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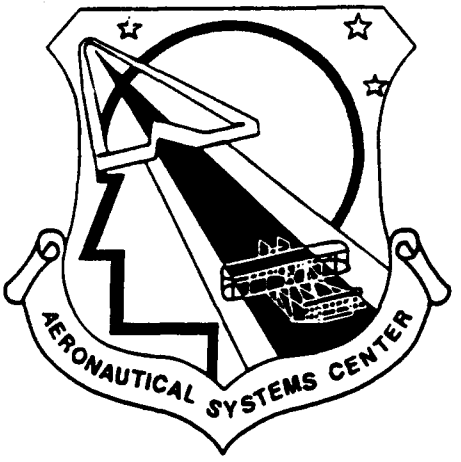
SYSTEM/SEGMENT SPECIFICATION FOR THE GENERIC MODULAR SIMULATOR SYSTEM - ELECTRONIC WARFARE MODULE VOLUME 9



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AUGUST 1994

FINAL REPORT

SYSTEMS ENGINEERING DIVISION
AERONAUTICAL SYSTEMS CENTER
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13. ABSTRACT *(Maximum 200 words)*

This is the Electronic Warfare 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 When the tailoring process is complete, the italicized tailoring instructions should have been replaced by application specific text or deleted from the specification.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.

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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 Electronic Warfare (EW) 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 EW segment simulates the electronic warfare functions within the _____ *(insert application aircraft type)* aircraft. The EW 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 functions identified within this volume are to be processed within the EW segment.

(This paragraph should be modified to specify the types of electronic warfare capabilities associated with the application aircraft. These may include threat detection, jamming, expendable countermeasures, etc.)

1.3 Document Overview. This segment specification defines EW 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 EW 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 EW 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 Non-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 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 EW 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 EW segment shall provide the capabilities to simulate _____ *(insert application aircraft type)* aircraft electronic warfare systems. EW systems shall include jammers, receivers, processors, displays, and countermeasure equipment contained on the _____ *(insert application aircraft type)* aircraft. The EW 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 EW segment shall provide the modes, states, and functions as defined in this specification volume and Volume I.

The EW segment shall provide the real-time simulation of the _____ *(insert application aircraft type)* defensive systems. This segment shall provide operation and control representative of both normal and degraded states. The EW segment shall provide simulation/stimulation for the aircraft Electronic Countermeasures (ECM) systems, Expendable Countermeasures (EXCM), Radar Warning Receiver (RWR) systems, and jammers.

(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 EW segment shall be as specified herein and in accordance with the _____ *(insert application aircraft type)* aircraft design criteria. The EW segment shall simulate functions associated with the _____ *(insert application aircraft type)* aircraft EW system. The fidelity of the EW 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 EW system design and engineering data
b. Manufacture of specific EW systems
c. Desired capabilities of the specific simulator system

Additional text should be added to this paragraph to identify the design criteria and specific EW 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 EW segment shall support the modes and states as described in Volume I of this

specification. Additional requirements, or operations, 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 EW Segment Functions. Functions characterized as "Implemented" shall be implemented, within the EW 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 EW segment.

a.	EW Support Function	Implemented
b.	Expendable Countermeasure Function	*(Implemented, N/A)*
c.	Dedicated Displays Function	*(Implemented, N/A)*
d.	Electronic Countermeasures Function	*(Implemented, N/A)*
e.	Warning Receiver Function	*(Implemented, N/A)*
f.	Threat Detection Function	*(Implemented, N/A)*

3.2.1.2.1 EW Support Function. The EW support function shall provide segment unique support services required for operation of the EW segment in the MSS environment. The EW support function services shall include the functions listed below, and as described in 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 Executive Control. The executive control support service shall provide operational control for the EW 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 EW 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 EW 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 EW segment interface to the VNET. It shall allow communication with other segments in the _____ *(insert application aircraft type)* MSS. The EW segment 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 EW segment. Diagnostic and test requirements, for the EW 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 EW 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 EW 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 Remote Controlled Diagnostics. Remote controlled diagnostics shall be provided for the EW 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 Backdoor Interfacing. The Backdoor interface support service shall provide the means to support external interfaces to the EW segment. All ownship EW 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 Malfunctions. The malfunctions support service shall provide control for the processing and execution of EW segment malfunctions. The system response shall be in accordance with aircraft design criteria.

(EW segment malfunction requirements should be defined in a program unique malfunction description document)

3.2.1.2.1.7 Damage Assessment. The damage assessment support service shall provide for the processing and implementation of any damage simulation for which the EW segment is responsible. This shall include the degradation of the appropriate systems within the EW 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 Security Processing. The EW segment security processing support service shall provide processing to meet the security requirements of the _____ *(insert application aircraft type)* MSS EW 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 Scoring. The scoring support service shall provide the ability to assess EW performance. The EW segment scores shall be provided to the IOS segment via the MSS VNET.

(Application specific scoring data requirements for the EW 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 Other Support Function Services. 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 Expendable Countermeasure Function. The Expendable Countermeasure (EXCM) function shall provide a simulation of the expendable countermeasure system employed on the _____ *(insert application aircraft type)* aircraft. This function shall produce outputs to crew station displays in accordance with _____ *(insert application aircraft type)* aircraft design criteria. The EXCM function shall maintain an inventory of expendable devices. This function shall simulate the release of EXCM devices. The EXCM function shall provide data to other MSS segments in accordance with the _____ *(insert application aircraft type)* MSS IDD.

(This paragraph should describe the required functionality of the EXCM simulation. Specific expendable countermeasures should be identified in this paragraph. The following items should be considered when specifying requirements for the EXCM function:

a. Number of dispensers, locations of dispensers, and inventory
b. Visual, motion, or aural cues
c. Interfaces with other EW functions or other MSS segments
d. Embedded avionics equipment related to the EXCM function
e. Types of controls and displays related to the EXCM equipment
f. Dynamic modeling requirements, effectiveness requirements, duration requirements, and threat response requirements

g. Types of expendables, i.e. chaff, flares, active emitters, decoys, etc.
h. Chaff type and reflectivity
i. Flare frequency range and direction of ejection.)

3.2.1.2.3 Dedicated Displays Function. The Dedicated Displays function shall provide Electronic Warfare Environment (EWE) audio and video information to the _____ *(insert application aircraft type)* crew. This function shall provide status, and information related to warning receivers, threat detection equipment, and EXCM. This function shall produce outputs to crew station displays in accordance with _____ *(insert application aircraft type)* aircraft design criteria.

(This paragraph should identify the specific EW controls, displays, and audio required for simulation. The following items should be considered when specifying requirements for the Dedicated Displays function:

a. Embedded aircraft equipment used for video, audio, and/or annunciator status
b. Types of displays, location, and quantity
c. Interfaces with other functions of the EW system or other segments
d. Types of controls and displays
e. Display fidelity, update rate, character set, colors, intensity, etc.
f. Information present on video displays with type of detail, location, and limitations
g. Display hardware interface requirements and limitations
h. Descriptions of video displays for each hardware device and selective control features
i. Crew members receiving EW video and audio and their controls
j. Warning tone characteristics, i.e. types, frequency, duration, controls, etc.
k. Threat audio characteristics, i.e. frequency, pulse repetition frequency, bandwidth, priority, scan type, number of threats represented, controls, etc.
l. Interrelationships between video and audio displays.)

3.2.1.2.4 Electronic Countermeasures Function. The Electronic Countermeasures (ECM) function shall provide a simulation of the ECM responses to the EWE. This function shall provide signal information commensurate with the types of countermeasures employed by the _____ *(insert application aircraft type)* aircraft. The ECM function shall produce outputs to displays in accordance with _____ *(insert application aircraft type)* aircraft design criteria. The ECM function shall provide data to other segments in accordance with the _____ *(insert application aircraft type)* MSS IDD.

(This paragraph should describe the required functionality of the ECM simulation. Specific electronic countermeasures should be identified in this paragraph. The following items should be considered when specifying requirements for the ECM function:

a. Jamming techniques and their characteristics, i.e. frequency, bandwidth, pulse repetition rate, etc.
b. Techniques which may be active simultaneously and number of threats affected
c. Threat types affected by a technique, expected threat responses, and technique patterns, i.e. directed at, omnidirectional, bounced, etc.
d. Interfaces with other functions of the EW system and other MSS segments
e. Embedded aircraft hardware related to the ECM function
f. ECM controls and details related to each type of control, e.g. automatic vs. manual
g. Antennae associated with jamming, locations, elevation and azimuth coverage, frequency range, etc.
h. ECM system gains and losses associated with jamming and/or specific techniques
i. Dynamic modeling algorithms, lookup table modeling, effectiveness requirements, jamming technique duration , etc.)

3.2.1.2.5 Warning Receiver Function. The Warning Receiver function shall simulate threat warning devices employed on the _____ *(insert application aircraft type)* aircraft. This function shall produce outputs to crew station displays in accordance with _____ *(insert application aircraft type)* aircraft design criteria. The Warning Receiver function shall provide data to other MSS segments in accordance with interface requirements specified in the _____ *(insert application aircraft type)* MSS IDD.

(This paragraph should describe the required functionality of the warning receiver simulation. Specific warning receiver models should be identified in this paragraph. The following items should be considered when specifying requirements for the Warning Receiver function:

a. Types of warning receivers employed, i.e. radar warning receivers, infrared, chemical, radiological, laser, etc.
b. Number of simultaneous warnings and number of sources required
c. Characteristics of warning receivers, i.e. types of visual and/or aural cues, system delays, audible volume level, video intensity, etc.
d. Interfaces with other functions of the EW system and other MSS segments
e. Embedded aircraft equipment related to the warning receiver function
f. Types of manual and automated warnings and controls and details related to each
g. Peripheral devices associated with each warning receiver, i.e. antennae, pods, sensors, line amplifiers, etc.
h. Each device's location, elevation and azimuth coverage, frequency range, sensitivity, etc.
i. Gains and losses associated with detection and warning receiver outputs
j. Dynamic modeling requirements, lookup table modeling, duration of warning receiver outputs, etc.)

3.2.1.2.6 Threat Detection Function. The Threat Detection function shall determine which threats can be detected by the

ownship EW equipment at any given time during a real-time training exercise. This function shall produce outputs to crew station displays in accordance with _____ *(insert application aircraft type)* aircraft design criteria. The Threat Detection function shall provide data to other MSS segments in accordance with the interface requirements specified in the _____ *(insert application aircraft type)* IDD.

(This paragraph should describe the required functionality of the threat detection simulation. Specific threat detection devices should be identified in this paragraph. The following items should be considered when specifying requirements for the Threat Detection function:

a. Number of simultaneous threats which can detected
b. Threat types detected and required parameters, i.e. frequency, bandwidth, pulse repetition frequency, etc.
c. Detection response time, update rate, ageout duration, priority, etc.
d. Manual and automated controls, and details related to each type of control
f. Identification requirements, i.e. data files, parameters used, best fit criteria, etc.
g. Interfaces with other EW system functions and other segments
h. Embedded aircraft equipment or hardware related to the threat detection function with I/O requirements
i. Antennae associated with detection, locations, elevation and azimuth coverage, frequency range, blind spots, etc.
j. Gains and losses associated with jamming and/or specific techniques
k. Dynamic modeling requirements, lookup table modeling, etc..)

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

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

3.2.2.1 Segment Functional Relationships. The top level, typical EW 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 EW 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 intra-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

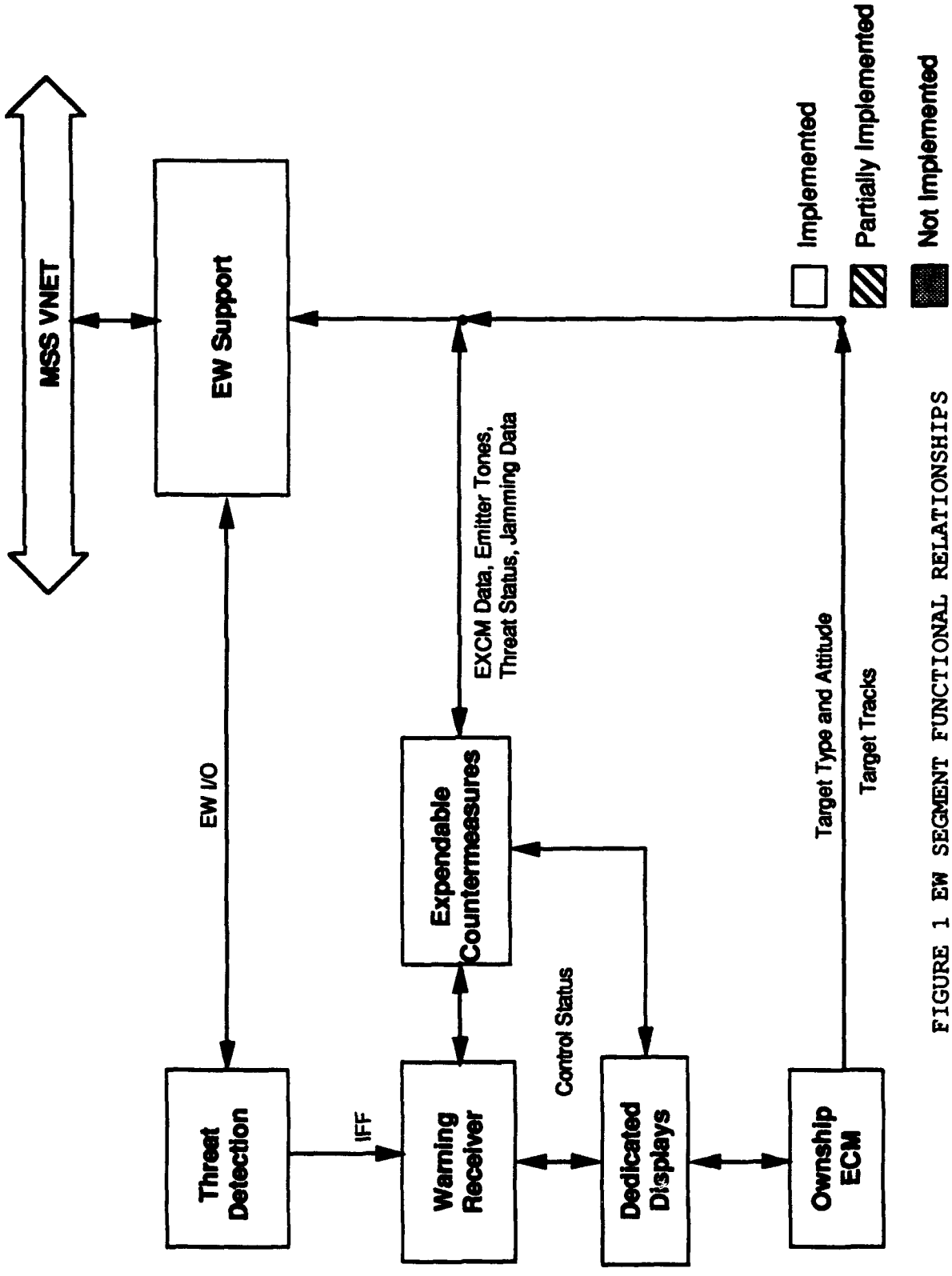

FIGURE 1 EW SEGMENT FUNCTIONAL RELATIONSHIPS

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 External Interface Requirements. The EW segment shall support the external interface requirements defined in Volume I of this specification and the _____ *(insert application aircraft type)* MSS Interface Requirements Specification (IRS), _____ *(insert IRS document number)*. External interfaces comprise data passed between functions contained in the EW segment and functions contained in the other MSS segments. With the exception of the dedicated interfaces for the cockpit, all other external interfaces which shall be used for the EW segment are specified in the _____ *(insert application aircraft type)* IRS.

(Define EW 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 (DSP). If such equipment is required it should be identified in this paragraph.)

3.2.4 Physical Characteristics. The physical characteristics of the EW segment shall meet the requirements as specified in Volume I of this specification. The EW 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 EW segment, other than those provided by the EW 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 EW segment I/O)to the EW 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 EW segment should be considered.)

3.2.4.1 Protective Coatings. EW segment protective coatings shall be as defined in Volume I of this specification.

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

3.2.5 EW Segment Quality Factors

3.2.5.1 Reliability. The system level reliability requirements applicable to all segments in the MSS are defined in Volume I of this specification. The EW 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 relaibility requirements will be met. Normally, this means that segment reliability will be higher than system reliability.)

3.2.5.2 Maintainability. The system level maintainability requirements applicable to all segments in the MSS are defined in Volume I of this specification. The EW segment shall have a mean corrective maintenance time, μ_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 faulty segment.)

3.2.5.3 Availability. 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 Additional Quality Factors. The additional quality factors, as defined in Volume I of this specification, shall apply to the EW segment.

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

3.2.6 Environmental Conditions. The environmental condition requirements, as defined in Volume I of this specification, shall apply to the EW segment.

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

3.2.7 Transportability. The transportability requirements, defined in Volume I of this specification, shall apply to the EW segment.

(Identify any EW 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 EW segment.)

3.2.8 Flexibility and Expansion. The flexibility and expansion requirements, defined in Volume I of this specification, shall apply to the EW 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 EW 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 EW segment.

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

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

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

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

(Identify any EW 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 EW segment.

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

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

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

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

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

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

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

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

3.3.7 Human Engineering. The human engineering requirements, defined in Volume I of this specification, shall apply to the EW segment.

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

3.3.8 Nuclear Control. The nuclear control requirements, defined in Volume I of this specification, shall apply to the EW segment.

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

3.3.9 Segment Security. The system security requirements, defined in Volume I of this specification, shall apply to the EW segment.

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

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

(Identify any EW segment unique GFP requirements. In general, the system level GFP requirements will suffice for the EW 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 EW segment may include the computational system hardware and software required to design, develop, and test the EW 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 Documentation. The documentation requirements, defined in Volume I of this specification, shall apply to the EW segment.

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

3.5 Logistics. The system level logistics requirements applicable to the EW 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 Personnel and Training. The system level personnel and training requirements, defined in Volume I of this specification, shall apply to the EW segment.

(Identify any EW 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 EW segment.)

3.7 Subordinate Element Characteristics. 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 Precedence. The precedence requirements for the EW segment shall be as specified in Volume I of this specification.

4. QUALIFICATION REQUIREMENTS

4.1 Responsibility For Test and Inspection. 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 EW segment.

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

4.2 Special Tests and Examinations. The system level general qualification events, levels, and methods of testing for the EW segment are defined in Volume I of this specification. The requirements defined in Volume I shall apply to the EW 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 Requirements Cross Reference. 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 EW 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 EW 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 EW segment shall support the mission requirements defined in Volume I of this specification. The EW segment shall provide simulation and training in cockpit familiarization, EW operating procedures, and mission procedures for the _____ *(insert application aircraft type)* aircraft EW systems. The EW simulation shall provide familiarization with the cockpit configuration and operation of the _____ *(insert application aircraft type)* EW 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 EW 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 weapon system trainer.)

6.1.2 Threat. Not applicable.

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

6.2 EW Segment Acronyms. The acronyms contained in this paragraph are unique to the EW 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
ECM	Electronic Countermeasures
EW	Electronic Warfare
EWE	Electronic Warfare Environment
EXCM	Expendable Countermeasure
GFP	Government Furnished Property
IDD	Interface Design Document
I/O	Input/Output
IOS	Instructor Operator Station
IRS	Interface Requirements Specification

MSS	Modular Simulator System
MTBCF	Mean Time Between Critical Failure
PIDS	Prime Item Development Specification
VNET	Virtual Network

6.3 Glossary of EW Segment Terms. The terms contained in this paragraph are unique to the EW segment and are in addition to the MSS terms contained in Volume I of this specification.

CHAFF - A shaped, resonant piece of material (frequently aluminum foil) used to re-radiate electromagnetic energy to create a false radar return.

ELECTRONIC COUNTERMEASURES (ECM) - Actions used to interfere with the effective operation of enemy electromagnetic systems. ECM includes jamming and other deception techniques.

ELECTRONIC WARFARE - Military action involving the use of electromagnetic energy to determine, exploit, reduce or prevent hostile use of the electromagnetic spectrum and action which retains friendly use of the electromagnetic spectrum.

EMITTER - An EW device that generates one or more EW signals.

FLARES - Radiating devices that operate in the Infrared (IR) portion of the spectrum and whose purpose is to counter IR receivers that depend only on energy emitted by the target aircraft.

JAMMERS - Devices used to generate and radiate electromagnetic energy for ECM purposes.

MEAN TIME BETWEEN CRITICAL FAILURE (MTBCF) - Any system failure which results in the loss of system operation. Critical failures require maintenance actions before system operation can be restored.

PLATFORM - A stationary, or moving, ground vehicle, naval vessel, or aircraft. Hostile platforms contain threats while friendly or neutral platforms do not. Stationary platforms which remain fixed are generally referred to as, "sites".

SIGNAL - An electromagnetic emanation with associated modulation used for EW against a target.

THREAT - An emitter or weapon associated with a single platform and directed against a target.

WARNING RECEIVER - A receiver designed to detect and identify emissions capable of controlling a hostile weapon. Warning receivers issue aural and visual warnings to the crew member.

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REVISIONS

LTR	DESCRIPTION	DATE	APPROVAL
A	BMAC-STS-86-303-1 Total revision required to incorporate changes required by testing/validation efforts and Government comments.	90/01/11	J. Clem Prepared By
		90/01/11	Checked By
		91/01/14	Dwg. Qual.
		90/01/11	Supervised By
		91/01/15	Approved By
B	CCP HSV-H91-008 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 Threat Environment Database, Threat Platform Dynamics, and Mission Scoring functions were deleted from the module. The Ownship Electronic Countermeasures Function and Warning Receiver (formerly Radar Warning Receiver) functions were modified to reference the Tactical and Natural Environments module and the movement of the threat environment database. The Threat Management Function was changed to the Threat Detection Function. The Chaff and Flares function was modified to be the Ownship Chaff and Flares function.	91/06/26	Prepared By
		91/06/26	Checked By
		91/06/26	Dwg. Qual.
		91/06/27	Supervised By
		91/06/27	Approved By

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REVISIONS

LTR	DESCRIPTION	DATE	APPROVAL
C	CCP HSV-H91-008 Total revision required to incorporate Government comments on document.	91-09-26 91-09-26 91/09/26 91-09-26 91-10-08	Prepared By Checked By Dwg. Qual. Supervised By Approved By
D	CCP HSV-H91-017 This specification volume has been totally revised to: 1. Change the format to comply with DI-CMAN-80008A. 2. Incorporate the tailoring instructions into the body of the text. 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: **Volume** — **IS** — **WAS** I through XII — Titles for these volumes are unchanged XIII — Environment — Tailoring Instructions XIV — "Deleted" — Tactical and Natural Environment	93-08-23 93-08-23 93-08-23 93/08/24	PREPARED CHECKED SUPERVISED APPROVED