ARMY, MARINE CORPS, NAVY, AIR FORCE

IDM

MULTI-SERVICE TACTICS, TECHNIQUES, AND PROCEDURES FOR THE IMPROVED DATA MODEM INTEGRATION

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MULTI-SERVICE TACTICS, TECHNIQUES, AND PROCEDURES

FOREWORD

This publication has been prepared under our direction for use by our respective commands and other commands as appropriate.

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PREFACE

1. Purpose

This publication is designed for use at the tactical level for planning and conducting joint or multi-Service IDM operations. Lessons learned from Southwest Asia and Kosovo operations indicate the need for agreed-to, multi-Service IDM procedures and standards between cross-service platforms. Too much time was spent re-learning which procedures did or did not work as units rotated into the theaters. This publication supplements established doctrine and tactics, techniques, and procedures (TTP) in order to bridge the gaps between each Service's use of the IDM.

2. Scope

This multi-Service tactics, techniques, and procedures (MTTP) publication provides a source of reference material to assist aircrew and ground personnel who need aviation support in planning and coordinating tactical operations. In addition, this document will help to promote an in-depth understanding of the complexities of Improved Data Modem (IDM) operations, analyze IDM networks by describing the common characteristics, delineate platform differences, and incorporate the latest lessons learned from real world and training operations.

3. Application

a. This publication applies to all elements of a joint or multi-Service force that plan and conduct IDM operations to include commanders, planners, aircrew and ground personnel who need aviation support. Procedures herein may be modified to fit specific theater command and control procedures and allied and foreign national electromagnetic spectrum management requirements.

b. The United States (U.S.) Army, Marine Corps, Navy, and Air Force approved this multi-Service publication for use.

4. Implementation Plan

Participating service command offices of primary responsibility will review this publication, validate the information, and reference and incorporate it within service manuals, regulations, and curricula as follows:

Army. The Army will incorporate the procedures in this publication in U.S. Army training and doctrine publications as directed by the Commander, U.S. Army Training and Doctrine Command (TRADOC). Distribution is in accordance with (IAW) initial distribution number 115896.

Marine Corps. The Marine Corps will incorporate the procedures in this publication in U.S. Marine Corps doctrinal and training publications as directed by the Commanding General, U.S. Marine Corps Combat Development Command (MCCDC). Distribution of this publication is IAW Marine Corps Doctrinal Publication System (MCPDS).

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Navy. The Navy will incorporate the procedures in this publication in U.S. Navy doctrinal and training publications as directed by the Commander, Navy Warfare Development Command (NWDC). Distribution of this publication is IAW military standard requisitioning and issue procedure (MILSTRIP) Desk Guide and Navy Standing Operating Procedures (NAVSOP) Pub 409.

Air Force. The Air Force will validate and incorporate appropriate procedures IAW applicable U.S. Air Force governing directives. Distribution is in accordance with Air Force Instruction (AFI) 33-360.

5. User Information

a. TRADOC, MCCDC, NWDC, Air Force Doctrine Center (AFDC), and the Air Land Sea Application (ALSA) Center developed this publication with the joint participation of the approving service commands. ALSA will review and update this publication as necessary.

b. This publication reflects current joint and service doctrine, command and control organizations, facilities, personnel, responsibilities, and procedures. Changes in service protocol, appropriately reflected in joint and service publications, will likewise be incorporated in revisions to this document.

c. We encourage recommended changes for improving this publication. Key comments to the specific page and paragraph and provide a rationale for each recommendation directly to--

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IDM
MULTI-SERVICE TACTICS, TECHNIQUES, AND PROCEDURES FOR IMPROVED DATA MODEM (IDM) INTEGRATION

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EXECUTIVE SUMMARY

IDM

Multi-Service Tactics, Techniques, and Procedures for Improved Data Modem (IDM) Integration

Successful employment of the IDM relies on the ability of tactical IDM-equipped airborne and ground platforms to communicate on an established network. To better understand the complexities of the IDM network, Chapter I provides the reader with an overview of the digital network that utilizes the IDM for sending and receiving digital information. It provides the user with a description of fielded IDM hardware and software features as well as current IDM data link protocols. An overview of modem-to-radio configuration is also included in Chapter I to assist users in making most effective use of the IDM network.

Chapter II contains a summary of planning considerations for the use of IDM. General communication requirements are detailed as is necessary pre-mission coordination for units making up the IDM network. Chapter II also addresses platform specific planning considerations and concludes with a summary of sources for IDM planning.

Chapter III discusses mission specific interoperability considerations for suppression of enemy air defenses, close air support, and attack reconnaissance, while Chapter IV discusses IDM lessons learned.

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Chapter I

Improved Data Modem Overview

1. History

The Naval Research Lab (NRL) built the first Improved Data Modem (IDM) prototype in February 1991 in response to a requirement to provide a data link capable of interconnecting a wide variety of platforms/combatants for their roles on a future battlefield. The IDM was adapted from the U.S. Army's (USA) Airborne Target Hand-off System I (ATHS I), which the Army uses in its helicopters and tanks. The U.S. Air Force (USAF) developed ATHS II, which increased transmission rates tenfold, and later became known as IDM.

2. Introduction

The capability of the IDM continues to expand for passing targeting data to and from airborne weapon systems for the Combat Air Forces (CAF) of the Army, U.S. Marine Corps (USMC), U.S. Navy (USN) and the USAF. Although its basic operation is unchanged, IDM hardware and software have evolved. The hardware evolution is depicted in Figures I-1 through I-4, (from second generation through fourth generation).

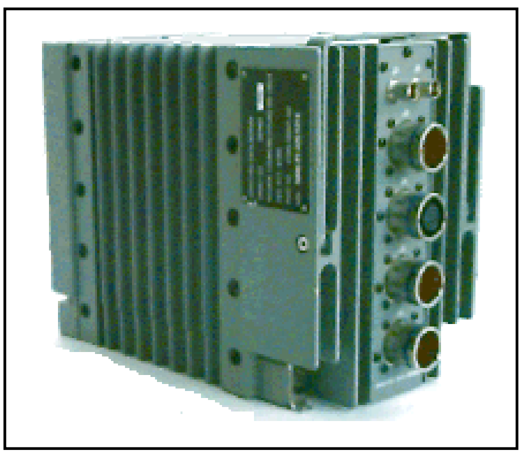


Figure I-1. IDM-v301/302

Figure I-2. IDM–v303

Figure I-3. IDM–v304

Figure I-4. Personal Computer IDM – v2.0/2.5

3. Scope

The remaining sections of this chapter include the basic system overview, hardware and software features, and a section on using IDM as a platform/network-centric data link. Section four provides an overview of how IDM is integrated into a digital connectivity network to enhance targeting and situational awareness (SA) of air and ground forces. Section five provides an overview of the integration of IDM with other equipment. Section six provides an overview of the IDM operational flight program (OFP)/firmware that is recorded on the IDM electronically erasable programmable read-only memory chip. Section seven provides an overview of the IDM/radio interface during transmission to assist users in taking full tactical advantage of the IDM capability and the IDM/radio connectivity network configuration.

4. System Overview Concept

a. This section focuses on the IDM system as a wireless platform/network-centric data link. IDM provides radio frequency (RF) based data communications connectivity that is uniquely suited to defense environments. The existing IDM supports point-to-point, waveform dependent legacy data links, via the following protocols:

(1) Air Force applications program development (AFAPD).

(2) Intraflight data link (IDL).

(3) Marine tactical systems (MTS).

(4) Tactical fire (artillery) (TACFIRE).

b. The next generation IDM is not only backwards compatible with the previously mentioned protocols (legacy data links), but it also supports the joint variable message format (JVMF)/ military standard (MIL-STD)-188-220B. The next generation IDM also implements fully networked, open data linkage using a transmission control protocol/internet protocol (TCP/IP)-based, packet switched system.

c. The legacy data links are widely used by U.S. ground forces of the Army, USMC, and the CAF. The IDM acts as a data link controller, and is utilized to establish a seamless, interconnected network data link architecture (Figure I-5).

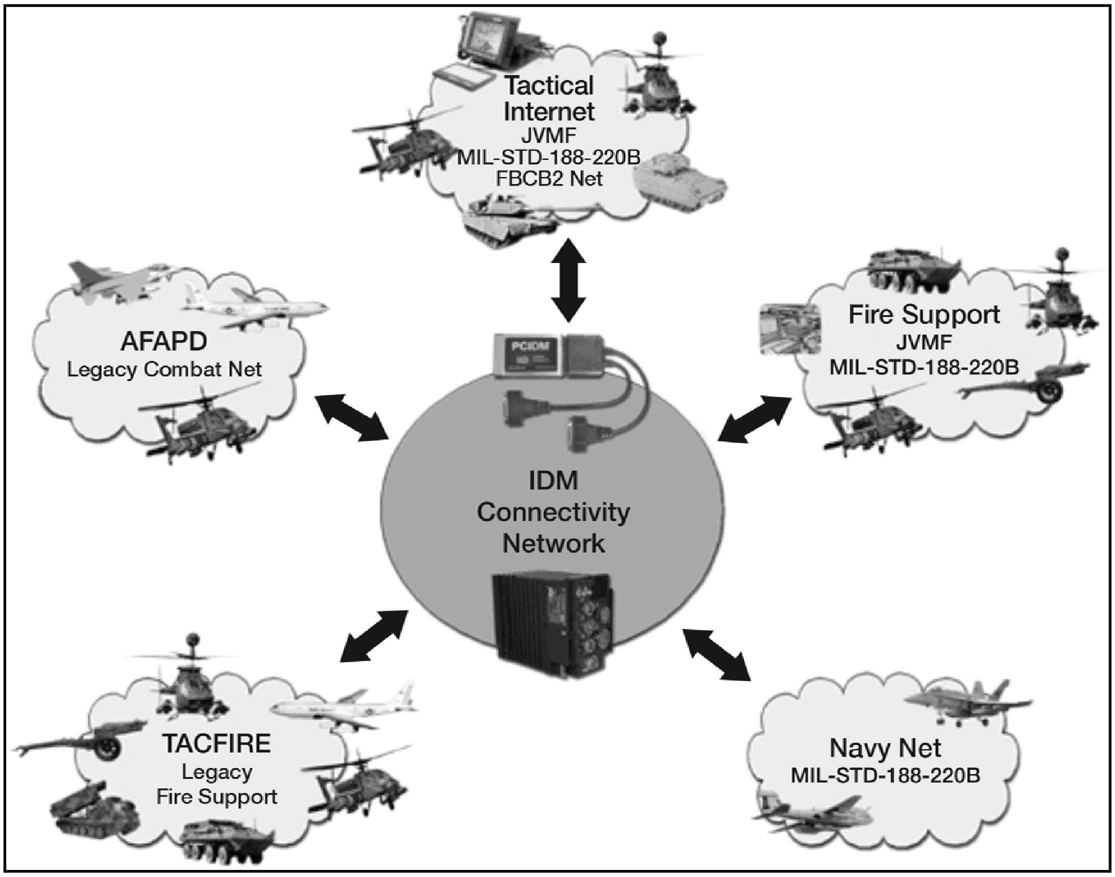


Figure I-5. IDM Connectivity Network

5. Hardware Features

a. A basic configuration of the IDM system as it is integrated into a platform is depicted in Figure I-6, and consists of the following equipment:

(1) Display terminal equipment (DTE).

(2) IDM.

(3) KY-58 Secure Voice Communications System.

(4) Radio.

(5) Antenna.

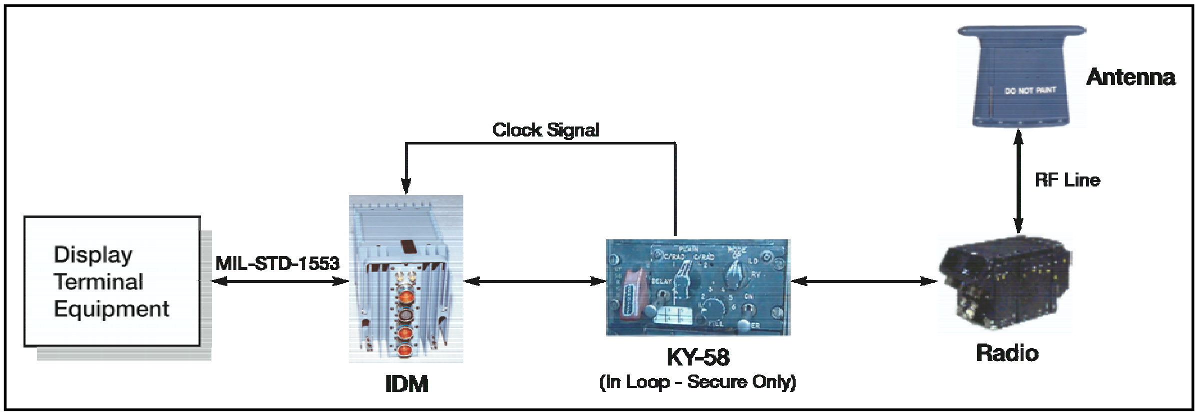


Figure I-6. IDM system

b. A Personal Computer Improved Data Modem (PCIDM) has also been developed by NRL's contractor for personal computers (PC) that are configured with a Personal Computer Memory Card International Association (PCMCIA) slot, with limited JVMF/ MIL-STD-188-220B capability (tailored for USA). A basic configuration of the PCIDM system (Figure I-7), as it is integrated into a platform, consists of the same equipment as the IDM system.

Note: The IDM is replaced with the PCIDM and the MIL-STD-1553 bus interface is not needed.

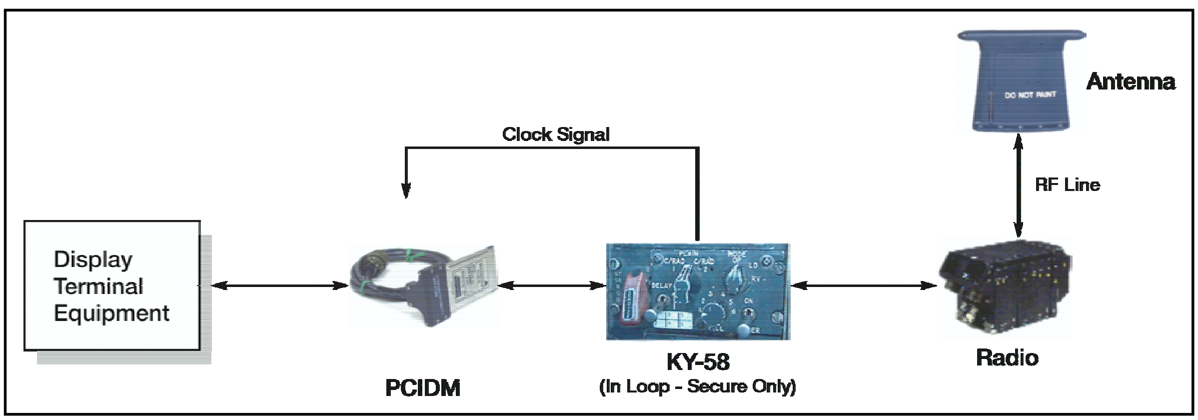


Figure I-7. PCIDM system

c. The following provides a brief description of the equipment that is utilized in the IDM and PCIDM systems:

(1) The DTE can consist of a display terminal such as the F-16 data entry display (DED) or a PC to provide the operator an interface to display and send commands to the IDM or PCIDM.

(2) The IDM hardware contains four shop-replaceable units (SRU). The four SRUs are as follows:

(a) Two digital signal processors (DSP).

(b) Generic interface processor (GIP).

(c) Power converter.

(d) Chassis assembly.

(3) The SRU functions are as follows:

(a) The DSP modules perform the modulation/demodulation and the physical-level radio interface functions for the IDM.

(b) The GIP performs link and protocol-level routing and processing for the IDM system.

(c) The power convertor converts 28 volts direct current (Vdc) to +/-15 Vdc and +/- 5Vdc.

(d) The chassis assembly holds modules and interfaces with platforms. The link interface consists of four half-duplex communications channels, two to each DSP. The secure port interface consists of four half-duplex communications channels and a clock. The analog ports support either binary continuous phase frequency shift keying (CPFSK) or duobinary frequency shift keying (FSK) at selectable data rates of 75, 150, 300, 600, 1200 and 2400 bits per second (BPS), to include selectable tone pairs of 1300/1700, 1300/2100 and 1200/2400. The digital ports support amplitude frequency shift keying (ASK) at selectable data rates of 1.2, 2.4, 4.8, 8, and 16 kilobits per second (KBPS), to include a channel bandwidth of 20 kilohertz (kHz). Also, it supports the mode of digital synchronous MIL-STD-188-144 clock and data operation typical of cryptography (CRYPTO) gear, including the KY-58. Messages transmitted and received on the communications channels will conform to one of five selectable communication protocols (i.e. language formats):

- AFAPD.
- MTS.
- TACFIRE.
- IDL.
- JVMF/ MIL-STD-188-220B.

(4) The data rate and other configurable parameters are specified by default parameters on power-up. The IDM is subject to radio performance limitations such as line of sight (LOS) communications, altitude restrictions, and weather conditions.

(5) The PCIDM is a Type II PCMCIA card that is designed to operate in commercial off the shelf (COTS) operating system environments (Win95, Win98, WinNT, Win2000, Win ME, Win XP and Linux) on a PC equipped with a PCMCIA slot. The PCIDM has similar operating characteristics to the IDM. It incorporates IDM communications functions, but has no MIL-STD-1553 bus interface. The PCIDM is fully compatible with the IDM. The PCIDM has two channels; asynchronous and synchronous. Channel 1 (asynchronous) supports two modes, digital (ASK) at 16 Kbps and analog (FSK) at 1.2Kbps (1200/2400 tone pairs). Channel 2 (synchronous) supports the mode of digital synchronous MIL-STD-188-144 clock and data operation typical of CRYPTO gear, including the KY-58. The PCIDM supports AFAPD, TACFIRE, MTS,

IDL, including JVMF/MIL-STD-188-220/VMF protocols. The PCIDM is also subject to radio performance limitations such as LOS communications, altitude restrictions, and weather conditions.

Note: V2.0 and V2.1 do not support asynchronous mode.

(6) KY-58. The KY-58 secure voice communications system is integrated with the IDM family. The KY-58 enables secure (encrypted) airborne voice/data transmissions over the ultrahigh frequency (UHF) or very high frequency (VHF)/frequency modulation (FM) radio. When properly coded and operated, this system scrambles voice/data transmissions making the transmissions unintelligible to anyone not possessing a similarly coded KY-58 set.

(7) Radio. Frequency ranges are: VHF-FM (close air support [CAS]) – frequency range: 30-87.975, VHF-AM – frequency range: 108-155.975 (Air Traffic Control [ATC]), UHF-AM (military band), VHF-FM – frequency range: 156-174 (maritime band) and UHF-FM – frequency range: 225-399.975 frequency ranges (AM/FM military/North Atlantic Treaty Organization (NATO). The IDM interfaces with the following radios:

(a) ARC-164 (Have Quick [HQ] II).

(b) ARC-182.

(c) ARC-186.

(d) ARC-201 (single channel common ground and air radio system [SINCGARS]); ARC-201D (SINCGARS system improvement program [SIP]).

(e) ARC-210.

(f) ARC-222 (data rate adapter [DRA] functions).

(g) ARC-225.

Note: Coordination with the appropriate United States European Command (EUCOM) component spectrum management office is required prior to use of any RF emitter. This is to ensure host nation restrictions placed on certain equipment are not exceeded and a valid frequency assignment is obtained.

(8) Antenna. The antenna is a VHF/UHF omni-directional and vertically polarized blade antenna that transmits and receives electromagnetic energy. It is configured to match the radio's parameters.

6. Software Features

The IDM OFP/firmware performs communications channel configuration, built-in-tests (BIT), message processing, and command and status functions. Communications channel message processing includes formatting, parsing headers, encoding, decoding, and storing messages, and message receipt and acknowledgement of four independent link interfaces. Command and status processing includes interfacing to the MIL-STD-1553 and synchronous data link communications (SDLC) interfaces. BIT includes power-up BIT, continuous BIT, and commanded BIT. Table I-1 provides IDM/PCIDM data link protocol compatibility matrices.

Table I-1. IDM OFP/Protocol Summary Chart

	IDM/PCIDM Version Capability							
Over the-Air Data Link Protocol	***IDM V4.34***	***IDM V5.01***	***IDM V5.15***	***IDM V5.16***	***IDM V6.0***	***PCIDM V1.0***	***PCIDM V2.5***	***PCIDM V2.6***
AFAPD	X	X	X	X	X	X	X	X
MTS	X	X	X	X	X	X		X (Limited)
TACFIRE	X	X	X	X		X	X (Limited)	X (Limited)
IDL		X	X	X	X			X
MIL-STD-188-220B (JVMF)				X	X		X	X

7. IDM Platform Operations

a. This section provides an overview of IDM and radio transmission/ reception and explains the significance of various settings that can be used to maximize the tactical advantage created by the IDM system in support of the following missions:

(1) Suppression of enemy air defenses (SEAD).

(2) CAS/forward air control (FAC).

(3) Special operations.

(4) Command and control (C2).

b. Basic IDM operation has not changed as equipment and software have evolved. IDMs link in a manner similar to a local area network (LAN) with the major exception that voice communications occurring on the RF can cause disruption if IDM network operation is not understood.

c. Sending a message. When a request to send a message is received, the modem sends a signal to the radio to prepare for the transmission. The radio then configures itself to transmit the data. The radio switches from voice transmit mode (analog) to data transmit mode (digital), during a key delay time. For an analog UHF radio, this takes approximately 400 milliseconds (ms) and for the digital UHF radio approximately 240 ms. The transition to digital for the VHF radio (e.g., ARC-182) is specified as instantaneous. The setting for the key delay time may hinder operations since some radios may not operate exactly to specification (if the UHF key delay time is set to 400 ms and the radio actually takes longer than 400 ms to transition to digital, then the IDM will not function on UHF). During the key delay time, the radio is adjusting its circuitry for data and establishing a carrier signal. After the key delay time expires, the IDM commands the appropriate radio to transmit RF energy. The radio sends a data stream called the “comm sync” in order to further refine its automatic gain control and circuitry. For secure operations, the phasing or “strapping” of the KY-58 is used for comm sync. It is important to have the KY-58 set at short strap (105 ms). If it is strapped higher than 260 ms, it is likely that the secure key timeout will be exceeded. The result is a failure of the IDM to operate in secure mode. Next, the initial data header is sent. The data header contains no part of the actual message, but tells the receiving (also called the target or interested) IDM to prepare for a message (also called a data burst). The data header establishes port connectivity between all interested IDMs. All IDMs on frequency are continuously listening for this data header, which tells them that data (rather than voice) is about to follow. Included in the data header are the originating IDM ownship address and the designated IDM addresses for which the ensuing data is meant. Once synchronization is established, the transmitting IDM sends a message called the robust header to further sync the IDMs. It then sends another message to tell the receiving IDM what type of message is to follow, and finally sends the data itself. The total time the IDM has control over the radio while sending or acknowledging includes the key delay time plus comm sync plus data burst (Table I-2).

Table I-2. IDM Send and Acknowledge

	(0.5)	(0.7)	(0.098)	(1.298)
SEND=	KEY DELAY +	COMM SYNC +	DATA =	TOTAL

	(0.5)	(0.7)	(0.026)	(1.226)
ACK=	KEY DELAY +	COMM SYNC +	DATA =	TOTAL

d. Acknowledging. Each host platform has a unique ownship address and each target platform has a unique destination address. If a receiving IDM's address does not match the designated address in the data header, the ensuing data is ignored. When an IDM transmits data, it can ask for an acknowledgement (ACK) if the AUTO ACK setting is enabled. If a match occurs and AUTO ACK is enabled on the target IDM(s), it acknowledges using the same key delay time, comm sync, and data burst sequence (Table I-2). The interested IDMs self-sequence, with each IDM on the net waiting its turn to respond, so that their transmissions will not interfere with one another (Table I-3). The amount of time each IDM waits to respond is called the response hold delay (RHD). In Table I-3, IDM 11 transmitted the original message and does not respond to itself. IDM 12 waits for one RHD then transmits its ACK, IDM 13 waits for two RHDs and so on. Problems could occur if the acknowledging IDM has different key delay and comm sync settings than the transmitting IDM. The ACK time is based on the acknowledging IDM's key delay and comm sync settings. If the ACK window in the acknowledging IDM is larger than what the sending IDM expects (i.e. ACK is greater than RHD), then some ACKs may be missed by the sending IDM. A link delay setting is available for receiving messages from an asset that requires extra processing time.

Table I-3. Network Timeout Period (TP)

Ownship		← NETWORK TIMEOUT PERIOD (TP) →								
		RHD 11	RHD 12	RHD 13	RHD 14	RHD 15	RHD 16	RHD 17	RHD 18	RHD 19
11	SEND									
12			ACK							
13				ACK						
14					ACK					

e. If an ACK is expected and not received (this may occur due to incorrect parameter settings, mismatched AFAPD transmit delay times between the host platform IDM and target platform IDM, jamming, LOS, or voice communications on the carrier frequency), the sending IDM can be set to retry up to three times.

f. Once an IDM transmit has been initiated, an IDM network is established between all interested IDMs. The duration of the network is called the timeout period (TP). During the TP, another message cannot be sent on the network until the above-described SEND/ACK sequence has finished (including retries). Two events can occur during the TP that may disrupt the network: (1) there is a voice transmission on the frequency, and (2) an attempt is made to send another data message.

(1) If there is a voice transmission on the RF during the network TP, one of several things will happen, depending on whether voice or data is the set priority. The voice/data priority setting establishes priority between the user and the IDM for control of the radio (for both SEND and ACK). If data is set as priority in the transmitting IDM, it will cut out its user's voice transmission in order to send or acknowledge data. If voice is set as priority in the transmitting IDM, then the IDM will:

(a) Delay the transmission of a data message if its user is talking.

(b) Not transmit an ACK if its user is talking during its RHD time.

(c) Terminate SEND or ACK if its user keys the microphone.

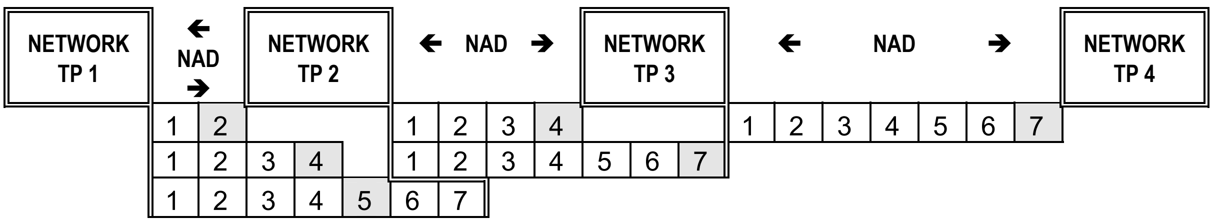
(d) Will not transmit if another user makes a voice transmission on the frequency (if ACK signals are interrupted or skipped, the sending IDM will go through its retry sequence as described in paragraph 7e).

(2) If a user attempts to send another message during the network TP, the sending IDM will queue the message in its memory until the network is no longer busy. Each queued message has a random network access delay (NAD) to reduce the likelihood of queued messages being transmitted simultaneously. The NAD is selected based upon the current state of the network and normally favors the low end of the range from zero to seven.

(a) Table I-4 depicts an example of how network access is regulated. Three queued messages are waiting during the first network TP. Each queued message has a different NAD time based on the random number from zero to seven. The one with the lowest value receives network access first and the IDM starts its SEND/ACK sequence for the duration of the second TP. When the second TP ends, there are two queued messages waiting, and the one with a NAD based upon the random number four receives access to the network. Finally, the last queued message is transmitted. At the end of each TP, the NAD for each message is recalculated. Another message entering the queue during this sequence would compete with the remaining messages. Note that there is no TP when a broadcast address (an address whereby the message is received but not acknowledged by all IDM equipped aircraft on a common frequency) is used or when AUTO ACK is disabled in the transmitting IDM.

Note: The AFAPD transmit delay time settings can affect overall IDM network performance – see Appendix E.

Table I-4. Network Access Delay



Chapter II

Planning Considerations

1. Communications Requirements

a. For normal voice communications, certain items need to be identical between the sending and receiving party. They are waveform, frequency, hopset, and encryption. For digital communications, additional requirements such as identical message set, ownship address, baud rate, key delay time, and communications synch time are mandatory. Successful employment of the IDM is highly dependent on pre-mission coordination between units participating in the IDM network. The primary resource for coordination between the EP-3E, EA-6B, F/A-18, F-16 CJ/CG/ mid-life update (MLU), RC-135V/W, Joint Surveillance Target Attack Radar System (JSTARS) and other IDM users is the local theater special instructions (SPINS).

b. The following paragraphs discuss planning considerations for users of various IDM versions, protocols, and radios. Table II-1 lists specific radios used by IDM participants.

Table II-1. IDM Radios

Radio	Modes	Platforms	Frequency Band	Notes
ARC-159	Plain, cipher	EA-6B	UHF AM	
ARC-164	Plain, cipher, HQII plain, HQII cipher	EA-6B, F-16, AH-64D, OH-58D, CH-47F	UHF AM	EA-6B not HQII IDM configured
ARC-186	Plain, cipher	F-16, OH-58D, CH-47F, AH-64D, E-8C	VHF FM, VHF AM	
ARC-201D	Surrogate data mode (SDM) plain, SDM cipher, enhanced data mode (EDM) plain, EDM cipher, packet plain, packet cipher	OH-58D, AH-64D, CH-47F, E-8C	VHF FM	SDM for TACFIRE
ARC-182	Plain, cipher	EA-6B	VHF FM, VHF AM, UHF AM	EA-6B not HQII IDM configured
ARC-210	Plain, cipher, HQII plain, HQII cipher, and SINCGARS	EP-3E, RC-135V/W	VHF FM, VHF AM, UHF AM	
ARC-220	Automatic link establishment (ALE)	AH-64D, CH-47F	HF	PCIDM is not compatible
ARC-225		E-8C	UHF	SC Only

c. HQ and KY-58 Operations.

(1) USN (EP-3E only) and USAF IDM units transmit messages over the ARC-164 and ARC-210 radios in HQ II anti-jamming mode at all data rates. USA IDM units with IDM software versions before 5.1 are not compatible with HQ II at data rates above 1200bps.

(2) If HQ II is used with the KY-58, the KY-58 must be configured by the CRYPTO technician to a phasing time of 105 ms.

(3) The IDM is compatible with the time delay (TD) mode of the KY-58. Place the KY-58 in TD mode when KY-58 communications are not functioning in order to improve communications. The TD feature adds additional synchronization time to the KY-58 preamble. If an IDM network is established in a mixed environment with some KY-58s in TD and others not in TD, acknowledgments will not work correctly.

Note: If the KY-58 is placed in TD mode and the IDM link delay time is not increased by 700 ms to compensate, the acknowledgments may not work correctly.

Table II-2. IDM Compatibility Summary Chart

	F-16CG	F-16CJ	F-16 MLU	Rivet Joint	EA-6B	EP-3E	F/A-18	Joint Stars	OH-58D	AH-64D	CH-47F
F-16CG	CAS IDT	CAS IDT Steerpoint	CAS, IDT	N/C	AFAPD Freetext	CAS Freetext	N/C	N/C	*Air Msn Rqst* *TACFIRE*	*Air Msn Rqst* *TACFIRE*	N/C
F-16CJ	CAS IDT Steerpoint	CAS IDT SEAD Steerpoint	CAS IDT	SEAD	SEAD	CAS SEAD	N/C	N/C	N/C	N/C	N/C
F-16 MLU	CAS IDT	CAS IDT	CAS IDT	N/C	AFAPD Freetext	CAS Freetext	N/C	N/C	N/C	N/C	N/C
Rivet Joint	N/C	SEAD	N/C	SEAD	SEAD	SEAD	N/C	N/C	N/C	N/C	N/C
EA-6B	AFAPD Freetext	SEAD	AFAPD Freetext	SEAD	Freetext SEAD	Freetext SEAD	**CAS**	N/C	N/C	N/C	N/C
EP-3E	CAS Freetext	CAS SEAD	CAS Freetext	SEAD	Freetext SEAD	CAS **CAS** Freetext **Freetext** SEAD	**CAS**	N/C	*TACFIRE*	*TACFIRE*	N/C
F/A-18	N/C	N/C	N/C	N/C	**CAS**	**CAS**		N/C	N/C	N/C	N/C
Joint Stars	N/C	N/C	N/C	N/C	N/C	N/C	N/C	CAS **CAS** Freetext **Freetext** SEAD	N/C	*TACFIRE* **TI** Longbow Freetext	N/C
OH-58D	Air Msn Rqst TACFIRE	N/C	N/C	N/C	N/C	*TACFIRE*	N/C	N/C	*TACFIRE* **TI**	*TACFIRE* **TI**	**TI**
AH-64D	Air Msn Rqst TACFIRE	N/C	N/C	N/C	N/C	*TACFIRE*	N/C	*TACFIRE* **TI** Long-bow Freetext	*TACFIRE* **TI**	*TACFIRE* **TI** Longbow AFAPD	**TI**
CH-47F	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C	**TI**	**TI**	**TI**

Note 1. Text in italics represents TACFIRE messages (TACFIRE indicates full USA Airborne TACFIRE message set).
Note 2. Text in bold print indicates VMF messages (TI indicates that platform MAY be included in the USA TI database; only OH-58D, AH-64D, and CH-47F are currently programmed to be included).
Note 3. Other (plain) text represents AFAPD messages (Longbow AFAPD indicates full Boeing proprietary Longbow message set).
Note 4. Test crews have demonstrated limited capability for JSTARS to communicate with Rivet Joint, F-16CJ and TACP using PCIDM; however, this capability does not presently exist within the operational JSTARS fleet. No capability has been demonstrated for JSTARS to communicate with the F-16CG.

d. AFAPD Protocol. The AFAPD protocol is utilized for SEAD messages (USMC, USN, USAF); CAS messages (USN, USAF); the AH-64D Longbow message set (USA, USAF) and free text messages (USA, USMC, USN, USAF).

(1) AFAPD Addresses: An AFAPD address is a number between 0 and 127 which is used to communicate with specific IDM user(s). Appendix D delineates default ownship addresses. A broadcast address is one that is received but not acknowledged by all IDM equipped aircraft on a common frequency. The broadcast transmit address for these aircraft is 00. When an address ending in zero (i.e. 10, 20, 30…90) is selected, that aircraft sends an IDM SEAD message to the next nine sequential recipients. For

example, when an F-16CJ sends a SEAD message to a transmit address of 10, it sends to addresses 11,12,13…19 sequentially. Address 127 is a broadcast address that can serve as a work around if other network user(s) addresses are unknown. There are a few exceptions to address 127's functionality as a broadcast address. The F-16C/J and RC-135V/W use a broadcast address of 00. The EA-6B and the AH-64D have no broadcast capability.

(2) The F-16CJ and RC-135V/W have some implementation peculiarities when assigning AFAPD addresses. These aircraft can only display two digits for an AFAPD address, so they are limited to the range 00-99.

(3) The AH-64D uses a unique addressing system. It uses addresses from 0-39, A-Z, 2A-2Z, and 3A-3I. Each aircraft has one of these addresses as its ownship network subscriber identification (ID). The Longbow crew has the ability to send messages to a single subscriber, or to a network of up to 15 other subscribers, on up to four different digital networks. The members of these networks are normally chosen during pre-mission planning on the aviation mission planning system (AMPS). The AH-64D does not have the ability to broadcast its messages outside the network.

(4) AFAPD is capable of operating between 75 bps and 16Kbps. It is recommended that airborne AFAPD users employ AFAPD at 16Kbps, ASK (non-encrypted). For communications with ground FAC elements, AFAPD operates at 1200 bps or 2400 bps, FSK. AFAPD timing parameters must be adjusted when changing from ASK to FSK.

e. TACFIRE Protocol. The USA and USMC employ TACFIRE in artillery communications. The USA also uses TACFIRE for its airborne fire mission communications. The USAF F-16CG can receive a TACFIRE airborne fire request, but does not implement the full TACFIRE message thread.

(1) TACFIRE Addresses. TACFIRE addresses are two-digit alphanumeric entries in the range 00-3I. Addresses in the range 00-09 and 0A-0Z are used with non-IDM subscribers on fire support nets. Addresses in the higher range are used between IDM users on TACFIRE nets.

(2) TACFIRE recommended timing parameters are as follows:

(a) Preamble: 1.4 seconds.

(b) Monitor: 1.0 second.

(c) Baud Rate: 1200 bps.

(3) TACFIRE is capable of operating between 75 bps and 1200 bps. The TACFIRE protocol only operates in the FSK mode.

f. Intraflight Data Transfer (IDT) Protocol. USAF F-16s employ IDT between other F-16s in a tactical flight to enhance SA and relay targeting data between members of the flight. This protocol is currently used only by the F-16.

g. Variable Message Format (VMF) Protocol. The USA employs VMF for their tactical internet (TI) messaging. The USMC and USN use VMF CAS messages for CAS and SEAD support with the F/A-18 and EA-6B (initial operational capability [IOC] 2003).

(1) TI addresses are based on IP routing. The TI implementation on the AH-64D utilizes a limited address book associating call signs with IP addresses. The user should not adjust IP addresses. The addressing is performed by unit communications section personnel, and once set, is transparent to the user.

(2) CAS VMF messages are based on IP routing. The CAS implementation on the F-18 utilizes a limited address book associating call signs with IP addresses. This address book is set up by support personnel and is transparent to the user.

Note: Unlike TI, the CAS VMF users may change their own IP address.

(3) The VMF standard incorporates many lower-level protocol and message standards. These standards are still emerging. The fact that two platforms share a common message in VMF does not ensure compatibility. The user must check the version numbers of the VMF standard and associated documents used by each platform and verify that they match before attempting to interoperate.

2. Platform Specific Communications Considerations

a. EA-6B IDM Communications.

(1) The USMC/USN EA-6B Prowler is a high-speed anti-radiation missile (HARM) capable electronic attack (EA) platform with some electronic warfare support (ES) capability. This will be greatly improved by Improved Capability III (ICAP III), which is expected to achieve IOC in 2005. A pilot and three electronic countermeasures officers (ECMO) comprise the crew of the EA-6B. The forward cockpit primarily handles aircraft employment, navigation, and safety of flight related communications with some control over EA and HARM. The aft cockpit is responsible for EA, ES, HARM and mission-specific communication. The IDM is imbedded in a modified laptop computer that incorporates a multi-mission advanced tactical terminal (MATT). ICAP III will directly integrate the IDM/MATT into the aircraft on-board systems.

(a) Most Prowler aviators discuss IDM concurrently with the MATT due to the commonality of a laptop computer interface for both systems. Despite the additional satellite-based source of intelligence information provided to the MATT, the IDM serves as the preferred means of non-voice communications between joint aircraft in the SEAD environment.

(b) For a detailed discussion of MATT/IDM, see " MATT/IDM - From Test to Combat in OPERATION SOUTHERN WATCH" by Lieutenant Commander Gordon Smith in summer edition of EA NEWS (Appendix A).

(2) EA-6B IDM Capability. USMC and USN experience with the IDM is continuously growing. Previously, EA-6B, F-16CJ, RC-135 and EP-3E inter-communications was conducted solely through voice communications. IDM serves to add an additional and potentially more reliable means of non-voice connectivity. In either secure or non-secure modes accessed via KY-58 encryption, IDM is able to send information that appears in two formats in the SEAD environment: free-text messages and SEAD messages.

(a) The EA-6B is capable of sending/receiving the AFAPD X204 Free Text and S100 SEAD message to/from any platform or ground station that utilizes the IDM or PCIDM and appropriate protocol. Table II-3 shows the IDM messaging interoperability of the IDM capable platforms.

Table II-3. IDM Message Interoperability

Platform	Free Text Format	SEAD Message
EA-6B	X	X
F-16CJ		X
F-16CG/MLU	X	
JSTARS	X	
EP-3E	X	X
RC-135		X

(b) Free text messages consist of up to 70 characters of information that can be used for passing SEAD or mission-related information.

(c) SEAD messaging is a specific HARM-targeting data field. This field appears as a table and requires operator or MATT automated entries prior to sending to another aircraft. These fields include, time-on-target (TOT), target elevation, ID type, direct attack/avionics launcher interface computer (ALIC) code, location, error ellipse, and frequency. The location will have an error ellipse similar to MATT data. Some aircraft are unable to use the free-text message system. As an alternative, the SEAD message format can be used to pass basic threat emitter parametrics and location.

(3) Radio Configuration.

The IDM in the EA-6B aircraft is integrated with the UHF #3 radio in the aft cockpit. The IDM is compatible with all the radio's frequencies and modulations. The installed UHF #3 radio is dependent upon aircraft configuration. There are three current EA-6B Blocks or configurations: Block 82 (transitioning to 89A), 89, and 89A (all airframes eventually). ICAP-III will begin phasing out the Block 82/89/89A series in 2005. Block 82/89 aircraft (approximately half of the fleet) are not capable of VHF communication with the IDM, and no aircraft are IDM HQ configured; see Table II-4.

Note: Some Block 89 configurations utilize the ARC-159 radio and some utilize the ARC-164. All configurations are summarized in Table II-4.

Table II-4. EA-6B Radio Configuration

Aircraft Configu-ration	COMS #3 Radio	Band	Modulation	Frequency Range (MHz)	HQ II Capable
ICAP-2 Block 82	None	N/A	N/A	N/A	N/A
ICAP-2 Block 89	ARC-159	UHF	AM	225 – 400	No
ICAP-2 Block 89	ARC-164	UHF	AM	225 – 400	Yes, Voice Only
ICAP-2 Block 89A	ARC-182	V/UHF	AM/FM	30 - 400	No
ICAP-3	ARC-182	V/UHF	AM/FM	30 - 400	No

Note: The frequency that the UHF is tuned to serves both as a voice and IDM communications link that is time-shared between the two.

(4) Host Mission Computer Interface.

(a) In the current EA-6B configuration, the interface to the IDM is via the standard tactical receive equipment display (STRED) program that runs on the ruggedized laptop carried in the aft cockpit. The STRED program provides the primary operator interface to the MATT and IDM. The STRED and the IDM are not interfaced with the central mission computer (CMC) or the tactical jamming system (TJS).

(b) In the ICAP-III configuration, the monochrome digital display indicators (DDI), laptop, and forward cockpit radar displays are replaced with a new tactical display system (TDS) consisting of three ECMO displays and a pilot display. The IDM is also interfaced directly with the CMC and the TJS. The new displays will integrate control of the IDM and display functions.

(c) The EA-6B IDM uses one of three IDM channels that are hardwired to the UHF #3 radio and associated KY-58 to provide the capability to send/receive digital secure, digital clear, and analog clear data-link transmissions. This installation provides the capability to instantaneously receive an incoming message on any of the three channels once selected. The available IDM channels/modes are summarized in Table II-5:

Table II-5. IDM Channels / Modes

Channel	Mode	Default Data Rate (bps)	Characteristics	Comments
1	Digital Secure	16,000	Synchronous ASK	KY-58 must be in cipher position.
2	Digital Clear	16,000	Asynchronous ASK	KY-58 must be in plain text position.
3	Analog Clear	1200	Asynchronous FSK	KY-58 must be in plain text position.

(d) The EA-6B must have the correct AFAPD address entered for the specific platform(s) or aircraft. EA-6B ownship address is defaulted to 85. See Appendix C for the complete default list.

(e) The KY-58 must be keyed and selected to cipher if encrypted communications are to be used.

(5) Platform Limitations.

(a) The EA-6B is not capable of maintaining IDM communications throughout all phases of mission execution due to safety of flight issues. The EA-6B Block 89 and 89A do not have an airframe-integrated interface for its IDM. Instead, it uses a ruggedized laptop computer located in the aft cockpit.

Note: Use of the laptop below 5000 feet above ground level (AGL) is not authorized by Naval Air Systems Command (NAVAIR). Additionally, laptop operation is not generally performed during tactical phases of flight requiring aggressive maneuvering.

(b) For mission reasons, EA-6B crews prefer IDM frequencies above 380.0 megahertz (MHz).

(c) Link reliability is provided by the default setting of the link acknowledgement bit with two retries for each channel. When a destination IDM receives an AFAPD message addressed to it from an EA-6B, the destination IDM will automatically send an ACK message to the sending IDM. STRED provides an indication if the ACK was received or not. In the EA-6B, if an ACK message from the destination IDM is not received within a predefined time-out period (typically 10 seconds) then the EA-6B IDM will automatically resend the message again. This process is repeated one more time if necessary. The aircrew is alerted if an ACK is not received on the second retry. Therefore, it could be as long as 30 seconds before the EA-6B crew is aware that IDM communications have not been received.

b. EP-3E IDM Communications.

(1) The non-integrated IDM on the EP-3E consists of a laptop computer with a Type II PCMCIA card (constituting PCIDM) connected via a KY-58 to the ARC-210 (RT 1556B) radio (UHF/VHF #2). Clear or encrypted communication is controlled at the UHF/VHF #2 KY–58 panel and HQ I/II operations is controlled by the UHF/VHF #2 control panel in the flight station.

(2) Using PCIDM, the EP-3E can communicate with F-16 CJ (Block 50), F-16CG (Block 40), F-16 MLU (NATO), RC-135 V/W Rivet Joint (RJ), EA-6B, F/A-18, OH-58D, and AH-64D. IDM support by the EP-3E primarily consists of SEAD and free text messaging using the AFAPD protocol supporting both USN and USAF assets. To a limited degree, the EP-3E may communicate a general situation awareness with USA units via either the TACFIRE free text or the A501 free text message set. Table II-6 shows the messaging capability of the EP-3E.

Table II-6. EP-3E Messaging Capability

Platform	HARM Targeting (S100)	Free Text Messaging (X204, A501, TACFIRE)	CAS Message (X202, *VMF)
F-16 CJ	X	N/A	N/A
*F-16 CG	N/A	X	X
*F-16 MLU	N/A	X	X
RC-135 V/W	X	N/A	N/A
*F/A-18	N/A	N/A	Will receive VMF with DCS update 2003
EA-6B	X	X	Will receive VMF2003
OH-58D	N/A	X	N/A
AH-64D	N/A	X	N/A

*The EP-3E is capable of communicating via the AFAPD X202 mission update message (CAS 9-line brief). The EP-3E will be capable of communicating a CAS 9-line via the VMF Protocol when the PCMCIA Version 2 cards replace Version 1 cards. The addition of the VMF Protocol will allow communications with the F/A-18 upon installation of their digital communications system (DCS) (IOC 2003).

(3) The EP-3E has the ability to communicate with many platforms in the UHF or VHF spectrum via either secure or non-secure methods using a KY-58 encryption device. Execution of secure and non-secure communications can occur through either a HQ I or II format. Timing is achieved from a global positioning system (GPS) input, or a self-generated UHF/VHF "Mickey."

(4) To ensure successful connectivity for IDM employment, it is the responsibility of the IDM operator to understand the EP-3E's IDM connectivity with the other platforms. Table II-7 provides guidance on the platforms that have IDM connectivity with the EP-3E, the available methods, and their preferred methods.

Table II-7. EP-3E Connectivity for IDM Employment

Platform	*UHF/VHF*	*Secure*	*Non-Secure*	*HQ I/II*
F-16 CJ	*UHF/VHF	X	P	X
F-16 CG	*UHF/VHF	X	P	X
F-16 MLU	UHF/VHF	X	P	X
RC-135 V/W	UHF/VHF	X	P	X
F/A-18	UHF/VHF	X	P	X
EA-6B	** UHF only	X	P	N/A
OH-58D	UHF/VHF	P	X	X
AH-64D	UHF/VHF	P	X	X

X = Capable of IDM in this mode
P = Preferred mode of operation
* = UHF/VHF capable, however F-16CJs and CGs typically prefer UHF IDM
** = All block 89A EA-6Bs are capable of UHF/VHF IDM. Block 89 EA-6Bs are capable of UHF IDM only.

(5) Selection of the data mode is controlled by the senior evaluator (SEVAL) on the IDM/Joint Tactical Information Distribution System (JTIDS) control panel located

between positions 12 and 13. The IDM operator must have data selected on the IDM/JTIDS control panel for IDM operation.

(6) The EP-3E uses PCIDM Application Message Parcer Graphical User Interface (AMPGUI) software as its interface to communicate with other IDM participants in either a pre-formatted, free text, or imagery format. The user will primarily use the AFAPD SEAD (S100) and AFAPD free text (X204) message sets. On occasion, the user may need to access the AFAPD mission update (X202, CAS 9-line brief), AFAPD free text A501 (used by AH-64D for their free text), TACFIRE free text (used by USA units other than AH-64Ds), and the AFAPD image (B700).

(7) The first data field the EP-3E IDM user must enter in any IDM message is the Channel which will always be Channel 2 since this is the only Channel wired. For protocol, the EP-3 will primarily use the AFAPD Protocol in support of SEAD at a 16 kbps data rate; however, TACFIRE should be selected when communicating with USA units. Refer to Appendix C for amplifying information regarding EP-3E message configuration procedures.

(8) It is essential for the EP-3E IDM user to enter the proper ownship and destination address for the IDM message. Per AFTTP 3-1, the ownship and destination address of all IDM players should be published in the theater SPINS. In the absence of either prior coordination between IDM participants or publication in the theater SPINS, a default of 55 (refer to Appendix D other users default addresses) should be used for ownship. A destination address of 127 will serve as a backup if a default destination address fails. It (127) will broadcast to all IDM participants; however, the user will not receive an acknowledgement.

(9) EP-3E Communications Limitations.

(a) The stand-alone PCIDM laptop is not integrated with the EP-3E mission computer. In a hostile environment with blinking emitters, little time for data entry is available. Refer to Chapter III, Section 1.C. for tactics to mitigate this limitation.

(b) The AFAPD free text message (X204) is the primary means by which the EP-3E can pass free text messages to EA-6B and F-16CG IDM participants. The AFAPD free text message is restricted in the amount of information passed in each message to 200 characters. To overcome this limitation, the EP-3E IDM operator may send a free text message longer than 200 characters by using the AFAPD image message. The user can draft the message in a text format and access the text document via the image message, thus avoiding the 200 character limitation.

(c) Although the EP-3E has the message sets to support the USA's attack/reconnaissance mission, it currently lacks the steerable SINCGARS antenna required for communication with USA assets. In the future, the EP-3E will receive the steerable antenna and communications with USA units will be possible.

c. JSTARS IDM Communications.

(1) Mission planning is critical for effective utilization of PCIDM. Ensure applicable elements are addressed during the planning process.

(2) Standard attack support considerations apply (call signs, contact frequencies, TOT, etc.).

(3) Obtain ownship address from the communication section for incoming free text messages. Ensure units know their ownship address.

(4) Ensure IDM frequencies and protocol have been identified for all aircraft and ground units that may receive targeting or free text message data (through mission planning documents such as the airspace control order [ACO], operational testing data link [OPTASKLINK] or telephonically).

(5) If JSTARS is within LOS of attack assets while assets are on the ground (before takeoff), determine if assets want attack support information prior to getting airborne.

(6) When performing tactical operations with JSTARS expect a test message sent over the IDM.

(7) For message X202, expect the following fields to be used:

(a) Channel (analog or digital).

(b) Destination address.

(c) Latitude/longitude (degrees, minutes decimal).

(d) Elevation.

(e) Size (need to include element size, such as squad [SQ], section [SEC], platoon [PLT]).

(f) Type (any size character description such as. ARMOR, artillery [ARTY], vehicle [VEH]).

(g) Degree of Protection ("IN OPEN," "MOVING" followed by degree of movement, "FAST," "SLOW," followed by cardinal direction "N," "NE").

(h) Remarks: The first statement should read "ID" or "KILL" followed by mover description ("2 MTI .5km north of river" or "SA6 bullseye 240/12 NM").

(i) Expect a call of "What luck data?" If no luck, JSTARS will retransmit the data. Target/Mover updates will be filled in under the "Remarks" section. This is usually voiced as "standby target/mover update" and retransmitted.

(8) X204 and X501 free text messages are used to send up to 200 characters. Free text messages can be used by attack assets to send battle damage assessment (BDA) reports back to JSTARS or for amplifying information from JSTARS to assets (i.e. weather, big picture of targeting within an area of responsibility [AOR], etc.)

d. RC-135 V/W (RIVET JOINT) IDM Communications.

(1) RIVET JOINT (RJ) Overview.

(a) The RJ is an air refuelable theater-level signals intelligence (SIGINT) asset. It collects, analyzes, reports, and exploits RF emissions from an area of interest (AOI). During contingencies, RJ deploys to the theater of operations with the other command, control, intelligence, surveillance, and reconnaissance (C2ISR) aircraft such as airborne warning and control system (AWACS), JSTARS, and U-2, and maintains connectivity with other C2ISR platforms and ground sites via data links and voice communications as required. The RJ has secure UHF, VHF, high frequency (HF), and satellite communications (SATCOM) voice communication capabilities. Refined intelligence data can be transmitted from RJ to airborne and ground assets through the Tactical Digital Information Link A/J (TADIL-A/J) or to any network subscriber via satellite on the Tactical Information Broadcast Service (TIBS), which is a near-real-time theater information broadcast.

(b) IDM allows RJ to provide target cueing and SA information to HARM Targeting System (HTS) equipped, Block 50 F-16CJ aircraft conducting the SEAD mission. RJ data can be sent over LOS UHF and VHF radios in plain, secure and/or HQ modes directly into the F-16CJ cockpit where it can be handed off to the HARM. RJ utilizes the AFAPD-protocol SEAD message to send and receive data using the IDM network. RJ also has the ability to send/receive steerpoint messages to/from the F-16CJ. The SEAD message communicates target ID, location and emitter frequency while the steerpoint message uses the same message type primarily to convey location and time.

(c) Specific RC-135V/W capabilities and IDM hardware configuration can be found in the Rivet Joint Capabilities Guide and the ES-2000 available on the Secret Internet Protocol Router Network (SIPRNET) (Appendix A).

(2) RJ IDM Limitations.

(a) Coordinates provided by RJ via SEAD/steerpoint messages are intended to provide SA and are to be used for cueing other off-board targeting systems like HTS. RJ locations are not precision target-quality such as designated mean point of impact (DMPI) locations.

(b) RJ cannot utilize IDM on VHF frequencies below 100MHz due to antenna limitations.

(c) Currently, only the first 13 words of the 32-data word SEAD message contain valid data (Figure II-1).

e. F-16 Communications.

(1) Block 40 and 50 F-16s have two radios, one UHF and one VHF (AM or FM capable). Standard IDM transmission will occur in UHF although secure transmissions of data are feasible. Standard protocol used with the F-16 is X202 Mission Update.

f. AH-64D IDM Communications.

(1) The AH-64D has the ability to transmit and receive a total of 28 different AFAPD messages via IDM (Appendix B). Six of these messages can be exchanged with JSTARS. The messages that Longbow can transmit to JSTARS are the fire control radar information service request (FCR ISR) of a priority fire zone, present position query response, present position report, and free text messages. It can receive Fire Control Radar (FCR) Targets All Reports, present position queries, and free text messages. These messages are all sent using the AFAPD protocol.

(2) Longbow is capable of transmitting over the IDM via VHF (unsecure), UHF (secure capable via KY-58) in single channel and HQ I/II modes, and FM SINCGARS (secure capable) in both single channel and frequency hopping modes.

(3) Figures II-2 and II-3 show examples of the AH-64D MPD pages.

DATA BITS

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	1	TOGGLE		WORDCOUNT					DESIGNATION ADDRESS								0
	2	CHANNEL #			PORT #		CURR BLK #			TOTAL BLOCK#							
	3	MESSAGE ID (CHARACTER 1)								MESSAGE ID (CHARACTER 2)							
	4	DATA LINK TOT (HOURS)								DATA LINK TOT (MINUTES)							
	5																
D	6	DATA LINK PRIMARY TARGET POSITION															
	7																
A	8	DATA LINK PRIMARY TARGET ELEVATION															
	9	WPN	SHRIKE TYPE					RNG ACCUR			TI				RANGE CONF		
T	10	VAL				PRE-LAUNCH RF FREQUENCY OF THREAT 1											
	11	MAN	PRIM	THREAT 1 TARGET NUMBER													
A	12					START FREQUENCY											
	13					STOP FREQUENCY											
	14					MINIMUM PRI											
W	15	BLOCK II PW				MAXIMUM PRI											
	16	BLK II DWELL				PW SCALE			PWC	UPPER PW GATE				LOWER PW GATE			
O	17	SC	ATTEN-MSH			PRI SC					MM	IM	ANTENNA HEIGHT				
	18	ATTEN-LSH		LT ADJ-LSH		MISSING DATA ITEM						DWELL TIME					
R	19	LT ADJ-MSH				PRI STAGGER MASK-MSP											
	20					PRI STAG MASK-LSP				STAGGER MASK CELL GEN							HB
D	21		AQ RNG-MSH			TM	MD	PROB OF DET			HARMON PRI			INT VECTOR CORR			
	22	AQ RNG-LSH				FREQ AG		FREQ AG RNG			AG	CK	DUTY CYCLE			PRI	
S	23	VAL				PRE-LAUNCH FREQUENCY THREAT 2											
	24		PRIM	THREAT 2 INDEX NUMBER													
	25	VAL				PRE-LAUNCH FREQUENCY THREAT 3											
	26		PRIM	THREAT 3 INDEX NUMBER													
	27	VAL				PRE-LAUNCH FREQUENCY THREAT 4											
	28		PRIM	THREAT 4 INDEX NUMBER													
	29	VAL				PRE-LAUNCH FREQUENCY THREAT 5											
	30		PRIM	THREAT 5 INDEX NUMBER													
	31	VAL				PRE-LAUNCH FREQUENCY THREAT 6											
	32		PRIM	THREAT 6 INDEX NUMBER													

Figure II-1. SEAD Message

Figure II-2. AH-64D MPD IDM Page

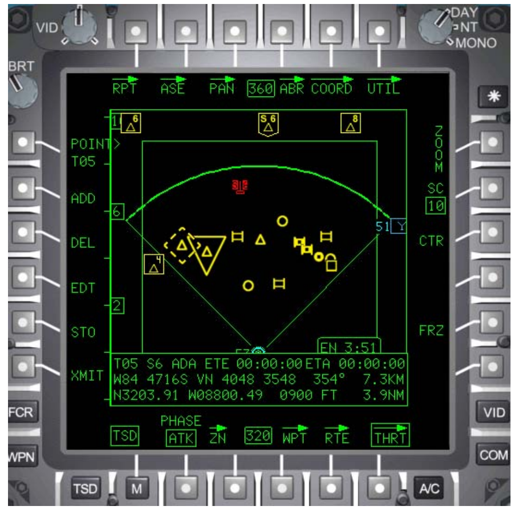


Figure II-3. AH-64D Tactical Situation Display

Chapter III

Inter-Service/Interoperability Tactics, Techniques, and Procedures (TTP)

1. SEAD Interoperability

The EA-6B Prowler is the only dedicated radar-jamming aircraft used by the U.S. Armed Forces. The F-16CJ is the only USAF data link equipped aircraft capable of employing the HARM. The USAF RC-135 RJ and the USN EP-3E are high-demand/low-density assets that provide stand-alone SIGINT gathering sources. With the retirement of the USN ES-3 and the USAF EF-111, joint forces are increasingly reliant upon inter-Service cooperation and coordination to suppress enemy Integrated Air Defense System (IADS). This cooperation and coordination can be enhanced through efficient and effective use of IDM. IDM is relatively new to the EA-6B and F-16CJ communities. It was incorporated in operational USN squadrons in 2000 and CJ squadrons in 1995. With EP-3E, EA-6B, RJ, F-16CJ, and F-16CGs now having the ability to use IDM, it has begun to provide a unique capability in SEAD.

a. EA-6B SEAD.

(1) Tactical Employment. The lack of IDM integration into the EA-6B operating system, combined with the operational limitations of the laptop interface, severely limits its real-time employment. EA-6B crews prefer to use the MATT/IDM during the pre-strike phase of the mission. The system then becomes an excellent tool to enhance electronic order of battle (EOB) SA or for any post launch updates to the mission. Due to the inherent physical hazard of the laptop in a dynamic environment, the MATT/IDM should rarely be used post-push, or below 5000 feet AGL.

(2) Pre-Strike. During the pre-push phase of the mission, it is essential that aircrew build the most current picture possible. Up-to-date EOB and HARM targeting information can be relayed to oncoming platforms via the free text or SEAD message format from assets on station. These could include the RJ, E-P3, or F-16CJ. The information gathered will help refine/retask the EA6B's assets to enhance its mission effectiveness.

(a) The free text message format is currently limited to EA-6B and EP-3E use with limited receive capability in the F-16CG. It is an effective means to communicate aircraft status, EOB, and pass down information between oncoming and off-going aircraft significantly reducing communications traffic. The free text message allows the user to input 200 characters of text and is the most flexible means to relay EOB and HARM targeting information.

(b) In the joint theater, the only way an EA-6B will be able to communicate to most IDM capable assets will be through SEAD message. The primary function of the SEAD messages is to pass HARM targeting information between assets. This is most likely to occur between the EA-6B, F-16CJ, and RJ. While the F-16CJ and RJ have the capability to pass information real-time during the strike mission, the EA-6B will most likely participate in this exchange pre-push. This message format lends itself to HARM targeting and retargeting, but with some aircrew ingenuity utilizing the available fields, it can be used for refining both radar and communications jamming assignments from external SIGINT information.

(3) Strike. Standard tactics are to stow the laptop interface prior to strike "push." The laptop can be stowed without taking the system offline and may be used based on mission necessity. It is important to note that the EA-6B IDM does not give any indication of an incoming IDM transmission when stowed. EA6B crews must be notified via voice communication prior to receiving IDM transmissions. The EA-6B cannot be relied upon as a reactive HARM shooter in the pure IDM arena based on this limitation.

(4) Reference Appendix C for standard configuration.

(5) Sixteen CJs in the Republic of Korea Air Force (ROKAF) and most F-16s with the Mid Life Upgrade (Belgium, Netherlands, Luxemburg [BENELUX countries]) will also have IDM capability.

(6) Reference Appendix D for Recommended Default IDM Parameters.

b. F-16 SEAD.

The F-16CJ uses IDM for HARM targeting and SA (AFAPD S100 SEAD). The F-16 CJ does not have the ability to execute free text messaging. Generally, the more information provided in the HARM message, the higher the probability that the missile will hit the desired target. At a minimum, the message must provide a target location (latitude/longitude/elevation) and target ID (threat 1-6 and target ID [0-4095]) for the F-16 to have the opportunity to shoot. The target ID data field must be populated with an ALIC code between 0 and 4095, which correlates to the emitter's electronic intelligence (ELINT) and electronic intelligence notation (ELNOT).

c. EP-3E SEAD.

(1) The EP-3E stand-alone PCIDM laptop is not integrated with the EP-3E mission computer. In a hostile environment with blinking emitters, little time is available for data entry and SEAD message generation. To effectively employ IDM under these circumstances, the EP-3E user should arrive on station early to collect the pre-strike SIGINT baseline that may be required for reactive HARM shots. The operator should then enter each signal of interest in an AFAPD SEAD message. Each saved message can be used in the event the information is required immediately by a SEAD package. The operator should note that the more information entered into the SEAD message, the higher the probability the HARM will strike the desired target. At a minimum, the operator must enter the target latitude/longitude and the target ID data fields for the HARM shooter to have any chance of a successful shot.

(2) The primary customer of the SEAD message is the F-16 CJ for pre-planned and reactive HARM targeting. Although the EA-6B has access to the SEAD message, its non-integrated IDM laptop severely limits the EA-6B's ability to reactively employ HARM. EP-3E IDM users should plan on coordinating SEAD information for a preemptive EA-6B HARM strike as the EA-6B will only use IDM before the SEAD package pushes into hostile territory. The EA-6B will receive the fully integrated IDM with their ICAP-III update and will be able to take a more active role in SEAD coordination through IDM.

(3) The F-16CG and F-18 do not have access to the SEAD Message Set. To provide SEAD support to these platforms, the EP-3E operator can pass appropriate SEAD information via the AFAPD CAS Message (F-16CG) and CAS VMF Message (F/A-18).

Note: The F-18 will be capable of receiving the VMF when the Digital Communications System (DCS) update is installed (IOC 2003).

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(4) The RC-135 has limited functionality in SEAD coordination with the EP-3E due to the limitations of the SEAD message. The SEAD message has no line-of-bearing function which would be useful for cross-correlation of an emitter. Also the RC-135's IDM does not include free text message functionality.

d. RC-135V/W SEAD.

(1) RJ provides ES to airborne assets executing the SEAD mission. RJ provides target cueing information to F-16CJ and EA-6B aircraft equipped with the IDM using AFAPD SEAD messages. Detailed mission planning and pre-mission coordination is essential to mission success. All IDM users who require near real-time information from RJ, and plan to be within UHF/VHF (LOS) with the RJ while it is on station, must ensure the necessary IDM and radio parameters/settings are compatible.

(2) RJ and F-16CJ have established and validated TTP to standardize IDM operations between the platforms. Current TTP can be found in AFTTP 3-1, Volume 21 (see Appendix A). A standard IDM parameter setup has been established to facilitate information flow via voice communications and data transfer via IDM during all phases of engagement. These parameters may be modified, provided they are compatible between all IDM network participants and communicated to all affected mission planners. Mission planners must coordinate the type of radio (UHF/VHF) and frequency for the AFAPD IDM network and which mode (plain/secure) will be used for transmitting SEAD messages. Specific send-criteria covering what SEAD information and when to transmit the SEAD message must be established during mission planning and disseminated to all SEAD assets employing IDM. The following critical RJ/F-16CJ IDM parameters must be coordinated and agreed upon by mission planners from all affected platforms:

(a) Ownship address. This value may be any two-digit number from 00 to 99 (excluding multiples of 10). This is the platform's AFAPD address to receive data. RJ's standard default ownship address is 19.

(b) Transmit address. The address(es) may be any two-digit number from 00 to 99 and identifies AFADP address(es) to which data is sent. On RJ the IDM operator may choose between broadcast (00) –all compatible IDMs within LOS receive data, Multiple (10, 20, 30, 40, 50, 60, 70, 80, 90)-a group of nine addresses called "a team" receives data (e.g.- an address of 10 transmits to individual address 11, 12, 13, 14, 15, 16, 17, 18, 19) or individual (01-99)-only the specified address receives data. RJ's standard default transmit address is 00.

(c) Net mode. Selections are digital, analog and secure. Only the digital mode is available to RJ. F-16CJ default selection is also digital.

(d) Auto acknowledge. This parameter activates the retry function of the IDM that continues sending a SEAD message (up to the number of retry entered) until the receiving address sends a message back to the initiator indicating the data was received. When broadcast is selected for the transmit address the auto acknowledge function is disabled.

(e) Retries. This parameter controls the number of retries attempted when auto acknowledge is enabled.

(f) Message protocol. AFAPD is the only protocol currently available to RJ. The RJ/F-16CJ default is AFAPD and all IDM users on the network must use the same protocol for successful IDM communications.

(g) Default elevation. This value should reflect the target (area) elevation above sea level and is coordinated during mission planning. It is a very coarse estimate with a +/- 2100 feet accuracy. RJ's standard default elevation is 2100 feet which covers sea level to 4200 feet.

(h) Data rate - The IDM operator may select data transmission rates of 75, 150, 300, 1200, 2.4k and 16k baud. The RJ/F-16CJ default is 16k and all IDM users on the network must use the same data rate for successful IDM communications.

(i) Key delay. This is a time value that allows the IDM radio to switch from voice to data transmit mode. The RJ/F-16CJ default value is 0.5 seconds and all IDM users on the network must use the same value for successful IDM communications.

(j) Comm sync. This is a time value that the IDM radio uses to send a data stream to further refine automatic gain control and circuitry while non-vital data is on the carrier signal. The RJ/F-16CJ default value is 0.2 seconds for normal use for non-secure operations and 1.0 second for secure operations.

(k) Transmit (TX) gate timeout. This is a time value that allows the IDM to release the radio if an internal error occurs during HQ operations. At the end of the timeout value, the IDM will stop keying the radio to prevent tying up the radio indefinitely. The RJ/F-16CJ default value is 1.0 seconds and all IDM users on the network must use the same value for successful IDM communications.

(l) Pulse shaping. The RJ/F-16CJ default value is NO/DISABLE. All IDM users on the network must use the same value for successful IDM communications.

(m) IDM updates. Enables an update function on RJ that directs IDM to update active messages being transmitted on the IDM network if mission planned values for the time or location data fields of the SEAD message change. RJ default value is OFF since the IDM operator must manually access the IDM radio and current RJ – F-16CJ TTPs direct voice communications prior to sending a SEAD message.

(n) Radio silence. This option is used during emissions control (EMCON) conditions to suppress RJ IDM auto acknowledge radio transmissions. RJ's default setting is "OFF" since broadcast net mode disables the auto acknowledge function.

(o) Suppress RF. Removes the RF parameter from the SEAD message prior to transmission for use in non-secure networks and during training.

e. AH-64D SEAD.

(1) Army aviation has limited functionality within the Joint SEAD mission area.

(2) The AH-64D has the ability to provide and request SEAD within USA units. Although the AH-64D shares the TACFIRE Airborne Fire Request with the F-16CG, there is no history of employment.

If operating with joint assets over TACFIRE, the AH-64D crew must make some setting changes on the modem page for the net to be used. The crew must set the protocol to TACFIRE and the baud rate to 1200 or less. In addition, they should set the retries to 0 and turn the auto acknowledge off. Figure III-1 shows the AH-64D Modem Setup Page.

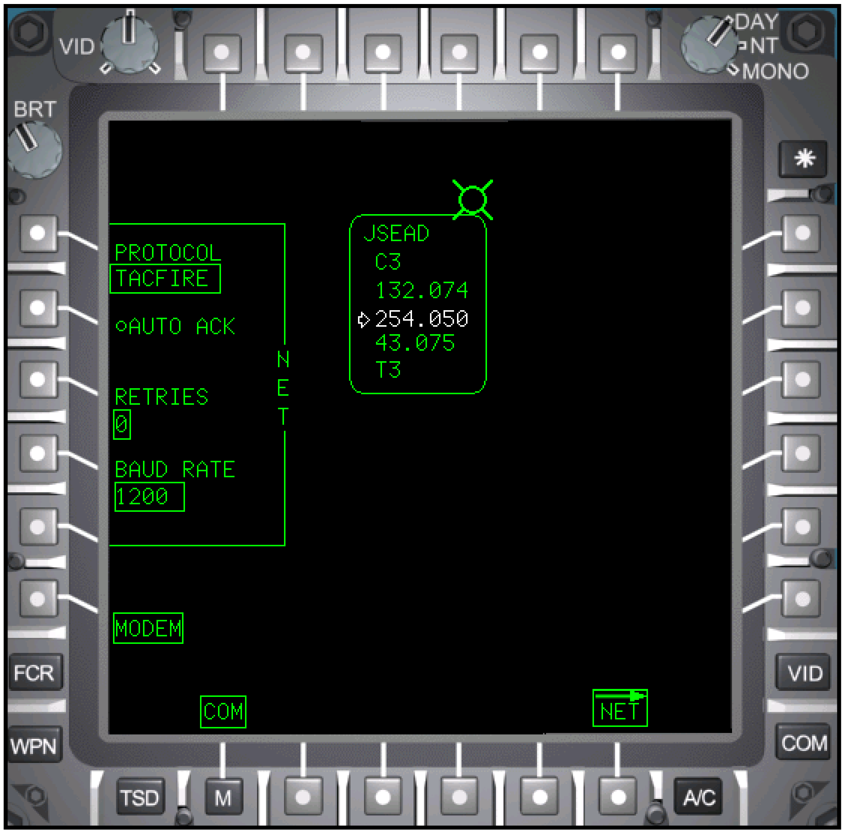

Figure III-1. AH-64D Modem Setup Page

2. CAS.

a. EA-6B CAS.

(1) The EA-6B does have the capability to receive and transmit the standardized CAS message with the F/A-18 in the VMF protocol.

(2) Electronic Warfare Close Air Support (EWCAS). During EWCAS or Reactive SEAD (RSEAD), an EA-6B provides EA and HARM support to striking aircraft against a specific surface-to-air threat. The goal of EWCAS is for the EA-6B to position itself in order to attain the proper positioning relative to the striking aircraft and the target radar site. It is conducted primarily in two ways depending on whether or not the hostile surface-to-air missile (SAM) system is collocated with the target.

(a) Inter-EA-6B and Joint Emitter Correlation. The EA-6B ALQ-99 on-board system is the Prowler's primary means of scanning the electromagnetic environment for hostile emitters. Ambiguities often present Prowler aircrew with a difficult task of correctly identifying potential threats. The EA-6B can perform correlation functions with other Prowlers, RJ and EP-3E using IDM free text format.

(b) Joint HARM Targeting. The EA-6B and EP-3E are able to send and receive free text and SEAD messages, while F-16CJ communication is limited to sending and receiving SEAD messages only. The relationship between RC-135s and CJs is special in that RJ is able to send the information directly to the F-16CJ HTS. Although the EA-6B carries the HARM and accesses it via the HARM Control Panel (HCP), it incorporates no such functionality that links it to the IDM and therefore requires manual entry of SEAD information by an ECMO into the HCP. In either platform, valuable HARM targeting information can be sent.

b. EP-3E CAS.

The EP-3E is capable of transmitting and receiving the AFAPD CAS messages. Following receipt of the PCMCIA Version 2 Modem Card, the EP-3E will be able to transmit and receive the VMF CAS message. The AFAPD CAS message should be used to support the F-16 CG in the SEAD mission (refer to Chapter III, Section 1.C.(3) for SEAD tactics). Once the EP-3E has access to the VMF CAS message, the VMF should be used to support the F-18 in the SEAD mission (refer to Chapter III, Section 1.C.(3) for SEAD tactics).

c. JSTARS CAS.

(1) JSTARS supports air interdiction (AI), CAS, combat search and rescue (CSAR), Army and USMC aviation, and Army, USMC, and USN fire support operations. For purposes of this publication, all operations will be considered attack operations. Currently ROK F-16s, U.S. Block 40 and 50 F-16s, B-1, B-52, USA AH-64D Apache Longbow, OH-58D Kiowa Warrior, RC-135 RJ, and tactical air control parties (TACP) have a capability to receive digital targeting information from off board sensors via this system. The following messages are applicable to attack operations:

(a) X202 Mission Update. This message provides the capability to transmit targeting information to inbound fighters for CAS/interdiction missions.

(b) X204 Free Text. This message provides the capability to transmit free text information to USAF participants only.

(c) Free Text. This message provides the capability to transmit free text information to USA participants only.

(d) TACFIRE Free Text. This message provides the capability to transmit free text information to TACFIRE units. This message is different than the X204 and the A501 because of format and protocol.

(e) IDM Communications can be conducted via UHF/VHF, HQ, and secure (KY-58) or combinations thereof depending on the operation requirements. Typical intraflight communications require some limited voice coordination for data transmissions; however, extensive voice calls will impinge if not "walk-on" IDM data transmissions. Each IDM equipped aircraft has an ownship address (1 to 126, multiples of 10 excluded). The multiples of 10 (10, 20 etc.) are reserved as multiple or "team" addresses that will be received by all addressees within that 10 number block of addresses. A “team” address of 10 will be received by any platform with an ownship address of 11-19. In network operations, the transmit address can specify an individual recipient (e.g. Address “11” would go only to the aircraft with that ownship address) or broadcast (transmit address “127”) will be received by all IDM recipients on that particular net. USA platforms use ASCII addresses.

d. AH-64D CAS.

(1) USA aviation has limited functionality within the Joint CAS mission area.

(2) The AH-64D has the ability to provide CAS to USA ground units using the VMF Target Handover message. However, this message does not provide functionality to request Joint CAS. Although the AH-64D shares the TACFIRE Airborne Fire Request with the F-16CG, there is no history of employment.

(3) If operating with joint assets over TACFIRE, the AH-64D crew must make some setting changes on the modem page for the net to be used. The crew must set the protocol to TACFIRE and the baud rate to 1200 or less. In addition, they should set the retries to 0 and turn the auto acknowledge off. Figure III-2 shows the AH-64D CAS setup page.

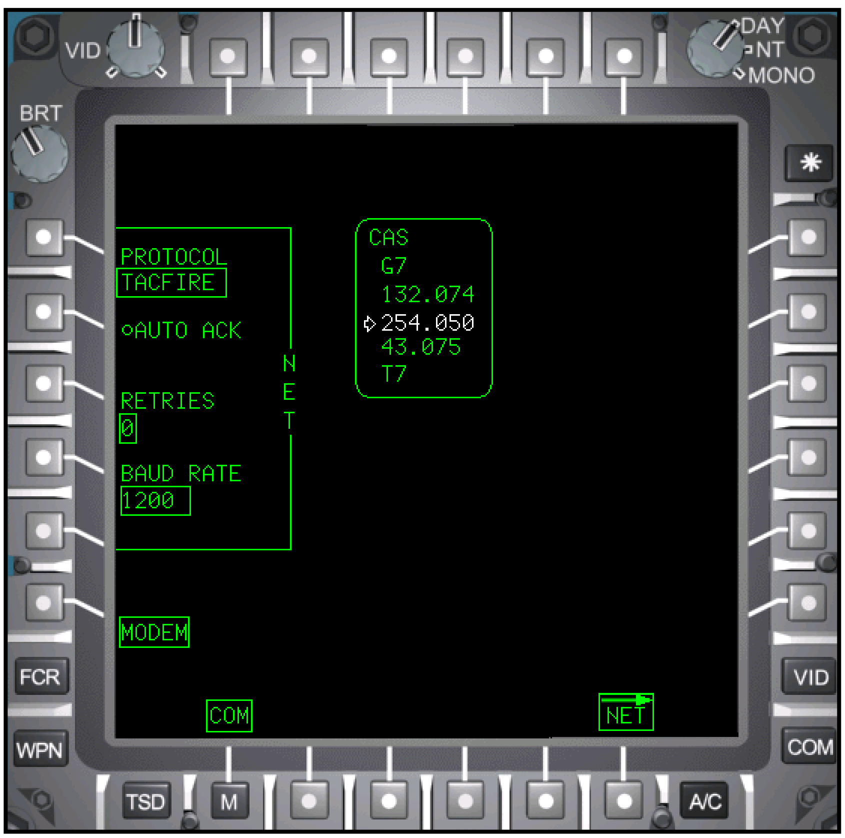

Figure III-2. AH-64D CAS Modem Setup Page

3. Attack Reconnaissance

a. EP-3E Attack Reconnaissance.

(1) The EP-3E has a limited capability to communicate with USA units in support of attack reconnaissance missions via the TACFIRE Protocol.

(2) The EP-3E can communicate with OH-58D and AH-64D in support of attack reconnaissance missions using a standard (*non-SINCGARS) UHF/VHF radio. Although the EP-3E has the ability to provide free text, airborne fire requests, and fire control request messages, the operator should pass only free text messages to USA units to communicate a general SA. Typical SA includes IADS activity, position and movement of ground units, and survivor locations for CSAR.

(3) The EP-3E IDM user should avoid passing targeting data to USA participants as the EP-3E lacks the precise targeting required by USA aviation units.

Note: The requirement for SINCGARS communication has been generated and is funded for the EP-3E. Upon arrival of the steerable SINCGARS antenna, the EP-3E will have the equipment to communicate through SINCGARS.

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b. AH-64D Attack Reconnaissance.

(1) The AH-64D Longbow uses the Longbow AFAPD protocol to share SA and C2 data with other Longbow aircraft. It uses the IDM to transmit targeting data, routes, waypoints, threats, control measures, laser codes, communications data, free text, and other mission data. Crewmembers interface with the IDM through multi-purpose displays (MPD) in the cockpit that provide the crew with graphical control over the information they wish to transmit. It requires very little "heads down" time on the part of the crew, and very little manual data entry. See Appendix B for a complete list of Longbow AFAPD messages.

(2) When operating with JSTARS aircraft, certain system limitations must be accounted for that are not present during Longbow-to-Longbow IDM operations. When transmitting Longbow-to-Longbow, fire control radar target reports classify targets in one of six categories. Targets are classified as tracked vehicles, wheeled vehicles, air-defense units, rotary-wing air targets, fixed-wing air targets, or unknown targets. They can also be classified as either moving or stationary targets. In some instances the radar frequency interferometer (RFI) on the Longbow can identify air-defense targets down to the system type (SA-8, 2S6, SA-13, etc.) when the system is radar guided. While the data provided to the AH-64D by the JSTARS is not suitable for targeting, it is suitable for providing the Longbow SA and cuing it to the target area. After receipt of the targets from the JSTARS, the Longbow crew simply uses the information to orient its sensors at the target area in order to engage.

Chapter IV

IDM Lessons Learned

1. Navy Platforms

a. Operational testing of the EA-6B IDM was completed June 2000 and cleared for flight that fall. The final distribution of MATT, the IDM interface, has not been completed as of publication of this manual. Two squadrons have completed deployments with MATT IDM and lessons learned are classified SECRET. These can be found on SIPRNET (see Appendix A).

b. Due to the lack of an airframe-integrated interface, foreign object damage (FOD) and ejection hazards limit tactical use to the pre-strike portion of the mission.

c. The AUTO ACK feature of IDM can cause confusion for crews since receipt of the message does not mean that the receiving aircraft can interpret the data. For example, if an EA-6B sends a SEAD message, an F-16CG IDM can receive the information, but it cannot be displayed to the pilot. If the AUTO ACK feature is enabled, the F-16CG IDM will still send the EA-6B crew confirmation that a message was received. This could lead the ECMO to mistakenly believe the F-16CG pilot knows the location of the HARM target.

d. Coordination Issues.

(1) The EA-6B squadrons should coordinate UHF/VHF compatibility with other assets (especially F-16CG).

(2) Ensure all proper addresses of intended IDM participants are known.

(3) Identify not only type of aircraft, but model and associated IDM capability (such as F-16CG, F-16CJ).

(4) Prepare for redundant communications in the event you are working with both IDM equipped and unequipped aircraft.

(5) Ensure IDM transmission frequency does not fall into the jamming susceptible spectrum.

(6) Work-Arounds.

(a) SIGINT platforms must send pertinent HARM and signals of interest (SOI) data prior to the push.

(b) Crews can utilize a VMF CAS message to refine jamming assignments and HARM targeting data for transmission to the F/A-18.

2. Air Force Platforms

a. The following is a description of F-16C/D Block 40/42 Production Tape No. 6 (40T6) IDM enhancements.

b. The IDM was incorporated into Block 40T5 and Block 50T5. Both have capability to transmit and receive CAS, SEAD, and IDT messages. The Block 40T5 message includes a “9-Line” CAS brief message reception, CAS “on-station” message transmit, transmit of current steerpoints, and IDT. IDM messages are formatted into three datalink protocols, AFAPD, TACFIRE, and IDT.

c. There is a substantial difference between the IDT protocol and the AFAPD and TACFIRE protocols; therefore, the radio selected to transmit and receive IDT messages cannot be used to transmit AFAPD and TACFIRE protocol messages.

d. Confusion can occur when group address 10 or 20 is used for IDT. The response message format adds the aircraft altitude to the response. Example: A message is sent to aircraft ID 11, the response is 11 10 (address 11 at 10,000 feet).

e. Certain settings in Block 40, F-16 must be used to accomplish a successful data transfer for a CAS mission. There are currently two methods of communicating digitally with ground TACPs.

(1) The Digital Communications Terminal (DCT). The DCT attached to a PRC-113 UHF/VHF portable radio.

(a) Maximum baud rate of 2400 bps. The baud rate must be stepped down on F-16 aircraft to the DCT for data transfer.

(b) When transmitting target coordinate, latitudinal/longitudinal must be input by the ground FAC in the DCT. IDM will not accept universal transverse mercator (UTM) coordinates.

(c) A "friendly" location can be sent through the DCT in meters or nautical mile (NM) distances from the target (for example, 3500 meters, North = "3500 N." The aircraft will show distances in the horizontal situational display (HSD) as NM only.

(2) The TACP-modernization equipment (fielding December 2002). Combination of MK-7 laser range finder, PRC-117F man portable radio and tactical computer. TACP software is designed to "speak" directly to the F-16C/D Block 40/42 Production Tape No. 6 (40T6) aircraft OFP but requires the following settings on the aircraft:

(a) 16 kps baud rate.

(b) Protocol AFAPD.

(c) Auto ACK: Enable.

(d) AFAPD Retries = 0.

(e) TACFIRE Retries = 0.

(f) Priority = Voice.

(g) Antennal Section = Norm.

(h) IDM Channel/Port Unsed = CH1/DIGITAL, CRAD1.

(i) TACFIRE Set-up:.

- Preamble time (sec) 0.2.
- Monitor time (sec) 0.2.
- Block Select SINGLE.
- Authentication mode NONE.

(j) Channel Set-up:

- Message scrambling ENABLE.
- Key Delay (sec) 0.5.
- Comm Sync (sec) 0.3.
- TX Gate Timeout (sec) 1.5.
- Link Delay (sec) 0.
- Secure Key Timeout (sec) 1.5.

(k) Improper KY-58 phasing calibration reduces encrypted voice and data communications reliability. Data communications may be affected more severely due to the lack of re-sync capability in the data mode.

- KAM-337A/TSEC states that KY-58 default phasing is 290 + 20 msec.
- AFIC 11 KAM-337A/TSEC 14 April 1998 states that the KY-58 phasing should be set to 105 + 1 msec when used with a HQ radio.

f. Normal IDM preflight settings include “FILL ALL.” Once a CAS message is received, “FILL NONE” should be selected to ensure the CAS message is not overwritten.

g. Dissemination of mission planned SEAD message send criteria is vital to successful mission execution. All SEAD assets must be aware of both location and emitter type to be used for IDM SEAD or steerpoint messages used as system test points prior to mission execution. Standardized mission planning factors and USAF brevity terminology can be found in AFTTP 3-1, Volume 1.

3. USA Platforms

a. During the 2000 Joint Expeditionary Force Experiment (JEFX 2000), the AH-64D Longbow and JSTARS conducted a test exercise to assess the functionality of communicating digital data between each other. Two E-8Cs were temporarily modified with SINCGARS and IDMs that facilitate digital transfer of JSTARS moving target indicator (MTI) to a Longbow Apache. All messages were digitally transmitted through SINCGARS in the frequency hopping (anti-jam) secure mode.

b. In April 2001, the USA conducted its Division Capstone Exercise (DCX) demonstrating the digital connectivity capability within the 4th Infantry Division (Mechanized), Fort Hood, TX. Sixteen AH-64D Longbows from Fort Hood and one JSTARS aircraft participated in this exercise. All messages were digitally transmitted through SINCGARS in the frequency hopping (anti-jam) secure mode.

c. Assessment.

(1) General. SINCGARS/IDM usage increases lethality and survivability of Longbow Apaches while greatly reducing sensor to shooter time. It was effectively demonstrated that integrating IDM with the E-8C LAN enables JSTARS to capture and transmit a battlespace picture to an AH-64D beyond the limitations of the Longbow’s organic radar. Use of SINCGARS/IDM also enabled JSTARS to accurately track the Longbow’s present position and use this information to provide additional security

against threatening mobile targets. Combining the Longbow's present position information with the MTI of the intended targets enabled the Longbow to remain masked by terrain until the target entered maximum standoff range. This enhancement resulted in increased survivability and lethality.

(2) IDM Message Sets.

(a) Free text was used to task the Longbow for launch and pass essential mission data. The use of free text helped minimize the amount of voice traffic and reduce the Longbow's RF signature. Using preset procedural control measure, the free text could be kept short.

Example:

Chard 55, Assume REDCON 1, launch when able
Fly Route Hawk, assume Attack Position 55
Orient on TRP 20 to destroy 5-vehicle convoy moving north
Notify when ready to receive FCR Target Report

(b) Present Position Query/Response enabled JSTARS to track the exact location of the Longbow. This information was used to gauge the distance between the Longbow and the intended target. In the current configuration, only one console on the E8C displays the Longbow's position. However, this information is shared with the rest of the JSTARS mission crew by sending pointers to other workstations. The JSTARS operations section then uses this information to de-conflict the Longbow from other attack assets.

(c) Priority Fire Zone (PFZ) messages were successfully transmitted by the Longbow to JSTARS. Though not a major influence during this experiment, this message has applicability in cases where the Longbow needs to cue JSTARS for MTI data in specific areas of concern. Returning MTI data for a PFZ request requires very few keystrokes on the part of a JSTARS mission crewmember. It simply requires the crewmember to copy the message, fill in the radar service request (RSR) job number, and transmit. All other blocks are already filled in.

(d) FCR target reports were used effectively to orient the Longbow to its targets. The MTI picture significantly reduced the exposure time needed to acquire the enemy enabling the Longbow to remain masked until the target was in range. The FCR target report has the added advantage of graphically depicting the target array and enables the AH-64D to slave sensors to the target without the need to transcribe the data.

(3) Of the 15 E-8C aircraft currently assigned to the 116th Air Control Wing (ACW), only two are temporarily configured to integrate IDM with the operator workstation (OWS) LAN. Integration with the LAN is required to capture moving target indicators for the FCR report and graphically display the Longbow's PFZ and present position on an OWS.

(4) Future JSTARS. Longbow training and testing is needed to continue to develop and refine TTPs. The skills required to operate this link are perishable and will be lost through attrition if not used. Longbow operators train with IDM frequently. Training opportunities will increase in the 116th ACW with the fielding of additional Longbow units. The 116th ACW must aggressively seek opportunities to train with fielded Longbow units and prioritize its resources to protect them. In the near term, training objectives should be kept simple with the primary goal to grow more operators.

d. Lessons Learned.

(1) Common understanding of symbology. The E-8C OWS displays radar data as yellow (tracked vehicle) or magenta (wheeled vehicle) dots. JSTARS operators can also input an assortment of ground points, reference points and tracks as analysis tools. All symbols on the E-8C OWS can be sent to the Longbow, but do not display the same (see Figure IV-1). MTI will display in the Longbow as non-priority wheeled/tracked stationary targets. Ground points, reference points and tracks will display to the Longbow as unknown priority targets, (with the exception of an air defense artillery unit reference point in the E-8C will display as a priority ADU symbol in the Longbow display).

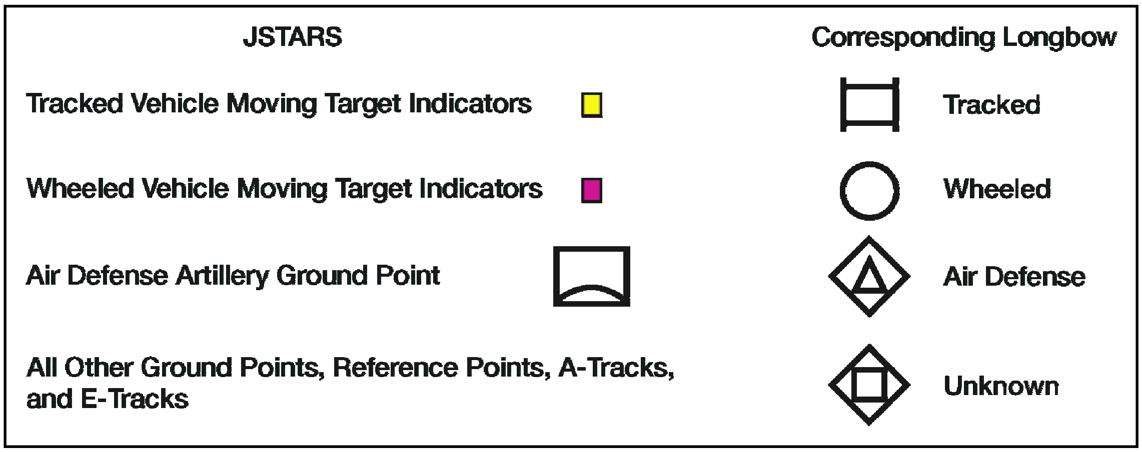

Figure IV-1. JSTARS/Longbow Symbology

Recommendation. Develop a quick reference list of common use terms to be added to the JSTARS aircrew aid manual. Incorporate a SINCGARS/IDM block of instruction in the mission crew commander, senior director, air weapons officer, and combat survival training and evaluation programs.

(2) Present Position Report versus Present Position Response. Pre-mission planners decided that the Longbow would send a Present Position Report every time it reached an aerial control point. During JEFX, exercise participants noted that the Present Position Report is different than the Present Position Response to a query. When the Longbow sends a Present Position Report, as opposed to a Present Position Response to a query, it locks up the PCIDM. When the E-8C's IDM queries the Longbow for a present position, the Longbow's IDM automatically returns a Present Position Response. However, an unsolicited Present Position Report contains different data fields that lock up the JSTARS IDM whenever it is received.

Recommendation. Exclude the use of Present Position Reports in the near term and work to include this message in future software upgrades to the PCIDM.

(3) Common CRYPTO. The IDM on the E-8C is connected to a classified LAN and therefore must be encrypted (secured) when it is broadcast off-board. Verifying the Longbow is using the same CRYPTO as the E-8C requires prior coordination. In the USA system, getting the CRYPTO and installing it on an automated network control

device (ANCD) (a.k.a. CZY-10) is the job of the unit signal office. Longbow operators generally receive an ANCD already filled with the CRYPTO and transfer it to the helicopter.

Recommendation. Coordinate with the Longbow battalion's signal section prior to an operation to ensure like CRYPTO is being used.

(4) SINCGARS Loadsets. USA spectrum management (ASM) guidance imposes limitations on the use of SINCGARS radios in the frequency hopping mode above 1,000 feet AGL due to potential interference with commercial television stations and amateur radio bands. The spectrum manager, 116th ACW, has obtained rights to a 10-frequency hopset that is good for continental United States (CONUS) use for SINCGARS/IDM training. Use of other hopsets must be coordinated through the area frequency coordinator (AFC) by the local spectrum manager.

Recommendation. Use the 116th ACW training load set for short notice operations supporting small unit operations. To support major USA exercises such as Air Warrior at National Training Center rotations, coordinate in advance through the AFC to obtain approval to use unit hopsets above 1000 feet AGL. Ensure that Longbow units are issued the loadsets to facilitate better coordination for training.

(5) Setting SINCGARS time of day. For SINCGARS radios to communicate in the frequency-hopping mode, they must be set with the same time stamp. ANCD times tend to drift when battery power is low. Once positive frequency hopping is established, times can be kept synchronized if one of the participants is set as the frequency-hopping master. Each time the radio of the frequency-hopping master transmits, it also transmits an updated TOD to keep radios aligned.

Recommendation. Set the time in the ANCD radio to ZULU off the GPS time just prior to loading the ARC-201D. Coordinate in advance which participant will be the frequency hop master to keep times synchronized.

(6) SINCGARS/IDM New Equipment Training (NET) Control Procedures. Through experience/training JSTARS crews refined and reduced the steps to get the link into operation. The procedure established during training and testing prior to JEFX was to establish SINCGARS single channel plain text voice operations first, then transition to cipher text and frequency hopping before switching to the data mode. This was partly because the current configuration of the SINCGARS/IDM is not conducive to simultaneous voice and data operation. It was also a matter of being able to isolate the problem with the CRYPTO, or loadset, should the link fail. During JEFX, the E-8C was in SINCGARS/IDM frequency hopping data mode before the Longbow powered up. This will become important as JSTARS continues to work with more aircraft.

Recommendation. Review the SINCGARS and CAS manuals produced by Northrop Grumman to verify all procedures are detailed and develop a continuation-training program. Review concept of operations (CONOPS) and develop TTPs for NET control procedures of SINCGARS IDM. Disseminate CONOPS to the field.

Appendix A

Software References and Links

Table A-1. References and Points of Contact

U.S. Marine Corps / U.S. Navy	
EP-3E	www.pcidm.com/ampgui/
	NAVAIR PMA-290
	NSAWC, ERWS Tactics
EA-6B	http://205.1.233.130/missionplanning/MATT/MATTIDM.htm
	www.eaws.navy.smil.mil
	EAWS, DSN 820-3210
	https://ea6bipt/mugu.navy.mil
U.S. Air Force	
RC-135 V/W	Air Force Tactics Techniques and Procedures 3-1, Volume 21, http://afttp3-1.nellis.af.smil.mil/HTML_Volumes/3-1Vol21/3-Vol21.htm
	Rivet Joint Capabilities Guide and ES-2000, http://majorsfield.af.smil.mil
	55th WG/XP, DSN 271-5317
F-16	www.symetrics.com/products/idm.htm www.innocon.com/idm.html
	WR-ALC, DSN 468-9817
U.S. Army	
AH-64D/ OH-58D	www.peoavn.redstone.army.mil

Appendix B

IDM Platform Specific Message Sets

Table B-1. IDM Platform Specific Message Sets

Platform	***Protocol***	***Messages***	***Notes***
F-16CJ	AFAPD	S100 (SEAD, Steerpoint) X204 (Freetext) Steerpoint	
	IDT	AA Request AA Reply AA Assign AG Cursor Markpoint Penguin data Carapace data	
F-16CG	TACFIRE	Airborne Fire Request	Receive only
	AFAPD	X204 (Freetext) On Station X202	
	IDT	AA Request AA Reply AA Assign AG Cursor Markpoint Penguin data Carapace data	
Rivet Joint	AFAPD	S100	
EA-6B	AFAPD	S100 X204	
	VMF	K1.1 K2.33 K2.34 K2.35	

Table B-1. IDM Platform Specific Message Sets

Platform	*Protocol*	*Messages*	*Notes*
OH-58D	TACFIRE	29 Free text (TX/RX) 2007 Artillery Target Intelligence (TX) 3030 Observer Location (TX/RX) 3030 Fire Request Grid (TX) 3027 Fire Request Quick (TX) 3033 Fire Request Shift (TX) 3037 Message to Observer (RX) 3031 Forward Observer Command (TX/RX) 3038 Subsequent Adjust (TX/RX) 3026 End of Mission and Surveillance (TX/RX) Airborne Situation Report Airborne Movement Command Airborne Fire Request Airborne Mission Command Airborne Check Fire Airborne Target Position Update Airborne Mayday Airborne Request Of Present Position Automatic Update Airborne Automatic Present Position Update Airborne Battle Damage Assessment Airborne Casualty Report Airborne Spot Report (SPOTREP) Airborne Initialization (Bulk Data) Message	

Table B-1. IDM Platform Specific Message Sets

Platform	***Protocol***	***Messages***		***Notes***
OH-58D	VMF	Msg #	Name	
		K1.1	Free Text	
		K2.1	Check Fire	
		K2.12	On-call Fire Command	
		K2.14	Message to Observer	
		K2.16	End of Mission & Surveillance	
		K2.22	Subsequent Adjust	
		K2.4	Call For Fire	
		K2.6	Observer Mission Update	
		K4.1	Spot/Salute Report	
		K5.1	Position Report	
		K5.14	Situation Report	
		K5.15	Field Order (FRAGO)	
		K0.2	System Coordination Message	
		K1.3	Information Request Message	
		K2.37	Observer Readiness Report	
		K2.38	Airborne Fire Mission	

Table B-1. IDM Platform Specific Message Sets

Platform	*Protocol*	*Messages*	*Notes*
AH-64D	TACFIRE	29 Free text (TX/RX) 2007 Artillery Target Intelligence (TX) 3030 Observer Location (TX/RX) 3030 Fire Request Grid (TX) 3027 Fire Request Quick (TX) 3033 Fire Request Shift (TX) 3037 Message to Observer (RX) 3031 Forward Observer Command (TX/RX) 3038 Subsequent Adjust (TX/RX) 3026 End of Mission and Surveillance (TX/RX) Airborne Situation Report Airborne Movement Command Airborne Fire Request Airborne Mission Command Airborne Check Fire Airborne Target Position Update Airborne Mayday Airborne Request Of Present Position Automatic Update Airborne Automatic Present Position Update Airborne Battle Damage Assessment Airborne Casualty Report Airborne Spot Report (SPOTREP) Airborne Initialization (Bulk Data) Message	

Table B-1. IDM Platform Specific Message Sets

Platform	*Protocol*	*Messages*	*Notes*
AH-64D	AFAPD	RF Target Handover FCR Targets – All FCR Targets – Priority FCR Targets – Single or Multiple Shot At – All Shot At – Ownship Shot At – Query Pres Position Report Pres Position Query Single Stored Target/Threat Single Waypoint/Hazard Single Control Measure Zones – Priority Fire Zones – No Fire Zones – All Free Text Waypoints file Routes file Single route Laser codes Communications Data All Control Measures file Boundary/Phase Lines file Engagement Areas file Stored Targets/Threats file Current Mission – All MISSION 1 – All files MISSION 2 – All files	

Table B-1. IDM Platform Specific Message Sets

Platform	***Protocol***	***Messages***	***Notes***
AH-64D	VMF	Msg # Name K1.1 Free Text K2.1 Check Fire K2.12 On-call Fire Command K2.14 Message to Observer K2.16 End of Mission & Surveillance K2.22 Subsequent Adjust K2.4 Call For Fire K2.6 Observer Mission Update K4.1 Spot/SALUTE Report K5.1 Position Report K5.14 Situation Report K5.15 Field Order (FRAGO) K0.2 System Coordination Message K1.3 Information Request Message K2.37 Observer Readiness Report K2.38 Airborne Fire Mission	
J-STARS	TACFIRE	Freetext Airborne Fire Request	
	AFAPD	Priority Fire Zones FCR Target Report Present Position Report Present Position Query Present Position Query Response A501 Free Text	Receive Only Transmit Only Receive Only Transmit Only Receive Only Transmit/Receive
	VMF	TBD	IDM contractor is working with J-STARS program to determine which messages will be implemented.

Table B-1. IDM Platform Specific Message Sets

Platform	***Protocol***	***Messages***	***Notes***
EP-3	TACFIRE	Free Text Airborne Fire Request	
	AFAPD	X202 Mission Update X204 Free Text X204 Depart IP X204 On Station S100 SEAD S100 Steerpoint B700 Image Block A501 Free Text A301 Fire Control Radar Targets A302 Shot At Query A406 Present Position Query A407 Present Position Response	
	VMF	TBD	EP-3E is not capable of VMF with the Version 1 Modem Card. When Version 2 is acquired, the EP-3E will support the JVMF CAS Message.
	MTS	MTS U075 Free Text	MTS is not used

Appendix C

IDM OPERATOR PROCEDURES

1. EP-3E PCIDM Operating Procedures.

a. System setup on the IDM Laptop Desktop.

(1) Select U/V#2 KY-58 to the desired mode (Cipher or Plain).

Note: Currently, the EP-3 PCIDM is capable of ciphered data only. A future work around may permit plain text.

(2) Double Click on the **PCIDM SERVER.**

Note: The PCIDM Server icon will display on lower right corner of the tool bar.

(3) Double Click **AMPGUI.**

Note: The AMPGUI software will open.

(4) Select **SERVER** if server is disconnected, otherwise skip to step 7.

(5) On the **REMOTE SERVER CONNECTION** window verify the host name field is 10.10.10.1.

(6) Select **CONNECT.**

(7) Select **CONFIGURE.**

(8) Select **OPTIONS.**

(9) PCIDM Versions **V1.**

(10) Station Address Display **DECIMAL.**

(11) Select **CLOSE.**

(12) Select **CONFIGURE.**

(13) Select **PCIDM SETTINGS.**

Note: The PCIDM V1 Configuration window, "General" tab will be displayed.

(14) Console Reporting Level **INFORMATIONAL.**

(15) Select Loopback Enable **UNCHECKED** (Disabled) or Loopback Enable **CHECKED** (Enabled).

Note: For normal operations, disable; for off-line operations, enable.

(16) Select **APPLY.**

(17) Select the **CHANNEL 2** tab.

Note 1: Channel 1 is not wired and cannot be used by the EP-3. Configuration is not required for Channel 1.

Note 2: The "General" tab will be displayed.

---

(18) Select Protocol **AFAPD** or **TACFIRE** as applicable.

Note: AFAPD is the protocol that the EP-3 primarily uses to support SEAD. EP-3 PCIDM should only be configured for TACFIRE when operations require IDM communications with USA units.

---

(19) Select Modulation **NRZ 16000 bps (DRA) (KY-58).**

Note: NRZ 16000 bps (DRA) (KY-58) is the modulation that the EP-3 primarily uses because CH2 can only transmit in the secure mode.

---

(20) Set Comm-Sync Time (ms) to **700.**

(21) Select **APPLY.**

(22) Select **AFAPD** or **TACFIRE** tab, as applicable, for Channel 2.

Note: AFAPD is the protocol that the EP-3 primarily uses. EP-3 PCIDM should only be configured for TACFIRE when operations require IDM communications with USA units.

---

(23) Ownship address **PER THEATER GUIDANCE.**

Note: In lieu of theater guidance, the EP-3 will use a default ownship address of 55.

---

(24) Set Retries to **2**; if only the TACFIRE tab was configured, skip to step 27.

(25) Set Enable Acks with a **CHECK** (AFAPD only).

(26) Set Equipment Turnaround Time to **500** (AFAPD only).

(27) Select **APPLY**.

(28) Select **CLOSE**; if an IDM Imagery folder is on the windows desktop, skip to step 33.

(29) Right-click on the **START** button.

(30) Select **EXPLORE.**

(31) Select **DESKTOP.**

(32) Select **FILE**, create a **NEW FOLDER** and name it **"IDM IMAGERY."**

(33) Select **CONFIGURE.**

(34) Select **IMAGE SETTINGS.**

(35) Ensure the Image Folder is mapped to **C:\WINDOWS\DESKTOP\IDM IMAGERY.**

(36) Time B/W Successive B700 Transmissions (S) = **6.**

(37) Time B/W Successive B701 Transmission (S) = **25.**

(38) Payload Size (Bytes) = **3200.**

(39) Maximum Number of Retries = **3.**

(40) Image Discard Time (S) = **300.**

(41) Select **OK.**

2. IDM Messages.

a. X204 AFAPD Free Test Message.

(1) Select **TRANSMIT.**

(2) Select **AFAPD FREE TEXT X204.**...

(3) Set Channel to **2.**

(4) Destination Address **PER THEATER GUIDANCE.**

Note: Use local theater guidance or use default addresses. An address of 127 will broadcast to all IDM participants.

---

(5) Category **ENTER CLASSIFICATION AS REQUIRED.**

(6) Unit **ENTER DESTINATION UNIT CALL SIGN.**

(7) This is **ENTER YOUR UNIT CALL SIGN.**

(8) Free Text **AS DESIRED** (200 Characters Max).

(9) Select **TRANSMIT** or **SAVE**, as applicable.

Note: When message is received, an acknowledgement will appear in the transmit record bin with the exception of broadcast messages.

---

(10) Select **CLOSE.**

b. X204 AFAPD On Station Report.

(1) Select **TRANSMIT.**

(2) Select **AFAPD X204 AIRCRAFT ON STATION.**

(3) Set Channel to **2.**

(4) Destination Address **PER THEATER GUIDANCE.**

Note: Use local theater guidance or use default addresses. An address of 127 will broadcast to all IDM participants.

(5) Category **ENTER REQUIRED CLASSIFICATION.**

(6) This is **ENTER YOUR CALL SIGN.**

(7) Unit Called **ENTER THE DESTINATION UNIT CALL SIGN.**

(8) Standard Conventional Load **AS DESIRED** (75 Characters Max).

(9) Mission Number **AS LISTED IN THE ATO.**

(10) Number of Aircraft **1.**

(11) Aircraft Type **EP-3E.**

(12) Station Time **H:MM.**

(13) Abort Code **TBD.**

(14) Call Sign **TBD.**

(15) Select **TRANSMIT** or **SAVE** as applicable.

Note: When message is received, an acknowledgement will appear in the transmit record bin with the exception of broadcast messages.

(16) Select **CLOSE.**

c. S100 Non-Generic SEAD Message.

Note: The S100 SEAD message has many fields to populate to maximize the accuracy of a HARM. While working with short timelines, EP-3 PCIDM operators must balance the accuracy of the SEAD message against the short timeline of a blinking threat emitter. At a minimum, the operator must populate the latitude/longitude and target ID data fields.

(1) Select **TRANSMIT.**

(2) Select **AFAPD S100 SEAD.**

(3) Set Channel to **2.**

(4) Destination Address **PER THEATER GUIDANCE.**

Note. Use local theater guidance or use default addresses. An address of 127 will broadcast to all IDM participants.

(5) Message **ID TBD** (2 characters max).

(6) Time on Target **HH:MM.**

(7) Latitude **HH:MM.SS (N or S).**

Note: HH (Range 0 to 90 degrees), MM (Range 0 to 59 minutes), SS (Range 0 to 99 represented as a decimal portion of one minute).

(8) Longitude **HH:MM.SS (E or W).**

Note: HH (Range 0 to 180 degrees), MM (Range 0 to 59 minutes), SS (Range 0 to 99 represented as a decimal potion of one minute).

(9) Elevation **0 to 99999** (ft).

(10) Weapon **HARM.**

(11) HARM Target Isolate **UNCHECKED.**

(12) Shrike Type -**3 SHRIKE.**

(13) Threat **AS DETERMINED BY USER.**

(14) Valid **UNCHECKED.**

(15) Manual Threat **UNCHECKED.**

(16) Primary **CHECKED.**

(17) PLF **PRE-LAUNCH RADIO FREQUENCY** (of target emitter).

(18) Target ID **ALIC CODE** (Range 0-4095).

(19) More **ADDITIONAL PARAMETERS.**

(20) Valid **CHECKED** or **UNCHECKED.**

Note: Checked represents error ellipse fields are valid; unchecked represents error ellipse fields are invalid.

(21) Major Axis **0 to 999999** (ft).

(22) Minor Axis **0 to 999999** (ft).

(23) Orientation **0 to 180** (degrees).

(24) Range Accuracy **0 to 9.**

(25) Range Confidence **HIGH, MEDIUM, LOW, or RESERVED.**

(26) Select **TRANSMIT** or **SAVE** as applicable.

Note: When message is received, an acknowledgement will appear in the transmit record bin with the exception of broadcast messages.

(27) Select **CLOSE.**

d. AFAPD A501 Free Text.

Note: The AFAPD A501 Free Text Message is formatted for compatibility with the Apache Longbow Free Text.

(1) Select **TRANSMIT.**

(2) Select **AFAPD A501 FREE TEXT.**

(3) Set Channel to **2.**

(4) Destination Address **PER THEATER GUIDANCE.**

Note: Use local theater guidance or use default addresses. An address of 127 will broadcast to all IDM participants.

---

(5) Free Text **AS DESIRED** (44 characters max each line).

Note: When communicating with Apache Longbow via the A501 Free Text, ensure Free Text is in CAPITAL LETTERS.

---

(6) Select **TRANSMIT** or **SAVE** as applicable.

Note: When message is received, an acknowledgement will appear in the transmit record bin with the exception of broadcast messages.

---

(7) Select **CLOSE.**

e. B700 Image Message (Image or Text File).

(1) Select **TRANSMIT.**

(2) Select **AFAPD B700 IMAGE.**

(3) Set Channel to **2.**

(4) Destination Address **PER THEATER GUIDANCE.**

Note: Use local theater guidance or use default addresses. An address of 127 will broadcast to all IDM participants.

---

(5) Filename **USE BROWSE FUNCTION TO SELECT IMAGE FILE.**

(6) Select ID **0000 to 00009** (5 characters max).

(7) Type **AS REQUIRED** (Unspecified, JPEG, or NITF 2.0).

(8) Description **SET AUTOMATICALLY WHEN USING THE BROWSE FUNCTION** (42 characters max).

(9) Select **TRANSMIT** or **SAVE** as applicable.

Note: When message is received, an acknowledgement will appear in the transmit record bin with the exception of broadcast messages.

---

(10) Select **CLOSE.**

f. TACFIRE Free Text Message.

(1) Select **TRANSMIT.**

(2) Select **TACFIRE FREE TEXT DATA.**

(3) Set Channel to **2.**

(4) Destination Address **PER THEATER GUIDANCE.**

Note: Use local theater guidance or use default addresses. An address of 127 will broadcast to all IDM participants.

---

(5) Free Text **AS DESIRED** (249 character max).

(6) Select **TRANSMIT** or **SAVE** as applicable.

Note: When message is received, an acknowledgement will appear in the transmit record bin with the exception of broadcast messages.

---

(7) Select **CLOSE.**

g. Reviewing the Received Message.

(1) Double Click **GREEN CIRCLE** in the **"S" COLUMN** of the **RECEIVED MESSAGE BIN.**

h. Forwarding the Received Message.

(1) Double Click **GREEN CIRCLE** in the **"S" COLUMN** of the **RECEIVED MESSAGE BIN.**

(2) Select **SAVE.**

(3) Saving-Select **DESIRED FOLDER.**

(4) Naming-Type **DESIRED NAME.**

(5) Select and Setup-**CHANNEL, DESTINATION CATEGORY, UNIT, THIS IS** (as applicable).

Note: See previous instructions for Free Text, SEAD, or Imagery Messages.

---

(6) Select **TRANSMIT.**

(7) Select **SAME IDM MESSAGE FORMAT** as **SAVED IDM MESSAGE.**

(8) Select **LOAD.**

(9) Open **DESIRED SAVED IDM MESSAGE.**

(10) Select **TRANSMIT** or **SAVE** as applicable.

Note: When message is received, an acknowledgement will appear in the transmit record bin.

---

(11) Select **CLOSE.**

3. RC-135 V/W Operator Procedures. See ES-2000-0925-6(E6C/6C+) Technical Manual (Classified) located at: http://majorsfield.af.smil.mil.

4. F-16 Operator Procedures.

a. F16 Block 50 (T5) IDM DATA LINK SYSTEM SETUP.

(1) After engine start, power on DL the same time as all other avionics.

(2) Wait 45 seconds for BIT and load the DLNK from the data transfer cartridge (DTC) Option Select Button (OSB) on DTE page.

(3) Wait another 45 seconds to allow transfer of data to the IDM and then cycle IDM power. While this data transfer is taking place, do not make any inputs to the up-front controls (UFC). Fire Control Computer (FCC) changes during the loading process can interrupt the load and corrupt the data.

(4) Again, give the IDM 45 seconds to run its BIT and then attempt to select **DL IDT INIT** page (page 2) (List, Enter, dobber right) and enter data. Then dobber right to the **DL INIT** page (page 1) and enter data. (Suggest page 2 first to minimize system lockup – indicated by data entry field blanking).

(5) After entering all data, exit to CNI page and re-enter to confirm data changes were accepted.

Note 1: At any time during this process if you are unable to access the DL INIT or DL IDT INIT page, cycle IDM power and wait for the IDM to run its BIT (45 seconds).

Note 2: The IDM will lock up nearly 100 percent of the time when you load the DLNK settings from the DTC (this is why you do a power cycle after loading them). Once you have the recommended settings loaded, you should never need to load them again since the system defaults to the last inputted data. However, there is always the potential for the uninformed to either push LOAD or DLNK on the DTE page when the settings have already been loaded. If DL power is on, the modem will accept whatever settings are in the DTC. Weapons officers should ensure there is only one data link load on the Mission Planning System (MPS) so bad settings do not get inadvertently loaded in the IDM and make it unusable.

Note 3: The reason you need to go to the DL IDT INIT page (page 2) first is due to another known problem that occurs when you select the DL INIT page (page 1) (List, Enter) and begin entering data. Most times this will lock-up the IDM and require a power cycle with another 45-second wait.

---

b. FOLLOW-ON IDM DATA LINK SETUP

(1) Once the proper settings have been transferred to the IDM, the following procedures can be used to power it up:

(a) Wait until after the inertial navigation system (INS) has been aligned and positioned to NAV, and then place the DL power switch on.

(b) Wait until the IDM completes its BIT --- 45 seconds.

(c) Go to the DL IDT INIT page (page 2) and modify setup.

(d) After modifying the IDT information, dobber right to the DL INIT page (page 1) and modify that setup.

Note: This process will give you an operational IDM 95 percent of the time without having to recycle power.

---

5. DEFAULT IDM ADDRESSES

a. 00 A broadcast sent to all IDM participants, used by the RC-135V/W, F-16 CJ, and F-16CG.

b. 10 F-16CJ Flight (this address will send the message to every aircraft in the flight).

c. 11 F-16CJ Lead.

d. 12 F-16CJ Dash-2.

e. 19 RC-135 V/W.

f. 55 EP-3E.

g. 85 EA-6B.

h. 127 A broadcast sent to all IDM participants, used by the EP-3E and EA-6B.

Appendix D

IDM Setup Parameters (AFAPD)

Software Version –	T5 (RJ and F-16CJ), EA-6B (STRED 7.0)
IDM Channel Number–	1(Secure), 2 (Clear)
Ownship Address –	See Address Table next page
Transmit Address –	00 (broadcast RJ and F-16CJ) 127 (broadcast EP-3E and EA-6B)
Net Mode / Port –	DIGITAL
Auto Acknowledge –	NO / Disable (RJ), Enable (EP-3E)
Retries –	NO / DISABLE, 0 (EP-3E), 2 (EP-3E and EA-6B)
Error Correction –	YES
Message Protocol–	AFAPD
Default Elevation –	2100
Data Rate –	16k
Key Delay –	0.5
Comm Sync –	0.2 (plain) or 1.0 (secure) (RJ and F-16CJ) 700ms (EP-3E and EA-6B)
TX Gate Timeout –	1.0
Secure Key Timeout -	0.2
Pulse Shaping –	NO / DISABLE
DRA Clock -	NO (plain) or YES (secure)
IDM Updates:	
	Time – OFF Location - OFF Frequency - OFF
Send Ellipse Data -	YES
Radio Silence –	NO
Suppress RF –	YES (plain)* or NO (secure)
Link Delay -	0.1
Secure Link Delay -	0.1

*- Dependent on SPINS and/or theater guidance

Table D-1. Recommended AFAPD Addresses

00	Broadcast	32		64	F-18 Wingman	96	
01		33		65	F-18 Wingman	97	
02		34		66	F-18 Wingman	98	
03		35	JSTARS	67	F-18 Wingman	99	
04		36		68	F-18 Wingman	100	
05		37		69	F-18 Wingman	101	
06		38		70		102	
07		39		71		103	
08		40		72		104	
09		41		73		105	
10	F-16CJ Team	42		74		106	
11	F-16CJ (Lead)	43		75		107	
12	F-16 Wingman	44		76		108	
13	F-16 Wingman	45		77		109	
14	F-16 Wingman	46		78		110	
15	F16 Wingman	47		79		111	
16	F-16 Wingman	48		80		112	
17	F-16 Wingman	49		81		113	
18	F-16 Wingman	50		82		114	
19	RC-135 V/W	51		83		115	
20	F-16CG Team	52		84		116	
21	F-16CG (Lead)	53		85	EA-6B	117	
22	F-16 Wingman	54		86		118	
23	F-16 Wingman	55	EP-3E	87		119	
24	F-16 Wingman	56		88		120	
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26	F-16 Wingman	58		90		122	
27	F-16 Wingman	59		91		123	
28	F-16 Wingman	60	F-18 Team	92		124	
29	F-16 Wingman	61	F-18 (Lead)	93		125	
30		62	F-18 Wing-man	94		126	
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Appendix E

AFAPD Transmit Delay Times

Excerpt from: Capt. Mike Manning, "F-16 Block 50 Improved Data Modem," USAF Weapons Review. vol. 43 no 2 (Summer 1995)

Table E-1 displays a summary of the previously discussed IDM settings that can be programmed into the DTC. The effect these settings have on total IDM system performance varies greatly depending on how the system is used.

Table E-1. DTC Settings

NAME	SETTING
Data Rate	16K
Port	DIGITAL
Auto Ack	It depends
Protocol	AFAPD
Retries	1
Link Delay	0.1
Key Delay	0.5
Comm Sync	0.2
TX Gate Timeout	1.0
Secure Key Timeout	0.2
Secure Link Delay	0.1

Table E-2 shows the difference between three different setups during normal operations (NON-HQ/NON-SECURE), HQ operations, and secure operations. The numbers are the total time in seconds that the system will allow between successive IDM transmits (i.e. COMM INBOARDs). The numbers come from the previously discussed RHD, NAD, and TP equations. The different low and high numbers are based upon a NAD with a random number of zero and seven, respectively. Notice the long times during 4-ship team operations secure delays of up to 42 seconds could occur. The F-16CJ dash 34 IDM transmit delays "...may be as long as 1 minute and is most noticeable in the secure 16K (mode)...."

Table E-2. IDM XMT Delay Times

TOTAL DELAY BETWEEN IDM XMTs	NORMAL	HQ	SECURE
ANY SETUP AUTO ACK DISABLE RETRY N/A	1 to 6 seconds	1 to 10 seconds	1 to 6 seconds
INTRA-ELEMENT #1 XMT = #2 OWN #2 XMT = #1 OWN AUTO ACK ENABLE	2 to 8 seconds	3 to 12 seconds	3 to 13 seconds
4-SHIP TEAM XMT=10 AUTO ACK ENABLE RETRY=1	19 to 25 seconds	28 to 38 seconds	32 to 42 seconds

There is no explanation for these delays. Due to the lack of documentation on the F-16 IDM, it took several months for 422 TES project pilots to figure out the IDM system. Initially, 422 pilots used the IDM settings tested during Development Test and Evaluation (DT&E) at Edwards AFB, CA. After months of trial and error and several trips to Lockheed Fort Worth Company, TX, these project pilots finally developed an understanding of the IDM system. The IDM was envisioned to be automatic and not require voice communications; hence the AUTO ACK mode enabled and Retries set greater than zero. Unfortunately, the long delays associated with four-ship team operations and the lack of good indications that the transmitted message was indeed received (only a faint data burst sound) makes the envisioned automatic capability of the IDM difficult to use. If the AUTO ACK mode is used, pilots must be patient and allow enough time for messages to travel through the TP and queue and not be impatient and keep sending the same message continuously. Initially, since the project pilots did not understand the IDM network, they were frustrated by the “slow” transmissions. With frustrated voices on the frequency during the TP (which is when IDMs respond), the messages got further delayed in the queue. If voice communications is used to confirm IDM operations, however, AUTO ACK can be disabled and the delays associated with it can be avoided. Compare a four-ship team setup with AUTO ACK ENABLED in NORMAL operations (19 to 25 seconds) and DISABLED (1 to 6 seconds). The TP is avoided with AUTO ACK DISABLED. Using individual addresses, even with AUTO ACK ENABLED, will significantly reduce message delays (2 to 8 seconds).

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GLOSSARY

PART I - ABBREVIATIONS AND ACRONYMS

A	
ACK	acknowledge
ACO	airspace control order
ACW	Air Control Wing
AFAPD	Air Force application program development
AFB	Air Force Base
AFC	area frequency coordinator
AFDC	Air Force Doctrine Center
AFI	Air Force Instruction
AFTTP	Air Force tactics, techniques, and procedures
AGL	above ground level
AI	air interdiction
a.k.a.	also known as
ALIC	aviation launcher interface computer
ALSA	Air Land Sea Application
AMPGUI	application message parcer graphical user interface
AMPS	aviation mission planning system
ANCD	automated network control device
AOI	area of interest
AOR	area of responsibility
ARTY	artillery
ASCII	American Standard Code for Information Interchange
ASK	amplitude frequency shift keying
ASM	Army spectrum management
ATC	air traffic control
ATHS	Airborne Target Hand-off System
ATO	air tasking order
AUTO ACK	automatic acknowledgement
AWACS	Airborne Warning and Control System
B	
BENELUX	Belgium, Netherlands, Luxemburg
BDA	battle damage assessment
BIT	built-in-tests
BPS	bits per second

C	
C2	command and control
C2ISR	command, control, intelligence, surveillance, and reconnaissance
CAF	Combat Air Forces
CAS	close air support
CMC	central mission computer
CONOPS	concept of operations
CONUS	continental United States
COTS	commercial off the shelf
CPFSK	continuous phase frequency shift keying
CRYPTO	cryptography
CSAR	combat search and rescue
D	
DA	Department of the Army
DCS	digital communications system
DCT	data communication terminal
DCX	Division Capstone Exercise
DDI	digital display indicators
DED	data entry display
DL	data link
DL INIT	data link initiation
DMPI	designated mean point of impact
DRA	data rate adapter
DSP	digital signal processor
DTC	data transfer cartridge
DT&E	development test and evaluation
DTE	display terminal equipment
E	
EA	electronic attack
ECMO	electronic countermeasures officer
EDM	enhanced data mode
ELINT	electronic intelligence
ELNOT	electronic intelligence notation
EMCON	emissions control
EOB	electronic order of battle
ES	electronic warfare support
etc.	etcetera
EWCAS	electronic warfare close air support

F	
FAC	forward air controller or forward air control
FCR	fire control radar
FM	frequency modulation
FM	field manual
FOD	foreign object damage
FSK	frequency shift keying
G	
GIP	generic interface processor
GPS	global positioning system
H	
HARM	high-speed anti-radiation missile
HCP	HARM control panel
HF	high frequency
HQ	Have Quick
HSD	horizontal situation display
HTS	HARM targeting system
I	
IADS	integrated air defense system
IAW	in accordance with
ICAP	improved capability
ID	identification
IDL	intraflight data link
IDM	Improved Data Modem
IDT	intraflight data transfer
INS	inertial navigation system
IOC	initial operational capability
IP	Internet protocol
ISR	information service request
J	
JEFX	Joint Expeditionary Force Experiment
JSTARS	Joint Surveillance Target Attack Radar System
JTIDS	joint tactical information distribution system
JVMF	joint variable message format
K	
Kbps	kilobits per second
kHz	kilohertz

L

LAN	local area network
LOS	line of sight

M

MATT	multi-mission advanced tactical terminal
MCCDC	Marine Corps Combat Development Command
MCDPS	Marine Corps Doctrinal Publication System
MCRP	Marine Corps Reference Publication
MHz	megahertz
MIL-STD	military standard
MILSTRIP	military standard requisitioning and issue procedure
MLU	mid-life update
MPD	multi-purpose display
MPS	mission planning system
ms	millisecond
MS	Microsoft
Msn	mission
MTI	moving target indicator
MTS	Marine tactical system
MTTP	multi-Service tactics, techniques, and procedures

N

N	North
N/A	not applicable
N/C	no change
NAD	network access delay
NATO	North Atlantic Treaty Organization
NAVAIR	Naval Air Systems Command
NAVSOP	Navy Standard Operating Procedures
NE	northeast
NET	new equipment training
NM	nautical mile
NRL	Naval Research Lab
NWDC	Navy Warfare Development Command

O

OFP	operational flight program
OPTASKLINK	operational testing data link
OWS	operator workstation

P	
PC	personal computer
PCIDM	personal computer improved data modem
PCMCIA	Personal Computer Memory Card International Association
PFZ	priority fire zone
PLT	platoon
R	
RF	radio frequency
RFI	radar frequency interferometer
RHD	response hold delay
RJ	Rivet Joint
ROKAF	Republic of Korea Air Force
Rqst	request
RSEAD	reactive SEAD
RSR	radar service request
S	
SA	situational awareness
SA-8	SA-8 missile system
SAM	surface-to-air missile
SATCOM	satellite communication
SDLC	synchronous data link communications
SDM	surrogate data mode
SEAD	suppression of enemy air defenses
SEC	section
SEVAL	senior evaluator
SIGINT	signals intelligence
SINCGARS	single channel common ground and air radio system
SINCGARS SIP	single channel common ground and air radio system-system improvement program
SIPRNET	Secret Internet Protocol Router Network
SOI	signals of interest
SQ	squad
SPINS	special instructions
SRU	shop-replaceable units
STRED	standard tactical receive equipment display
T	
TACFIRE	tactical fire (artillery)
TACP	tactical air control party

TADIL-A/J	tactical digital information link –A/J
TB	technical bulletin
TBD	to be determined
TCP/IP	transmission control protocol/internet protocol
TD	time delay
TDS	tactical display system
TI	tactical Internet
TIBS	tactical information broadcast service
TJS	tactical jamming system
TM	technical manual
TO	technical order
TOT	time on target
TP	timeout period
TRADOC	Training and Doctrine Command
TTP	tactics, techniques, and procedures
TX	transmit

U

U-2	U-2 reconnaissance aircraft
UFC	up-front controls
UHF	ultrahigh frequency
UHF-AM	ultrahigh frequency-amplitude modulation
US	United States
USA	U. S. Army
USAF	U. S. Air Force
USMC	U. S. Marine Corps
USN	U. S. Navy
UTM	universal transverse mercator

V

Vdc	volts direct current
VEH	vehicle
VHF	very high frequency
VHF-AM	very high frequency-amplitude modulation
VMF	variable message format

Z

ZULU	time zone indicator for Universal Time

PART II - TERMS AND DEFINITIONS

air defense artillery. Weapons and equipment for actively combating air targets from the ground.

air interdiction. Air operations conducted to destroy, neutralize, or delay the enemy's military potential before it can be brought to bear effectively against friendly forces at such distance from friendly forces that detailed integration of each air mission with the fire and movement of friendly forces is not required.

airspace control order. An order implementing the airspace control plan that provides the details of the approved requests for airspace control measures. It is published either as part of the air tasking order or as a separate document. (Joint Publication 1-02)

air tasking order. A method used to task and disseminate to components, subordinate units, and command and control agencies projected sorties/capabilities/forces to targets and specific missions. Normally provides specific instructions to include call signs, targets, controlling agencies, etc., as well as general instructions. (Joint Publication 1-02)

area of interest. That area of concern to the commander, including the area of influence, areas adjacent thereto, and extending into enemy territory to the objectives of current or planned operations. This area also includes areas occupied by enemy forces that could jeopardize the accomplishment of the mission. Also called AOI. See also area of influence.

area of responsibility. The geographical area associated with a combatant command within which a combatant commander has authority to plan and conduct operations.

battle damage assessment. The timely and accurate estimate of damage resulting from the application of military force, either lethal or non-lethal, against a predetermined objective. Battle damage assessment can be applied to the employment of all types of weapon systems (air, ground, naval, and special forces weapon systems) throughout the range of military operations. Battle damage assessment is primarily an intelligence responsibility with required inputs and coordination from the operators. Battle damage assessment is composed of physical damage assessment, functional damage assessment, and target system assessment.

close air support. Air action by fixed- and rotary-wing aircraft against hostile targets that are in proximity to friendly forces and that require detailed integration of each air mission with the fire and movement of those forces. (Joint Publication 1-02)

combat search and rescue. A specific task performed by rescue forces to effect the recovery of distressed personnel during war or military operations other than war.

command and control. The exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission. (JP 1-02)

contingency operation. A military operation that is either designated by the Secretary of Defense as a contingency operation or becomes a contingency operation as a matter of law (10 United States code (USC) 101[a][13]). It is a military operation that: a. is designated by the Secretary of Defense as an operation in which members of the Armed Forces are or may become involved in military actions, operations, or hostilities against an enemy of the United States or against an opposing force; or b. is created by definition of law. Under 10 USC 101 (a)(13)(B), a contingency operation exists if a military operation results in the (1) callup to (or retention on) active duty of members of the uniformed Services under certain enumerated statutes (10 USC Sections 688, 12301(a), 12302, 12304, 12305, 12406, or 331-335); and (2) the callup to (or retention on) active duty of members of the uniformed Services under other (non-enumerated) statutes during war or national emergency declared by the President or Congress.

electronic attack. Actions taken to prevent or reduce an enemy's effective use of the electromagnetic spectrum, such as jamming and electromagnetic deception. (JP 1-02)

electronic intelligence. Technical and geolocation intelligence derived from foreign non-communications electromagnetic radiations emanating from other than nuclear detonations or radioactive sources. Also called ELINT.

electronic warfare support. That division of electronic warfare involving actions tasked by, or under direct control of, an operational commander to search for, intercept, identify, and locate or localize sources of intentional and unintentional radiated electromagnetic energy for the purpose of immediate threat recognition, targeting, planning and conduct of future operations. Thus, electronic warfare support provides information required for decisions involving electronic warfare operations and other tactical actions such as threat avoidance, targeting, and homing.

fire control radar. Radar used to provide target information inputs to a weapon fire control system.

fire support. Fires that directly support land, maritime, amphibious, and special operation forces to engage enemy forces, combat formations, and facilities in pursuit of tactical and operational objectives.

forward air controller. An officer (aviator/ pilot) member of the tactical air control party who, from a forward ground or airborne position, controls aircraft in close air support of ground troops.

global positioning system. A satellite constellation that provides highly accurate position, velocity, and time navigation information to users.

military standard requisitioning and issue procedure. A uniform procedure established by the Department of Defense for use within the Department of Defense to govern requisition and issue of materiel within standardized priorities. Also called MILSTRIP.

moving target indicator. A radar presentation that shows only targets which are in motion. Signals from stationary targets are subtracted out of the return signal by the output of a suitable memory circuit.

SECRET Internet Protocol Router Network. Worldwide SECRET level packet switch network that uses high-speed Internet protocol routers and high-capacity Defense Information Systems Network circuitry. Also called SIPRNET.

signals intelligence. A category of intelligence comprising either individually or in combination all communications intelligence, electronic intelligence, and foreign instrumentation signals intelligence, however transmitted. Intelligence derived from communications, electronic, and foreign instrumentation signals.

special operations. Operations conducted by specially organized, trained, and equipped military and paramilitary forces to achieve military, political, economic, or informational objectives by unconventional military means in hostile, denied, or politically sensitive areas. These operations are conducted across the full range of military operations, independently or in coordination with operations of conventional, non-special operations forces. Political-military considerations frequently shape special operations, requiring clandestine, covert, or low visibility techniques and oversight at the national level. Special operations differ from conventional operations in degree of physical and political risk, operational techniques, mode of employment, independence from friendly support, and dependence on detailed operational intelligence and indigenous assets.

spot report. A concise narrative report of essential information covering events or conditions that may have an immediate and significant effect on current planning and operations that is afforded the most expeditious means of transmission consistent with requisite security. (Note: In reconnaissance and surveillance usage, spot report is not to be used.)

suppression of enemy air defenses. That activity that neutralizes, destroys, or temporarily degrades surface-based enemy air defenses by destructive and/or disruptive means.

time on target. 1. Time at which aircraft are scheduled to attack/photograph the target. 2. The actual time at which aircraft attack/photograph the target. 3. The time at which a nuclear detonation is planned at a specified desired ground zero.

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