federal standards)
    Military - (Identify applicable military standards)
    Other Government Agency - (Identify applicable government standards)

DRAWINGS: (Identify applicable government drawings)

OTHER PUBLICATIONS:

    Manuals - (Identify applicable government manuals)
    Regulations - (Identify applicable government regulations)
    Handbooks - (Identify applicable government handbooks)
    Bulletins - (Identify applicable government bulletins)

Copies of specifications, standards, handbooks, drawings, publications and other Government documents required in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.

(In this paragraph, list only those documents which are explicitly referenced within this specification volume. If a requirement paragraph is tailored to a reference in a system/segment specification Volume I paragraph, and that paragraph contains a reference, the document should not be listed here. All requirements and references in system/segment specification Volume I are requirements of this specification unless specifically excluded in this volume.)

2.2 <u>Non-Government Documents</u>. The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between the documents reference herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

The non-Government documents applicable to the _____ *(insert application aircraft type)* MSS are listed in Volume I of this specification. The following non-Government documents are in addition to those documents, and are specifically applicable to the _____ *(insert application aircraft type)* MSS Weapons segment.

SPECIFICATIONS: *(Identify applicable non-government specifications)*

STANDARDS: *(Identify applicable non-government standard)*

DRAWINGS: *(Identify applicable non-government drawings)*

OTHER PUBLICATIONS: *(Identify applicable non-government publications)*

Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal Agencies.

*(In this paragraph list only those documents which are explicitly referenced within this specification volume. If a requirement paragraph is tailored to reference a system/segment specification Volume I paragraph, and that paragraph contains a reference, the secondary document should not be listed here. All requirements and references in system/segment specification Volume I are requirements of this specification unless specifically excluded in this volume.)*

3. **REQUIREMENTS**

3.1 **Segment Definition**. The Weapons segment shall provide the
capabilities to simulate _____ *(insert application aircraft type)*
aircraft weapon systems. The Weapons segment is one of _____
*(insert number of segments to be used in the application simulation)* unique segments
which comprise the _____ *(insert application aircraft type)* MSS. The
Weapons segment shall provide the modes, states, and functions as
defined in this specification volume and Volume I.

The Weapons segment shall provide the real-time simulation of the
_____ *(insert application aircraft type)* weapon systems. This segment
shall provide operation and control representative of both normal
and degraded states. The Weapons segment shall provide
simulation/stimulation for the aircraft weapon control systems,
weapons, and weapon delivery systems.

*(This paragraph should be tailored to convey the exact top level functions required of the
segment. If this segment is to be used/reused on several devices within a family of trainers, that
should be stated here with any unique performance requirements.)*

3.2 **Characteristics**

3.2.1 **Performance Characteristics**. Performance of the Weapons
segment shall be as specified herein and in accordance with the
_____ *(insert application aircraft type)* aircraft design criteria. The
Weapons segment shall simulate functions associated with the
_____ *(insert application aircraft type)* aircraft weapon systems. This
segment shall provide a simulation for ownship weapon operations.
Threat weapons fired at the ownship shall be simulated by the
Environment segment. The fidelity of the Weapons segment shall
be sufficient to provide the necessary level of training as
specified in Volume I, paragraph 6.1 of this specification.

*(Several considerations must be addressed in this paragraph:*

    *a. Availability of specific and traceable weapon system design and engineering data*
    *b. Manufacture of specific weapon system components.*

*Additional text should be added to this paragraph to identify the design criteria and specific
weapon system equipment to be simulated. A general statement with respect to the fidelity of the
simulation should be added.)*

3.2.1.1 **Segment Modes and States**. The Weapons segment shall
support the modes and states as described in Volume I of this
specification. Additional requirements or operations specific to
the Weapons segment shall not cause degradation of the system nor
violate the intent of the system mode or state.

*(Introduction of new modes is prohibited. Functions should be accomplished within the established modes and states. This paragraph should be tailored to describe the segment's response to a given mode or state. Subparagraphs should be added to identify and define segment requirements for each mode and state.)*

3.2.1.2 <u>Weapons Segment Functions</u>. Functions characterized as "Implemented" shall be implemented, within the Weapons segment, to the extent described by the paragraphs dedicated to those functions. Functions characterized as "Not Applicable" do not exist in the simulation of the _____ *(insert application aircraft type)*, and are not required to be implemented in any form within the Weapons segment.

|   |   |   |
|---|---|---|
| a. | Weapons Support Function | Implemented |
| b. | Ownship Fire Control Function | *(Implemented, N/A)* |
| c. | Ownship Weapon Dynamics Function | *(Implemented, N/A)* |
| d. | Ownship Weapon Stores Function | *(Implemented, N/A)* |
| e. | Target Designation Function | *(Implemented, N/A)* |
| f. | Threat Weapons Damage Assessment Function | *(Implemented, N/A)* |

*(Each function listed should be characterized as "Implemented" or "Not Applicable (N/A)").*

3.2.1.2.1 <u>Weapons Support Function</u>. The Weapons support function shall provide segment unique support services required for operation of the Weapons segment in the MSS environment. The Weapons support function services shall include the functions listed below, and as described in the following paragraphs.

a. Executive Control
b. Initialization
c. MSS Virtual Network (VNET) Communication
d. Diagnostics and Test
e. Backdoor Interfacing
f. Malfunctions
g. Damage Assessment
h. Security Processing
i. Scoring
j. Other Support Function Services.

3.2.1.2.1.1 <u>Executive Control</u>. The executive control support service shall provide operational control for the Weapons segment. This control shall include: execution sequencing of all software segments, mode and state control, and communication between the simulation software and the VNET.

*(For most applications this paragraph will require no tailoring. If additional or specific executive control functions are required, they should be identified in this paragraph.)*

3.2.1.2.1.2 Initialization. The initialization support service shall control initial hardware and software states for the Weapons segment. System initialization shall occur during power-up and system resets, as defined in Volume I of this specification. The initialization function shall access mission initialization data, and transfer the data to other segment functions for mission initialization.

*(Initialization requirements unique to the application aircraft weapon systems should be specified in this paragraph. Initialization refers to setting initial hardware and software states during power-up and system resets as defined in Volume I. Instrument scale factors and default instrument settings (usually powered off) are typically initialized by this function. A second initialization function is to access mission initialization data (for example from disc) to pass to other segment functions for mission initialization.)*

3.2.1.2.1.3 MSS Virtual Network Communication. The MSS VNET communication support service shall provide the Weapons segment interface to the VNET. It shall allow communication with other segments in the _____ *(insert application aircraft type)* MSS. The Weapons segr ... shall communicate on the MSS VNET in accordance with the protocol requirements defined in the _____ *(insert application aircraft type)* MSS IDD, _____ *(insert MSS IDD document number)*.

3.2.1.2.1.4 Diagnostics and Test. The diagnostics and test support service shall provide control for the diagnostic and test functions incorporated into the Weapons segment. Diagnostic and test requirements, for the Weapons segment, shall be in accordance with the requirements specified herein.

*(Based upon the specific simulator diagnostic requirements, all or part of the three types of diagnostic capabilities may be required. "Not applicable" should be inserted if the specific diagnostic type is not required for the application MSS. Specific diagnostics and their requirements should be listed in each paragraph when applicable.)*

3.2.1.2.1.4.1 On-Line Diagnostics. On-line diagnostics shall be provided for the Weapons segment. These diagnostics shall be self initiating during startup, and/or they may be executed as a background function during training mode.

*(On-line diagnostics are those diagnostics that execute while the training system is in the real-time training mode. These diagnostics may run as a background task. An example that would be used in an MSS might be a segment functional diagnostic. Each diagnostic would tell the IOS segment that it was still functioning on a periodic basis (say once a minute). If the IOS does not receive the message then it assumes the segment is not functioning properly and provides a message to the instructor.)*

3.2.1.2.1.4.2 Off-Line Diagnostics. Off-line diagnostics shall be provided by the Weapons segment. Off-line diagnostics shall

be executed when the _____ *(insert application aircraft type)* MSS is not engaged in a system mode.

*(Off-line diagnostics are those diagnostics that are performed on a segment in the stand-alone or segment mode. Typical off-line diagnostics would include; hardware self tests, software tests, I/O debug programs, Daily Readiness at a segment level, etc.)*

3.2.1.2.1.4.3 <u>Remote Controlled Diagnostics</u>. Remote controlled diagnostics shall be provided for the Weapons segment. These diagnostics shall be executable, from the Instructor Operator Station (IOS), when the MSS is in the Remote Controlled Diagnostic mode.

*(Remote controlled diagnostics are those diagnostics that run in the special remote controlled Diagnostic mode. These diagnostics require the system to be up and running and the segments communicating. An example of a Remote Controlled Diagnostic would be a real-time debugger.)*

3.2.1.2.1.5 <u>Backdoor Interfacing</u>. The Backdoor interface support service shall provide the means to support external interfaces to the Weapons segment. All ownship weapons system Input/Output (I/O) not specifically identified in the _____ *(insert application aircraft type)* MSS IDD shall interface via the MSS VNET. Backdoor interfaces shall not be utilized for normal intersegment communication.

*(Specific external interfaces should be discussed in this paragraph. Backdoor interfaces may include a 1553 bus to installed aircraft avionics or a specialized interface to drive a Head Up Display (HUD). A backdoor interface may not be utilized to transmit intersegment data.)*

3.2.1.2.1.6 <u>Malfunctions</u>. The malfunctions support service shall provide control for the processing and execution of Weapons segment malfunctions. The system response shall be in accordance with aircraft design criteria.

*(Weapons segment malfunction requirements should be defined in a program unique Malfunction Description Document)*

3.2.1.2.1.7 <u>Damage Assessment</u>. The damage assessment support service shall provide for the processing and implementation of any damage simulation for which the Weapons segment is responsible. This shall include the degradation of the appropriate systems within the Weapons segment based on an evaluation of the damage severity and location.

*(Specific damage assessment and system degradation requirements should be specified in this paragraph which are consistent with the training requirements of the specific simulator.)*

3.2.1.2.1.8 <u>Security Processing</u>. The Weapons segment security processing support service shall provide processing to meet the

security requirements of the _____ *(insert application aircraft type)*
MSS Weapons segment.

*(This paragraph should be expanded to clearly specify which government directives apply and to what extent consistent with security considerations. Security processing would include Memory Erase Mode if required and any other security considerations, such as removable memory or special encoding devices.)*

3.2.1.2.1.9 <u>Scoring</u>. The scoring support service shall provide the ability to assess weapon performance. The Weapons segment scores shall be provided to the IOS segment via the MSS VNET.

*(Application specific scoring data requirements for the Weapons segment shall be listed in this paragraph. If large amounts of data are required, it may be advisable to provide this as a non-real-time activity.)*

3.2.1.2.1.10 <u>Other Support Function Services</u>. Not Applicable.

*(If there are other support functions unique to this segment they should be listed here, otherwise identify this paragraph as "Not Applicable". An example is intra segment communication. Before defining new functions be sure the function cannot be incorporated as a variant of an existing function.)*

3.2.1.2.2 <u>Ownship Fire Control Function</u>. The Ownship Fire Control function shall simulate weapon releases during real-time training exercises. This function shall interface with weapon system controls and displays to produce a fire control system simulation in accordance with _____ *(insert application aircraft type)* aircraft design criteria. The Ownship Fire Control function shall provide data to other MSS segments in accordance with the interface requirements specified in the _____ *(insert application aircraft type)* MSS IDD.

*(The Fire Control function will generally have multiple capabilities; these additional functions may require subparagraphs to adequately provide requirements. Generally, the Fire Control function performs the actions required to prepare and release a weapon. In some cases it may also involve guiding the weapon to the target. This paragraph should describe the required functionality of the ownship fire control simulation. The following items should be considered when specifying requirements for the Ownship Fire Control function:*

    *a. Types of weapon releases, i.e. bomb drops, gun fire, missile launches, etc.*
    *b. Weapon release prerequisites, i.e. weapon status, bomb bay door status, fire control radar system status, infrared sensor status, etc.*
    *c. Guidance systems used, i.e. radar, infrared, laser, etc.*
    *d. Sensor states required for weapon release*
    *e. Weapon system switches, their states, and required positions for weapon release*
    *f. Weapon system automated and manual controls*

g. *Dynamic modeling for guidance systems, effectiveness, and required I/O*
h. *Number of simultaneous weapon releases and time delays before next release*
i. *Types of weapon releases, i.e. jettisons, instructor dump, crew member activation*
j. *Specific Interfaces with other weapon functions or other MSS segments*
k. *Embedded aircraft equipment related to the fire control function*
l. *Displayed weapon information, fidelity, format, character set, color, etc.*
m. *Ownship dynamic state, i.e. position speed, attitude, altitude, etc.*

3.2.1.2.3  <u>Ownship Weapon Dynamics Function</u>.  The Ownship Weapon
Dynamics function shall simulate the weapon motion along its
flight path.  This function shall provide data to other MSS
segments in accordance with the interface requirements specified
in the _____ *(insert application aircraft type)* MSS IDD.

*(This paragraph should provide requirements for the functionality of the ownship weapon
dynamics simulation.  Specific weapon track information should be identified in this paragraph.
The following items should be considered when specifying requirements for the Ownship
Weapon Dynamics function:*

    a. *Types of weapon tracks to be simulated, i.e. bomb flight, gun projectile dynamics,
       missile track, etc.*
    b. *Specific types of bombs, guns, and missiles requiring weapon dynamics modeling*
    c. *Dynamic modeling algorithm requirements, lookup table modeling, velocity
       limitations, accelerations and decelerations, wind effects, etc.*
    d. *Dynamic motion fidelity*
    e. *Guidance tracks used, i.e. radar, infrared, laser, etc.*
    f. *Expected results with loss of guidance system*
    h. *Weapon flight information provided to cockpit displays, fidelity of information for
       displays, etc.*
    i. *Interaction between weapons released, e.g. effects upon guidance and/or tracks.)*

3.2.1.2.4  <u>Ownship Stores Function</u>.  The Ownship Stores function
shall control the dynamic inventory for ownship weapon stores
during real-time training exercise.  This function shall
interface with the crew station controls and displays to produce
a weapon system stores simulation in accordance with the
_____ *(insert application aircraft type)* aircraft design criteria.  This
function shall provide data to other MSS segments in accordance
with the interface requirements specified in the _____ *(insert
application aircraft type)* MSS IDD.

*(This paragraph should provide requirements for the functionality of the ownship weapon stores
simulation.  Specific weapon stores information should be identified in this paragraph.  The
following items should be considered when specifying requirements for the Ownship Stores
function:*

    a. *Weapon stores to be simulated, i.e. bombs, gun ammunition, missiles, etc.*

b. *Quantity and specific types of bombs, guns, and missiles released and/or available*

c. *Weapon stores configurations, limitations, normal loads, etc.*

d. *Number of simultaneous updates and system delays associated with stores updates*

e. *Available and expended weapon locations, weapon bays, and locations, etc.*

f. *Weapon weights, center of gravity locations, etc.*

g. *Automated and manual controls associated with weapons stores status and updates*

h. *Criteria for accepting updates to weapons stores information*

i. *Embedded aircraft equipment related to the weapon stores function*

j. *Displayed weapon stores information, fidelity, format, character sets, color, etc.)*

3.2.1.2.5 <u>Target Designation Function</u>. The Target Designation function shall provide target designation information to the ownship weapons simulation during real-time training exercises. This function shall provide information to the crew station controls and displays to produce the target designation simulation in accordance with the _____ *(insert application aircraft type)* aircraft design criteria. The Target Designation function shall provide data to other MSS segments in accordance with the interface requirements specified in the _____ *(insert application aircraft type)* MSS IDD.

*(This paragraph should provide requirements for the functionality of the target designation simulation. Specific target designation information should be identified in this paragraph. The following items should be considered when specifying requirements for the Target Designation function:*

a. *Embedded aircraft equipment related to the target designation function*

b. *Target designation displays, update rates, fidelity, information displayed, color, character sets, etc.*

c. *Types of target designation information, i.e. Identification Friend or Foe (IFF), pull-up anticipation cue indications, or Continuously Computed Impact Point (CCIP) reticle calculations, etc.*

d. *Systems being simulated, type, model number, etc.*

e. *Automated and manual responses and controls associated with target designation*

f. *Mission data associated with computed target designation, anticipated and range of differences between computed and actual targets, reaction to differences, etc.*

g. *Fidelity of target designation, range of acquisition and/or deselection, time before weapon releases, and target designations, etc.)*

3.2.1.2.6 <u>Threat Weapon Damage Assessment Function</u>. The Threat Weapon Damage Assessment function shall provide scoring, and damage assessment, for each simulated threat weapon fired at the ownship during a real-time training exercise. This function shall provide data to other MSS segments in accordance with the interface requirements specified in the _____ *(insert application aircraft type)* MSS IDD.

*(This paragraph should describe the required functionality of the threat weapon damage assessment function. Specific scoring and damage assessment information should be identified in this paragraph. The following items should be considered when specifying requirements for the Weapon Damage Assessment function:*

*a. Fidelity and types of damage to be assessed, cumulative damage assessments, etc.*
*b. System update rate, associated delays, algorithms to be used in modeling, lookup table effects, etc.*
*c. Weapon impact volume, miss effects, near miss effects, direct hit types, etc.*
*d. Automated and manual controls of assessment information and I/O requirements*
*e. Required and allowable controls by crew members and/or instructor*
*f. Required scoring format, fidelity, report forms, interpretation, time for reporting, etc.*
*g. Areas to be scored, i.e. damage assessment, firing, guidance control, requests for evasive maneuvers, etc.*
*h. Interfaces with other weapon functions and other MSS segments.)*

3.2.2 <u>System Capability Relationships</u>. The Weapons segment shall support the system capability relationships defined in Volume I of this specification. Weapons segment functional relationships shall be as described in the following paragraphs.

*(Define any Weapons segment unique capability relationships. In general, the capability relationships specified in Volume I will suffice for this segment.)*

3.2.2.1 <u>Segment Functional Relationships</u>. The top level, typical, Weapons segment functional relationships are depicted in FIGURE 1. Each function shall operate in a manner which will allow the segment, as a system, to satisfy the timing requirements described in Volume I of this specification. Functions implemented within the Weapons segment shall operate in such a manner which will allow the segment to meet both segment and system level requirements without degradation.

*(There are two approaches to describing inter-segment interfaces: all functions communicate through the support function, or all functions communicate directly with other functions. FIGURE 1 in all segments may have the same structure. For this segment, functions which are not implemented should be shaded out. If desired, functions which are only partially implemented may be graphically represented with cross hatching. Note that the intent of this diagram should be to identify "required" internal relationships and not to specify the segment's internal design. The tailoring of this paragraph should be done very carefully.)*

3.2.3 <u>External Interface Requirements</u>. The Weapons segment shall support the external interface requirements defined in Volume I of this specification and the _____ *(insert application aircraft)* MSS Interface Requirements Specification (IRS), _____ *(insert IRS document number)*. External interfaces comprise data passed between functions contained in the Weapons segment and functions contained in the other MSS segments. With the exception of the
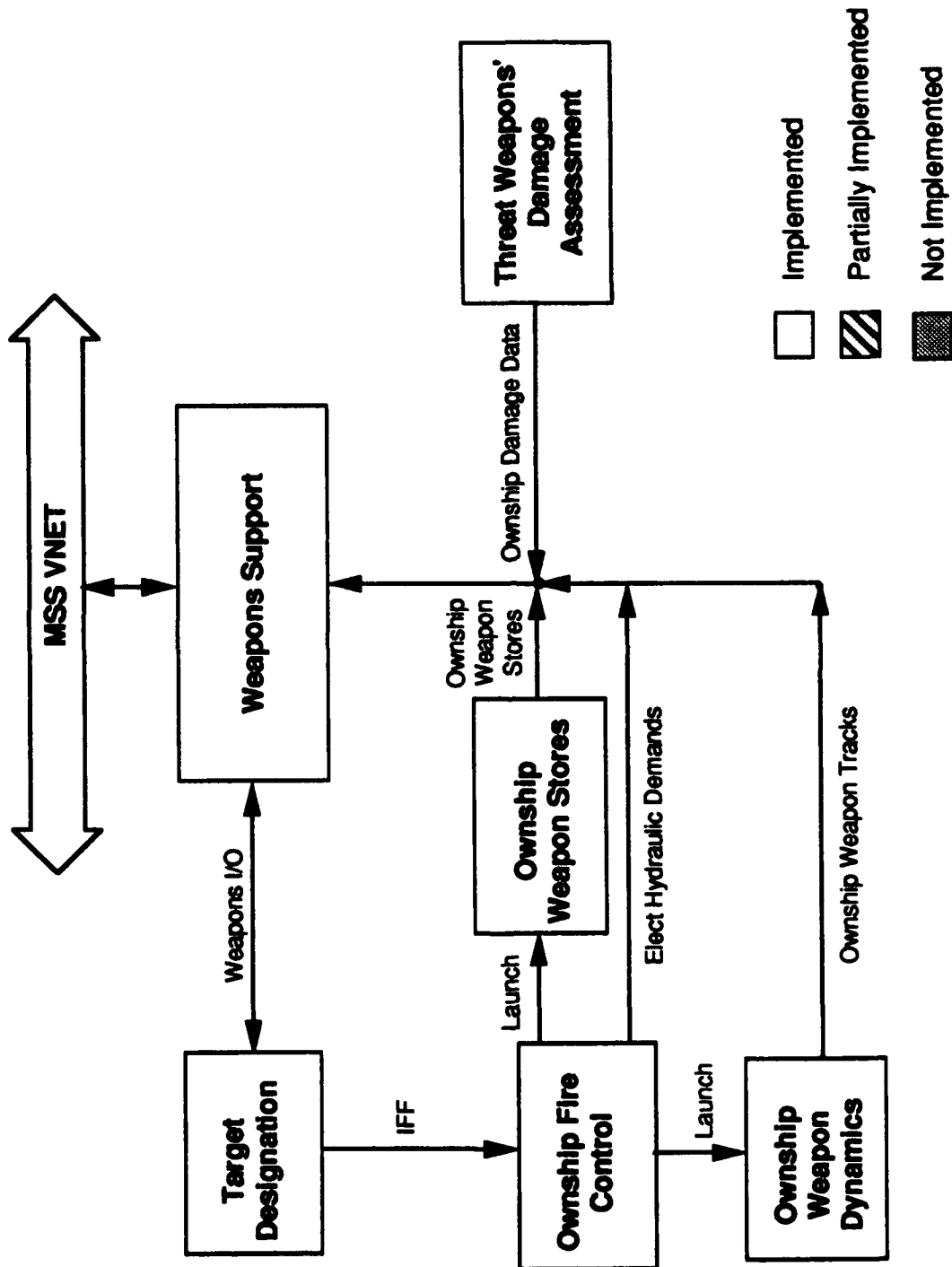
FIGURE 1 WEAPONS SEGMENT FUNCTIONAL RELATIONSHIPS

dedicated interfaces for the cockpit, all other external interfaces which shall be used for the Weapons segment are specified in the _____ *(insert application aircraft type)* IRS.

*(Define Weapons segment unique external interface requirements. Communications functions may interface with external systems which contain electronics equipment, such as amplifiers, noise or static generators, or digital signal processors. If such equipment is required it should be identified in this paragraph.)*

3.2.4 <u>Physical Characteristics</u>. The physical characteristics of the Weapons segment shall meet the requirements as specified in Volume I of this specification. The Weapons segment physical characteristics shall be of such design as to interface with the other MSS segments via the MSS VNET.

*(Physical characteristic requirements for the weapon segment, other than those provided by the Weapons segment computational system and its interface to the MSS VNET shall be defined in this paragraph. Physical characteristic requirements may include backdoor interface hardware to connect Weapons segment I/O to the weapons equipment in the application aircraft cockpit; in particular, backdoor hardware interfaces may be required for the fire control and weapon stores panels in the Flight Station cockpit. In addition, any weight or size considerations applicable to the weapons segment should be considered.)*

3.2.4.1 <u>Protective Coatings</u>. Weapons segment protective coatings shall be as defined in Volume I of this specification.

*(Additional protective coating requirements which are required for the Weapons segment may be defined in this paragraph. In general, the requirements of Volume I should suffice for the entire system.)*

3.2.5 <u>Weapons Segment Quality Factors</u>

3.2.5.1 <u>Reliability</u>. The system level reliability requirements applicable to all segments in the MSS are defined in Volume I of this specification. The Weapons segment reliability must be ___ % to satisfy the system level reliability requirements. The Mean Time Between Critical Failure (MTBCF) shall be not less than ___ hrs.

*(A specific allocation of reliability (e.g. MTBF) for this segment should be specified in this paragraph. Reliability should be allocated to each segment in such a way that system level reliability requirements will be met. Normally, this means that segment reliability will be higher than system reliability.)*

3.2.5.2 <u>Maintainability</u>. The system level maintainability requirements applicable to all segments in the MSS are defined in Volume I of this specification. The Weapons segment shall have a mean corrective maintenance time, $\mu_c$, of ___ minutes, and a 90th

percentile maximum corrective maintenance time of ___ minutes to satisfy the system level maintainability requirements.

*(Maintainability requirements such as MTTR should be allocated to each segment in such a way that system level maintainability requirements will be met. Normally, this means that segment MTTR will be higher than system MTTR. System level requirements will include isolation to a faulty segment.)*

3.2.5.3 <u>Availability</u>. The system level availability requirements applicable to all segments in the MSS are defined in Volume I of this specification.

*(Usually availability applies only to the system level. Reliability and Maintainability (MTBF and MTTR) are allocated to each segment in such a way that system availability requirements will be met. It would be unusual to impose an availability requirement at the segment level.)*

3.2.5.4 <u>Additional Quality Factors</u>. The additional quality factors, as defined in Volume I of this specification, shall apply to the Weapons segment.

*(Additional Weapons segment unique quality factors may be defined in this paragraph. In general, the system level additional quality factors will suffice for the Weapons segment.)*

3.2.6 <u>Environmental Conditions</u>. The environmental condition requirements, as defined in Volume I of this specification, shall apply to the Weapons segment.

*(Identify any Weapons segment unique environmental requirements. In general, the system level environmental conditions will suffice for the Weapons segment.)*

3.2.7 <u>Transportability</u>. The transportability requirements, defined in Volume I of this specification, shall apply to the Weapons segment.

*(Identify any Weapons segment unique transportation requirements. There may exist unique transportation requirements to ship the segment from the segment contractors facility to the prime contractors facility. In general, the system level transportability requirements will suffice for the Weapons segment.)*

3.2.8 <u>Flexibility and Expansion</u>. The flexibility and expansion requirements, defined in Volume I of this specification, shall apply to the Weapons segment.

*(Unique requirements for this segment may include spare memory, spare time, spare mass storage, I/O channels by type, chassis expansion slots, etc. Expansion requirements should consider the likelihood this segment will need to change as well as the cost of including capability now versus cost to change later. Reuse of the segment in future applications should also be considered.)*

3.2.9 Portability. The portability requirements, defined in Volume I of this specification, shall apply to the Weapons segment.

*(Except for field transportable trainers portability of hardware is usually not a requirement. Portability of software may be a concern of future changes which may include upgrading the Computer Hardware Configuration Item (HWCI) are considered likely. Use of a standard higher order language such as Ada is usually adequate to assure software portability.)*

3.3 Design and Construction. The design and construction requirements, defined in Volume I of this specification, shall apply to the Weapons segment.

*(Identify any Weapons segment unique design and construction requirements. In general, the system level design and construction requirements will suffice for the Weapons segment.)*

3.3.1 Materials. The materials requirements, defined in Volume I of this specification, shall apply to the Weapons segment.

*(Identify any Weapons segment unique material requirements. In general, the system level material requirements will suffice for the Weapons segment.)*

3.3.1.1 Toxic Materials. The toxic materials requirements, defined in Volume I of this specification, shall apply to the Weapons segment.

*(Identify any Weapons segment unique toxic materials requirements. In general, the system level toxic materials requirements will be applicable to all segments.)*

3.3.2 Electromagnetic Radiation. The electromagnetic requirements, defined in Volume I of this specification, shall apply to the Weapons segment.

*(Identify any Weapons segment unique electromagnetic radiation requirements. In general, the system level electromagnetic radiation requirements will suffice for the Weapons segment.)*

3.3.3 Nameplates and Product Marking. The nameplate and product marking requirements, defined in Volume I of this specification, shall apply to the Weapons segment.

*(Identify any Weapons segment unique nameplate and product marking requirements. In general, the system level nameplate and product marking requirements will suffice for the Weapons segment.)*

3.3.4 Workmanship. The workmanship requirements, defined in Volume I of this specification, shall apply to the Weapons segment.

*(Identify any Weapons segment unique workmanship requirements. In general, the system level workmanship requirements will suffice for the Weapons segment.)*

3.3.5 __Interchangeability__. The interchangeability requirements, defined in Volume I of this specification, shall apply to the Weapons segment.

*(Identify any Weapons segment unique interchangeability requirements. In general, the system level interchangeability requirements will suffice for the Weapons segment.)*

3.3.6 __Safety__. The safety requirements, defined in Volume I of this specification, shall apply to the Weapons segment.

*(Identify any Weapons segment unique safety requirements. In general, the system level safety requirements will suffice for the Weapons segment.)*

3.3.7 __Human Engineering__. The human engineering requirements, defined in Volume I of this specification, shall apply to the Weapons segment.

*(Identify any Weapons segment unique human engineering requirements. In general, the system human engineering requirements will suffice for the Weapons segment.)*

3.3.8 __Nuclear Control__. The nuclear control requirements, defined in Volume I of this specification, shall apply to the Weapons segment.

*(Identify any Weapons segment unique nuclear control requirements. In general, the system level nuclear control requirements will suffice for the Weapons segment.)*

3.3.9 __Segment Security__. The system security requirements, defined in Volume I of this specification, shall apply to the Weapons segment.

*(Identify any Weapons segment unique security requirements. The Weapons segment may have additional requirements to ensure declassification of an embedded Weapons system. In general, the system level security requirements will suffice for the Weapons segment.)*

3.3.10 __Government Furnished Property__. Government Furnished Property (GFP) shall be as identified in Volume I of this specification.

*(Identify any Weapons segment unique GFP requirements. In general, the system level GFP requirements will suffice for the Weapons segment.)*

3.3.11 __Computer Resource Reserve Capacity__. The system level processing resource requirements applicable to all segments in the MSS are defined in Volume I of this specification.

*(In addition to the computer resource reserve capacity identified in Volume I, the specific reserve capacity for the Weapons segment may include the computational system hardware and software required to design, develop, and test the Weapons segment. System considerations such as spare (time, memory, storage, I/O channels) for growth unique to this segment should be*

*imposed here. If this paragraph requires subparagraphs they should follow the numbering and topics used in Volume I.)*

3.4 <u>Documentation</u>. The documentation requirements, defined in Volume I of this specification, shall apply to the Weapons segment.

*(Identify any Weapons segment unique documentation requirements. Documentation requirements for the Weapons segment may include interface specifications and design data for interfacing to an embedded Weapons system. In general, the system level documentation requirements will suffice for the Weapons segment.)*

3.5 <u>Logistics</u>. The system level logistics requirements applicable to the Weapons segment shall be as specified in Volume I of this specification, paragraph 3.5, and all subparagraphs of paragraph 3.5.

*(Unique support requirements for this segment should be described here. These may include special tools and jigs for installation, alignment and calibration; special environmental conditions for operation and repair such as a clean-room for component repairs; levels and types of spares required.)*

3.6 <u>Personnel and Training</u>. The system level personnel and training requirements, defined in Volume I of this specification, shall apply to the Weapons segment.

*(Identify any Weapons segment unique personnel and training requirements. In general, the system level personnel and training requirements (number, skills and training for maintenance personnel) will suffice for the Weapons segment.)*

3.7 <u>Subordinate Element Characteristics</u>. Not applicable.

*(This volume defines requirements for a subordinate element of the MSS. In general, there will be no subordinate elements of a segment.)*

3.8 <u>Precedence</u>. The precedence requirements for the Weapons segment shall be as specified in Volume I of this specification.

# 4. QUALIFICATION REQUIREMENTS

4.1 <u>Responsibility For Test and Inspection</u>. The _____
*(insert application aircraft type)* MSS Responsibility For Test and Inspection
requirements are defined in Volume I of this specification. The
requirements defined in Volume I shall apply to the Weapons
segment.

*(This paragraph may be tailored to identify additional test or inspection requirements which are specific to the Weapons segment.)*

4.2 <u>Special Tests and Examinations</u>. The system level general
qualification events, levels, and methods of testing for the
Weapons segment are defined in Volume I of this specification.
The requirements defined in Volume I shall apply to the Weapons
segment.

*(Clearly identify which test events defined in Volume I apply to this segment. Be particularly explicit about the segment builder's responsibility during system integration and test. To the extent possible, segment verification should be accomplished as a stand alone segment test. In some cases verification can only be achieved in the integrated mode. A clear definition of the Segment supplier's responsibility during systems integration should be contained in the SOW.)*

4.3 <u>Requirements Cross Reference</u>. A requirements compliance
cross reference matrix shall be developed to ensure requirement
verification traceability. The requirements cross reference
matrix shall be included as part of the Weapons segment Prime
Item Development Specification (PIDS).

## 5. PREPARATION FOR DELIVERY

The _____ (insert application aircraft type) MSS preparation for delivery requirements, as defined in Volume I of this specification, shall apply to the Weapons segment.

*(Segment unique requirements may include packaging the segment for shipment to the integration location which could be different than packaging the system for shipment to the installation site. If requirements are imposed here, there may be test requirements for verification which must be added to Section 4.)*

## 6. NOTES

6.1 **Intended Use**. The _____ *(insert application aircraft type)* MSS shall be used as an integral part of the _____ *(insert application aircraft type)* aircraft training system.

6.1.1 **Missions**. The Weapons segment shall support the mission requirements defined in Volume I of this specification. The Weapons segment shall provide simulation and training in cockpit familiarization, weapon system operating procedures, and mission procedures for the _____ *(insert application aircraft type)* aircraft weapon systems. The weapon system simulation shall provide familiarization with the cockpit configuration and operation of the _____ *(insert application aircraft type)* weapon systems. The simulation shall provide an environment to gain proficiency in executing normal procedures, recognize malfunctions/abnormal indications and executing the corresponding emergency procedures, and in executing mission procedures.

*(The Weapons segment mission is to support the trainer mission, as described in Volume I. Any mission specific information should be described in this section. An example might be a segment intended to support a family of trainers, such as, a procedures trainer, part task trainer, flight trainer, or weapons system trainer.)*

6.1.2 **Threat**. Not applicable.

*(This paragraph shall describe the threat which the weapon system is intended to neutralize. In this context, this paragraph is not applicable to most simulators, and will generally remain "Not applicable".)*

6.2 **Weapons Segment Acronyms**. The acronyms contained in this paragraph are unique to the Weapons segment and are in addition to the MSS acronyms contained in Volume I of this specification.

*(Considerations may be given to including conversion factors or unique coordinate system definition.)*

| | |
|---|---|
| DOD | Department of Defense |
| GFP | Government Furnished Property |
| IDD | Interface Design Document |
| I/O | Input/Output |
| IRS | Interface Requirements Specification |
| MSS | Modular Simulator System |
| MTBCF | Mean Time Between Critical Failure |
| PIDS | Prime Item Development Specification |

VNET        Virtual Network

6.3 <u>Glossary of Weapons Segment Terms</u>.  The terms contained in this paragraph are unique to the Weapons segment and are in addition to the MSS terms contained in Volume I of this specification.

> STORES - Weapon loads on the ownship airframe.  Weapons may be gun projectiles, missiles, rockets, bombs, etc.

> THREAT WEAPONS - Any weapon released by a threat at the ownship.

> WEAPON TRACKS - Complete positional data, i.e., latitude, longitude, and altitude, of a fired weapon.

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## REVISIONS

| LTR | DESCRIPTION | DATE | APPROVAL |
|-----|-------------|------|----------|
| A | **BMAC-STS-86-303-1**<br><br>Total revision required to incorporate changes required by testing/validation efforts and Government comments. | 90/01/11 | *J. Clem*<br>Prepared By |
| | | 90/01/11 | *[signature]*<br>Checked By |
| | | 91/01/14 | *[signature]*<br>Dwg. Qual. |
| | | 90/01/11 | *[signature]*<br>Supervised By |
| | | 91/01/15 | *W. Tucker*<br>Approved By |
| B | **CCP HSV-H91-008**<br><br>Total revision required to incorporate changes resulting from addition of two new specifications and new functional allocation.  Damage Assessment and Scoring were added to the module support function. The Ownship Weapon Scoring & Damage and Threat Weapon Dynamics functions were deleted from the module.  The Threat Weapon Scoring & Damage function was modified to be the Threat Weapons' Damage Assessment function.  The Target Designation function was modified to add Continuously Computed Impact Point and pull-up anticipation cue. | 91/06/26 | *[signature]*<br>Prepared By |
| | | 91/06/26 | *[signature]*<br>Checked By |
| | | 91/06/26 | *[signature]*<br>Dwg. Qual. |
| | | 91/06/27 | *[signature]*<br>Supervised By |
| | | 91/06/27 | *W. Tucker*<br>Approved By |

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# REVISIONS

| LTR | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|
| C | CCP HSV-H91-008<br><br>Total revision required to incorporate Government comments on document. | 91-09-26<br><br>91-09-26<br><br>91/09/26<br><br>91-09-26<br><br>91-10-08 | *K. Kelley*<br>Prepared By<br>*Smith*<br>Checked By<br>*Bon*<br>Dwg. Qual.<br>*Sm Kran*<br>Supervised By<br>*NW Tucker*<br>Approved By |
| D | CCP HSV-H91-017<br><br>This specification volume has been totally revised to:<br><br>1. Change the format to comply with DI-CMAN-80008A.<br>2. Incorporate the tailoring instructions into the body of the text.<br><br>The incorporation of tailoring instructions into each specification volume has caused a change in the number of specification volumes from fourteen to thirteen. Prior to this change, all tailoring instructions were provided in Volume XIII and Volume XIV contained the Tactical and Natural Environment segment specification. The content of Volume XIII has been integrated into the other specification volumes. The change is summarized as follows:<br><br>**Volume**     **IS**     **WAS**<br>I through XII   Titles for these volumes are unchanged<br>XIII     Environment   Tailoring Instructions<br>XIV     "Deleted"   Tactical and Natural Environment | 93-08-23<br><br>93-08-23<br><br>93-08-23<br><br>93/08/24 | PREPARED<br><br>*J.A. Arnold*<br>CHECKED<br><br>*Sm Kran*<br>SUPERVISED<br><br>*NW Tucker*<br>APPROVED |

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