NOTICE OF CHANGE

NOT MEASUREMENT SENSITIVE

MIL-STD-2045-44500
NOTICE 2
27 June 1996

DEPARTMENT OF DEFENSE INTERFACE STANDARD
TACTICAL COMMUNICATIONS PROTOCOL 2 (TACO2)
FOR THE NATIONAL IMAGERY TRANSMISSION FORMAT STANDARD

TO: ALL HOLDERS OF MIL-STD-2045-44500:

1. THE FOLLOWING PAGES OF MIL-STD-2045-44500 HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
cover	27 June 1996	cover	18 June 1993
ii	27 June 1996	ii	18 June 1993
iii	27 June 1996	iii	18 June 1993
iv	27 June 1996	iv	reprinted without change
1	27 June 1996	1	18 June 1993
2	27 June 1996	2	18 June 1993
3	27 June 1996	3	18 June 1993
4	27 June 1996	4	18 June 1993
5	27 June 1996	5	18 June 1993
6	27 June 1996	6	reprinted without change
49	27 June 1996	49	29 July 1994
50	27 June 1996	50	reprinted without change
103	27 June 1996	103	reprinted without change
104	27 June 1996	104	18 June 1993
DD1426	27 June 1996	DD1426	29 July 1993

MIL-STD-2045-44500, NOTICE 2, 27 JUNE 1996

2. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.

3. Holders of MIL-STD-2045-44500 will verify that page changes and additions indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the military standard is completely revised or canceled.

Custodians:		Preparing Activity:
Army:	AC	CI
Navy:	OM	
Air Force:	02	(Project DCPS-0009)
MISC:	NC	

NOTE: The cover page of this standard has been changed for administrative reasons. There are no other changes to this document.

NOT MEASUREMENT SENSITIVE

MIL-STD-2045-44500
18 June 1993

DEPARTMENT OF DEFENSE INTERFACE STANDARD

TACTICAL COMMUNICATIONS PROTOCOL 2 (TACO2) FOR THE NATIONAL IMAGERY TRANSMISSION FORMAT STANDARD

AMSC N/A **AREA DCPS**

Supersedes cover of MIL-STD-2045-44500.

FOREWORD

1. This standard is approved for use by all Departments and Agencies of the Department of Defense (DOD).

2. The National Imagery Transmission Format Standard (NITFS) is the standard for formatting digital imagery and imagery-related products and exchanging them among members of the Intelligence Community (IC) as defined by Executive Order 12333, DOD, and other departments and agencies of the United States Government as governed by Memoranda of Agreement (MOA) with those departments and agencies.

3. The National Imagery Transmission Format Standard Technical Board (NTB) developed this standard based upon currently available technical information.

4. The DOD and members of the IC are committed to interoperability of systems used for formatting, transmitting, receiving, and processing imagery and imagery-related information. This standard describes the TActical COmmunication protocol 2 (TACO2) requirements and establishes its application within the NITFS.

5. As a result of a Defense Information Systems Agency (DISA) action, standards for all military data communication protocols will be published in a MIL-STD-2045 series of documents. A MIL-STD-2045 document series has been established within the Data Communications Protocol Standards (DCPS) standardization area.

a. MIL-STD-2045-10000 series. MIL-STD-2045-10000 to MIL-STD-2045-19999 inclusive, will be used to describe DOD's implementation of commercial, international, national, federal, and military standards within the functional profile concept, in order to provide required network services. U.S. Government Opeystems Interconnection Profile (GOSIP) will be the basis for developing the 10000 series with DOD enhancements and unique military standards.

b. MIL-STD-2045-20000 series. MIL-STD-2045-20000 to MIL-STD-2045-29999 inclusive, will be used to describe DOD enhancements and extensions to existing commercial, international, national, or federal standards.

c. MIL-STD-2045-30000 series. MIL-STD-2045-30000 to MIL-STD-2045-39999 inclusive, will be used to describe DOD unique protocols and services that are not supported by commercial, international, national, or federal standards.

d. MIL-STD-2045-40000 series. MIL-STD-2045-40000 to MIL-STD-2045-49999 inclusive, will be used to document interim standards. Interim standards are documents DOD needs until these standards are described in either GOSIP or MIL-STD-2045-20000 or 30000 series standards.

6. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to Central Imagery Office, STSD/ISD, 14675 Lee Road, Chantilly, VA 22021 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

CONTENTS

PARAGRAPH PAGE

Supersedes page iii of MIL-STD-2045-44500.

CONTENTS

1. SCOPE

1.1 Scope. This document establishes the requirements for the Tactical Communications protocol 2 (TACO2), part of the National Imagery Transmission Format Standard (NITFS). National Imagery Transmission Format (NITF) is a standard format for transmitting digital imagery and imagery-related products among members of the Intelligence Community (IC), and TACO2 is a protocol suite that may be used for that transmission. It includes requirements for Forward Error Correction (FEC), which is necessary to ensure interoperability and to promote commonality among subsystems that comply with NITFS.

1.2 Content. This standard establishes the requirements to be met by systems complying with NITFS when using the TACO2 protocol, and defines the protocols and formats that make up TACO2. All aspects of TACO2 that affect functional interoperability are specified herein. In addition, guidance is provided for those aspects of TACO2 operation that are not strictly related to interoperability but may affect technical performance or resistance to error.

1.3 Applicability. This standard is applicable to the IC and the Department of Defense (DOD). It is mandatory for all Secondary Imagery Dissemination Systems (SIDS) in accordance with the memorandum by the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence ASD(C^3I), Subject: National Imagery Transmission Format Standard (NITFS), 12 August 1991. This directive shall be implemented in accordance with JIEO Circular 9008, and MIL-HDBK-1300A. New equipment and systems, those undergoing major modification, or those capable of rehabilitation shall conform to this standard.

1.4 Protocol tailoring. TACO2 is designed as a single protocol stack that provides for message transfer over a wide variety of tactical communication circuits. It is particularly appropriate for use over circuits where other protocol suites operate poorly or not at all, but also is designed to perform well over any communications circuit. It can transfer any form of data, since it does not use any internal component of an NITFS message. It can be configured to operate over circuits not anticipated at initial installation; therefore, a conforming TACO2 implementation must implement all capabilities specified herein, except as specifically noted. The possible ranges of various parameters may be limited for specific applications; mandatory ranges are specified in this document. Additional information on NITFS compliance is available in JIEO Circular 9008.

1.5 FEC tailoring As a minimum, only those features or functions specified herein, necessary to ensure interoperability among systems, shall be implemented in an equipment item. While every effort has been made to include all the features necessary, certain aspects depend on system application and must be tailored by the specification writer. These aspects include:

a. User choice of appropriate FEC selection.

b. Automatic switching of FEC code based on the conditions of the tactical line.

c. Inhibiting external or internal FEC codes.

d. Using an external FEC code if it is desired.

Supersedes page 1 of MIL-STD-2045-44500.

Supersedes page 2 of MIL-STD-2045-44500.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, and 5 of this standard. This section does not include documents cited in other sections of this standard or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in section 3, 4, and 5 of this stanedard, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplements thereto, cited in the solicitation.

STANDARDS

FEDERAL

FED-STD-1037B	-	Telecommunications: Glossary of Telecommunication Terms.

MILITARY

MIL-STD-188-114A	-	Electrical Characteristics of Digital Interface Circuits.
MIL-STD-2500A	-	National Imagery Transmission Format (Version 2.0) for the National Imagery Transmission Format Standard (NITFS).

HANDBOOKS

MIL-HDBK-1300A	-	National Imagery Transmission Format Standard (NITFS).

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

DISA/JIEO Circular 9008 - NITFS Certification Test and Evaluation Plan.

(Copies of DISA/JIEO circular 9008 are available from the Defense Information Systems Agency, Joint Interoperability Test Command, Building 57305, Fort Huachuca, AZ 85613-7020.)

DISA/JIEO SPEC 9137 - NITFS TACO2 Protocol to KY-57/58 Cryptographic Device Technical Interface Specification (TIS).

DISA/JIEO SPEC 9138 - NITFS TACO2 Protocol to KG-84-A/C Cryptographic Device Technical Interface Specification (TIS).

DISA/JIEO SPEC 9139 - NITFS TACO2 Protocol to KY-68 Cryptographic Device Technical Interface Specification (TIS).

DISA/JIEO SPEC 9140 - NITFS TACO2 Protocol to STU-III Cryptographic Device Technical Interface Specification (TIS).

(Copies of DISA/JIEO Specifications are available from the Defense Information Systems Agency, Joint Interoperability Engineering Organization, Center for Standards, Building 283, Fort Monmouth, NJ 07703-5613.)

2.3 Non-Government publications The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation.

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO 3309 - High-Level Data Link Control Procedures - Frame Structure, International Organization for Standardization, Switzerland.

ISO 7498 - Open systems interconnection - basic reference model International Organization for Standardization, Switzerland.

ISO 8825 - Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1), International Organization for Standardization, Switzerland.

ISO 9171 - Recorded/Unrecorded Characteristics of 130 mm Optical Disk Cartridges.

(Application for copies of ISO standards should be addressed to the American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036.)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI X3.4-198	-	American National Standard Code for Interchange (ASCII), 1986.

(Application for copies of ANSI X3.4-1986 should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018-3308.)

INTERNET RFCs

RFC 791	-	Internet Protocol, Postel, J.B., 1981.
RFC 792	-	Internet Control Message Protocol, Postel, J.B., 1981.
RFC 919	-	Broadcasting Internet datagrams, Mogul, J.C., 1984.
RFC 922	-	Broadcasting Internet datagrams in the presence of subnets, Mogul, J.C., 1984.
RFC 950	-	Internet standard subnetting procedure, Mogul, J.C.; Postel, J.B., 1985.
RFC 998	-	NETBLT: A bulk data transfer protocol, Clark, D.D.; Lambert, M.L.; Zhang, L., 1987.
RFC 1055	-	Nonstandard for transmission of IP datagrams over serial lines: SLIP, Romkey, J.L., 1988.
RFC 1108	-	Security Options for the Internet Protocol, Kent, S., 1991.
RFC 1112	-	Host extensions for IP multicasting, Deering, S.E., 1989.

(Internet RFCs can be accesed at Universal Resource Locator (URL) http://dantes.enst.fr:8080/~dax/services/rfc/.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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5.2.9.5 REFUSED packets.

5.2.9.5.1 Reason for QUIT/ABORT/REFUSE. The reason shall be an appropriate ASCII string up to 80 characters long, suitable for display to the recipient. The use of REFUSED indicates that the connection cannot be completed for some reason.

(NOTE: Strings used may include:
"no service listening on port x," where x is the unacceptable port number.)

5.2.9.6 DATA and LDATA packets.

5.2.9.6.1 Packet number. The first data packet in each buffer shall be numbered 0.

5.2.9.6.2 Data area checksum value. All TACO2 DATA and LDATA packets shall be checksummed.

5.2.9.7 Timer precision. Timer precision in NETBLT shall be no worse than ±200 milliseconds (msec).

5.2.9.8 Open timer value. The open timer shall initially be set to no less than two seconds. In half-duplex and full duplex, the value of the open timer shall be increased by two seconds after each timeout.

5.2.9.9 Quit timer value. The quit timer shall be set to no less than five seconds.

5.2.9.10 Death timer value. The death timer should be set to no less than two minutes.

5.3 Network layer - IP.

5.3.1 Overview. The DOD IP forms the network layer of the TACO2 protocol suite. IP provides a mechanism for transmitting blocks of data (datagrams) from sources to destinations, which are specified by 32-bit addresses. It is a "best-effort" mechanism, which provides no assurance that a datagram is delivered, but takes appropriate steps when possible to move a datagram toward its destination. IP is specified in Internet RFC 791, as amended by RFC 950 (IP Subnet Extension), RFC 919 (IP Broadcast Datagrams), and RFC 922(IP Broadcast Datagrams with Subnets). It usually also includes the Internet Control Message Protocol (ICMP), specified in RFC 792, which provides a mechanism for communicating control and error information between hosts and other hosts or gateways. Although ICMP is an integral part of IP, it uses the support of IP as if it (ICMP) were a higher level protocol.

5.3.1.1 IP augmentations. As used in TACO2, IP may be augmented by the revised IP Security Option (RFC 1108), and by the Host Extensions for IP Multicasting (RFC 1112). These augmentations are not required in this version of TACO2, but they may be necessary for operation in certain

environments. TACO2 supports a limited form of multicasting by allowing simplex receivers to "listen in" on simplex, half-duplex, or full-duplex transmissions. (Effectivity 5: later versions of TACO2 may support acknowledged multicast).

5.3.2 Required IP components. Because TACO2 uses IP outside its normal internetworked environment, some components of IP are unnecessary or inappropriate in some cases. This section identifies the required components for each major case.

5.3.2.1 Simplex. Simplex transmission may be used to support point-to-point or broadcast communication in TACO2. The Internet Header format shall be as specified in 5.3.3. The following fields shall be correctly filled in and interpreted for simplex operation:

a. Version

b. Internet Header Length

c. Total Length

d. Fragment Offset (must be 0)

e. Protocol (30 for NETBLT)

f. Header Checksum

g. Source Address

h. Destination Address

i. IP Security Option, if required

The remaining fields shall be disregarded by a receiver in simplex operation, but shall be provided by a transmitter for the sake of consistency. Datagrams shall not be fragmented. Subnetting support is not required. ICMP shall not be used in simplex communications.

x	T[x]
24	0
25	1
26	2
27	3
28	4
29	5
30	6
31	7
0	10
1	11
2	12
.	.
.	.
.	.
23	33

(The expression above uses Galois Field arithmetic as described in 5.4.2.1 for the FEC-I code.)

Presently, FEC-II encoding is not specified for datagrams whose unencoded length is greater than 382 bytes. Should a FEC-II encoder be presented with such a datagram, the correct action is to transmit it without any encoding.

Because the FEC-II encoding process has the effect of adding zero-fill to a datagram to achieve a standard length, a receiving system must determine the actual length of the original datagram. It does this by examining the length field in the Internet Protocol (IP) header, or, in the case where header abbreviation is used, the length field in the abbreviated header.

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CONCLUDING MATERIAL

Custodians:
Army - AC
Navy - OM
Air Force - 02
Misc - NS

Preparing activity:
Misc - CI

Agent:
Not applicable

Review activities:
OASD - IR, IQ
Army - PT, SC, TM1, TM3
Navy - CG, CH, EC, MC, ND, OM, TD
Air Force - 02, 13, 17, 29, 33, 90
DLA - DH
Misc - DC1, DC7, DI, MP

Civil agency coordinating activities:
USDA - AFS, APS
NIST
DOE
EPA
GPO
NIH
BLM, GES
OST
NCS

(Project DCPS-0008)

Supersedes page 104 of MIL-STD 2045-44500.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1,2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER **MIL-STD-2045-44500**	2. DOCUMENT DATE (YYMMDD) **930618**

3. DOCUMENT TITLE
TACTICAL COMMUNICATIONS PROTOCOL 2 (TACO 2) FOR THE NITFS

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME *(Last, First, Middle Initial)*	b. ORGANIZATION	
c. ADDRESS *(Include Zip Code)*	d. TELEPHONE *(Include Area Code)* (1) Commercial (2) AUTOVON *(If applicable)*	7. DATE SUBMITTED *(YYMMDD)*

8. PREPARING ACTIVITY **CENTRAL IMAGERY OFFICE (CIO)**

a. NAME **STSD/ISD**	b. TELEPHONE *(Include Area Code)* (1) Commercial (2) AUTOVON
c. ADDRESS *(Include Zip Code)* **14675 Lee Road** **Chantilly, VA 22021**	**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:** Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340