National Imagery and Mapping Agency

IMPLEMENTATION PRACTICES OF THE NATIONAL IMAGERY TRANSMISSION FORMAT STANDARD (IPON)

COMMON PRACTICES AND CONVENTIONS FOR THE IMPLEMENTATION AND USE OF THE NITFS SUITE OF STANDARDS

DRAFT Version 0.2

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FOREWORD

The National Imagery Transmission Format Standard (NITFS) is the standard for the formatting and exchange of digital imagery and imagery-related products between members of the Intelligence Community. The Intelligence Community is made up of the Department of Defense (DOD) and other departments or agencies of the United States Government as defined by Executive Order 12333.

Members of the NITFS Technical Board (NTB) compiled these practices as an aid to those involved with the implementation and use of the NITFS. The content is based upon common practices, procedures, and guidelines used in fielded systems that have successfully implemented the NITFS. To meet a wide range and variety of imagery-related functional requirements, the NITFS has many combinations of implementation options from which to select. Those implementing the NITFS should select and apply common practices to meet operational requirements whenever practicable.

The DOD and members of the Intelligence and Geospatial Community (IGC) are committed to interoperability of systems used for formatting, transmitting, receiving, exchanging, and processing imagery and imagery related information. These practices describe the application of the NITFS suite of standards in support of interoperability among systems within the National Systems for Geospatial Intelligence (NSGI), systems that interface with the NSGI, and commercial systems that implement the NITFS.

The suite of standards that comprise the NITFS has evolved over time to meet the requirements of user systems. These practices address implementation topics for the NITFS associated with NITF version 1.1, NITF version 2.0, and NITF version 2.1. Many of these practices are also suitable for use with STANAG 4545, NATO Secondary Imagery Format (NSIF). Both NITF version 2.1 and NSIF version 1.0 are now documented in the NSIF01.00 Profile of ISO/IEC 12087-5, Basic Image Interchange Format (BIIF).

Beneficial comments (recommendations, additions, and/or deletions) and other pertinent data which may be of use in improving this document should be addressed to Joint Interoperability Test Command, ATTN: NITFS Test Facility, 2001 Brainard Road, Fort Huachuca, AZ 85613-7051.

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EXECUTIVE SUMMARY

This document is a compilation of common practices, conventions, and guidelines for implementing the National Imagery Transmission Format Standard (NITFS). The objective is to help promote common specification and application of the NITFS suite of standards by all fielded and developmental digital imagery-related systems. It describes common conventions for implementing the suite of NITFS standards that promote and sustain NITFS compliance and interoperability for the production, storage, cataloging, discovery, selection, exploitation, and dissemination of digital imagery, raster map, and other related raster products.

The National Imagery and Mapping Agency (NIMA/ETAS) has oversight of the standardization and testing process whereby digital imagery systems achieve and sustain NITFS compliance and interoperability. The practices herein address implementation conventions for NITF 1.1, NITF 2.0, NITF 2.1, and the related NITFS standards and specifications for imagery compression, graphic annotation, and data extensions.

These practices do not of themselves establish implementation requirements. NITFS implementation requirements are detailed in appropriate requirement documents, system specifications, interface specifications, statements of work, etc. Those involved with developing requirements, preparing specifications and acquisition documents, and implementing the NITFS should cite or draw from the information in this document to promote consistent application of the NITFS throughout the digital imagery enterprise.

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1 INTRODUCTION

1.1 Purpose

This document is a compilation of common practices, conventions, and guidelines for implementing the National Imagery Transmission Format Standard (NITFS). The objective is to help promote common specification and application of the NITFS suite of standards by all fielded and developmental digital imagery-related systems. It describes common conventions for implementing the suite of NITFS standards that promote and sustain NITFS compliance and interoperability for the production, storage, cataloging, discovery, selection, exploitation, and dissemination of digital imagery, raster map, and other related raster products.

1.2 Scope

This document contains technical information and specifications for the use and implementation of the NITFS within the digital imagery enterprise. It provides implementation practices and conventions applicable to efforts such as:

- NIMA Archive and Dissemination Applications:
  - NIMA Libraries (NL)
  - Image Product Library (IPL)
  - Information Access Services (IAS)
  - NIMA Common Client (CC)
  - Dissemination Element (DE)
  - Digital Products Data Warehouse (DPDW)
- NIMA Exploitation Applications:
  - Integrated Exploitation Capability (IEC)
  - Front End Processing Environment (FPE)
  - Multi-Source Intelligence Toolkit (MINT)
- NIMA Management Applications:
  - Imagery Exploitation Support System (IESS) Enhanced Analyst Client
  - National Exploitation System (NES)
  - Template's Enhanced Integration Tool (EIT)

- Non-NIMA National Systems for Geospatial Intelligence (NSGI) Applications:
    - Common Imagery Ground/Surface System (CIGSS)
        - Common Imagery Processor
        - CIGSS Screener
- Other Client/Exploitation Applications (including COTS) requiring access or interface to the NSGI Services.
- Commercial imagery providers that support the NITFS

1.3 Background

1.3.1 NITF Version 1.1

The development of the National Imagery Transmission Format (NITF) was initiated in 1985 under the auspices of the Imagery Acquisition Management Plan (IAMP) Working Group of the Office of the Assistant Secretary of Defense, Command, Control, Communications, and Intelligence (OASD/C^3I). Version 1.0 of the NITF was published, but not released, in 1988. This version served as the prototype for demonstrating that the format could be implemented. In 1988 and 1989, the NITF was successfully implemented and tested on six different systems using operational communications media with cryptographic and forward error correction devices. The specification for NITF Version 1.1 was approved and released by OASD/C3I on 1 March 1989 as the NITF baseline version.

1.3.2 NITF Version 2.0

NITF version 2.0 was published along with a suite of military standards designated as the National Imagery Transmission Format Standard (NITFS) in June 1993. The major additions to NITF version 1.1 included the Tactical Communications Protocol 2 (TACO2) to enable transmission over tactical circuits; improved image compression using the Joint Photographic Experts Group (JPEG) compression algorithm; support for large images and color images; and symbolic annotations using Computer Graphics Metafile (CGM). The Central Imagery Office (CIO) had since been organized and became the NITFS Program Manager.

1.3.3 NITF Version 2.1

A number of factors have driven the changes made to NITF 2.0 during recent years. Among these are: 1) the creation of the National Imagery and Mapping Agency (NIMA); 2) the Department of Defense (DOD) mandate for the selection and implementation of commercial/international standards over government/military standards where possible; 3) user requirements for improved fusion of information, whether imagery, geospatial, or other data types; and 4) the ever increasing need to share data within and external to systems of the DOD/Intelligence Community. NITF 2.1 is based on extensive coordination among NITFS users, within the NSGI community, North Atlantic Treaty Organization (NATO), Allied Nations, national and international standards bodies, and with commercial vendors and groups dealing with related standards and technologies. Military Standard 2500B and STANAG 4545 serve as the technical baseline for establishing an International Profile of ISO/IEC 12087-5, Basic Image Interchange Format (BIIF). A summary of changes made to the existing NITF 2.0 baseline in support of the NITF 2.1 is addressed in Appendix C.

NITF Version 2.1 compliance testing began 1 October 1998. NITF 2.1 testing will be done in parallel with NITF 2.0 testing until the need for testing of NITF 2.0 capability ceases. The capability to test NITF 2.0 will be maintained until all contractual requirements for NITF 2.0 have been satisfied. The need to unpack and interpret NITF 2.0 files will continue indefinitely.

1.3.4 NSIF Version 1.0

The NATO Standard Image Format (NSIF) is essentially the NATO equivalent of NITF 2.1 file format. Both formats are profiles of the ISO Basic Image Interchange Format (BIIF) and structurally the mirror each other.

1.4 References

(Note: Those documents with version numbers designated as 0.9x are draft specifications that have not undergone validation testing as described in section 2.0 of N0105. The implementation and test details of these specifications are subject to change based on the lessons learned by the first attempts to implement and test the features of these specifications. Implementers of these specifications are encouraged to coordinate their implementation efforts with the NITFS Test and Evaluation Facility personnel.)

1.4.1 Policy and Planning Documents

CJCSI 6212.B Interoperability and Support of National Security System and Information Technology Systems May 8 2000

DOD/JTA V 3.1	Department of Defense Joint Technical Architecture Version 3.1 31 March 2000.
JIEO Circular 9002	Requirements Assessment and Interoperability Certification of C4I and AIS Equipment and Systems, 23 January 1995.
JIEO Circular 9008	NITFS Certification Test and Evaluation Program Plan, 30 June 1993, with Errata Sheet dated 20 June 1997.

	(Superceded by NIMA Document N0105; referenced herein for historical purposes.)
JIEO Plan 9000	Department of Defense and Intelligence Community Imagery Information Technology Standards Management Plan, 01 November 1995.
NITF 1.1 Vol I	Department of Defense, National Imagery Transmission Format, Certification Plan Volume I, Policy, 02 January 1990.
NITF 1.1 Vol II	Department of Defense, National Imagery Transmission Format, Certification Plan Volume II, Processes and Procedures 02 January 1990.

(Requests for copies of the above policy and planning documents may be addressed to the Joint Interoperability Test Command, NITFS Test and Evaluation Facility, Building 57305, Fort Huachuca, AZ 85613-7020.)

1.4.2 Federal Information Processing Standards (FIPS)

FIPS PUB 10-4	Countries, Dependencies, Areas of Special Sovereignty, and Their Principal Administrative Divisions, April 1995
FIPS PUB 147	Group 3 Apparatus for Document Transmission (DOD adopted, 19 August 1981.

1.4.3 Military Standards (MIL-STDs) and Handbooks

MIL-HDBK-1300A	Military Handbook for the National Imagery Transmission Format Standard (NITFS), 12 October 1994.
MIL-STD-2500A	National Imagery Transmission Format (Version 2.0) for the National Imagery Transmission Format Standard, 12 October 1994 with Notice 1, 07 February 1997; Notice 2, 26 September 1997; and Notice 3, 01 October 1998.
MIL-STD-2500B	National Imagery Transmission Format (Version 2.1) for the National Imagery Transmission Format Standard, 22 August 1997 with Notice 1, 02 October 1998 and Notice 2, 01 March 2001.

MIL-STD-188-161	Interoperability and Performance Standards for Digital Facsimile Equipment, 30 October 1991.
MIL-STD-188-196	Bi-Level Image Compression for the National Imagery Transmission Format Standard, 18 June 1993 with Notice 1, 27 June 1996.
MIL-STD 188-197A	Adaptive Recursive Interpolated Differential Pulse Code Modulation (ARIDPCM) Compression Algorithm for the National Imagery Transmission Format Standard, 12 October 1994.
MIL-STD-188-198A	Joint Photographic Experts Group (JPEG) Image Compression for the National Imagery Transmission Format Standard, 15 December 1993 with Notice 1, 12 October 1994 and Notice 2, 14 March 1997.
MIL-STD-188-199	Vector Quantization Decompression for the National Imagery Transmission Format Standard, 27 June 1994 with Notice 1, 27 June 1996.
MIL-STD-2301	Computer Graphics Metafile (CGM) Implementation Standard for the National Imagery Transmission Format Standard, 18 June 1993 with Notice 1, 12 October 1994.
MIL-STD-2301A	Computer Graphics Metafile (CGM) Implementation Standard for the National Imagery Transmission Format Standard, 05 June 1998.
MIL-STD-2045-44500	Tactical Communications Protocol 2 (TACO2) for the National Imagery Transmission Format Standard, 18 June 1993 with Notice 1, 29 July 1994 and Notice 2, 27 June 1996.
MIL-STD-6040	United States Message Text Format (MTF) Note: The baseline for this standard is updated frequently, but this has no impact within the context of its current use within the NITFS. Currency of the USMTF has potential impact when MTF data within NITF files is passed to external processes.

(Copies of the above military standards and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

1.4.4 NIMA Specifications and Publications

N0101-G	Geospatial and Imagery Access Services Specification (GIAS), Version 3.5, 26 June 2000.
N0102-G	USIGS Interoperability Profile (UIP), 26 June 2000. SCN001, 06 August 2001.
N-0106-97	National Imagery Transmission Format Standard (NITFS) Bandwidth Compression Standards and Guidelines, 25 August 1997.
NSPIA	NIMA Standards Profile for Imagery Archive (NSPIA), 23 April 1997.
NTER	NITFS Tagged Extensions Registry (NTER), latest update as posted at: http://jitc.fhu.disa.mil/nitf/nitf.htm/tag_reg.htm
NSDE	NIMA Support Data Extensions (SDE) (Version 1.2) for The National Imagery Transmission Format Standard (NITFS), 13 March 1997.
NUTA	NIMA USIGS Technical Architecture (NUTA), 28 October 1997.
PIAE v2	National Imagery Transmission Format Standard Profile for Imagery Archive Extension (PIAE), Version 2.0, 25 April 1996.
PIAE v3	National Imagery Transmission Format Standard Profile for Imagery Archive Extensions (PIAE), Version 3.0, 25 September 1997. (E001)
RASG-9606-001	Airborne Synthetic Aperture Radar (SAR) Support Data Extensions (SDE) for the National Imagery Transmission Format (Version 2.0) of the National Imagery Transmission Format Standard, Version 0.9, 20 May 1996.
VIMAS	Visible, Infrared, and Multispectral Airborne Sensor Support Data Extensions for the National Imagery Transmission Format of the National Imagery Transmission Format Standard Version 0.9, 25 September 1997.
STDI-0002	The Compendium of Controlled Extensions (CE) for the National Imagery Transmission Format Version 2.1 16 November 2000

BWC Guide	Bandwidth Compression (BWC) Guide for JPEG 2000 Visually Lossless and Numerically Lossless Compression of Imagery Data Working Draft 1.0

(Requests for copies of the above NIMA Specifications and Publications may be made to the National Imagery and Mapping Agency, Attn.: NIMA/ETAS, MS-P-24, 12310 Sunrise Valley Drive, Reston, VA 20191-3449.)

1.4.5 Standardized NATO Agreements

STANAG 4545	NATO Secondary Imagery Format (Version 1.0); Edition 1; Promulgation date: 27 November 1998.
STANAG DIGEST	Digital Geographic Information Exchange Standard (DIGEST), Edition 2.0, June 1997.

(Requests for copies of the above STANAG may be made to SAF/AQIJ, 1060 AF Pentagon (5D156), Washington, DC 20330-1060.)

1.4.6 International Standards

CCITT	Recommendation T.4, Standardization of Group 3 Facsimile Apparatus or Document Transmission, 1998
ISO/IEC Directives	Procedures for the technical work of ISO/IEC JTC1 on Information Technology, Third Edition 1995.
ISO/IEC TR10000-1	Information technology - Framework and Taxonomy of International Standardized Profiles - Part 1: General principles and documentation framework, third edition, 1995.
ISO/IEC TR10000-2	Information technology - Framework and taxonomy of International Standardized Profiles - Part 2 : Principles and Taxonomy for OSI Profiles, third edition, 1995.
ISO/IEC 8632-1:1994	Information Technology - Computer graphics metafile for the storage and transfer of picture description information - Part 1: Functional Specification, AMD 2, 01 July 1995.

ISO/IEC 8632-3:1994	Information Technology - Computer graphics metafile for the storage and transfer of picture description information - Part 3: Binary Encoding, AMD 2, 01 August 1995.
ISO/IEC 8632:1992	Information Technology - Computer graphics metafile for the storage and transfer of picture description information, AMD.1:1994 - Parts 1-4: Rules for Profiles.
ISO/IEC 9973:1994	1st Edition, Procedures for Registration of Graphical Items, 15 December 1994.
ISO/IEC 10646-1:1993	Information technology - Universal Multiple-Octet Coded Character Set (UCS) - Part 1: Architecture and Basic Multiple Plane, AMD 6, 15 Nov. 1996.
ISO/IEC 10918-1:1994	Information technology - Digital compression and coding of continuous-tone still images : Requirements and guidelines, 15 December 1994.
ISO/IEC 10918-2:1995	Information technology - Digital compression and coding of continuous-tone still images : Compliance testing, 15 August 1995.
ISO/IEC 10918-3:DIS	Information Technology; Digital Compression and Coding of Continuous-Tone Still Images; Part 1: Extensions, 01 May 1997.
ISO/IEC 10918-4:DIS	Information Technology; Digital Compression and Coding of Continuous-Tone Still Images: Part 4; Registration Procedures for JPEG Profile, APPn Marker, and SPIFF Profile ID Marker, 26 Dec. 96.
ISO/IEC 15444-1	Coding of Still Pictures, JPEG 2000 Part I Final Draft International Standard (corrected and formatted), 25 September 2000
ISO/IEC 11072:1993	Information technology - Computer graphics - Computer Graphics Reference Model, 01 Oct. 92.
ISO/IEC 12087-1:1995	Information technology - Computer graphics and image processing - Image processing and Interchange—Functional specification Part 1: Common architecture for imaging, 15 April 1995.

ISO/IEC 12087-2:1994	Information technology - Computer graphics and image processing - Image processing and Interchange—Functional specification Part 2: Programmer's imaging kernel system application program interface.
ISO/IEC 12087-3:1995	Information technology - Computer graphics and image processing - Image processing and Interchange—Functional specification Part 3: Image Interchange Facility (IIF), AMD 1, 15 December 1997.
ISO/IEC 12087-5: 1998	Information technology; Computer graphics and image processing; Image Processing and Interchange; Functional Specification - Part 5: Basic Image Interchange Format.
ITU T.4 (1993:03)	Terminal Equipment and Protocols for Telematic Services - Standardization of Group 3 Facsimile Apparatus for Document Transmission, AMD2 08/95.

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

1.5 Applicability

The NITFS is the designated standard for the formatting and exchange of digital imagery and imagery-related products between members of the Intelligence Community as defined by Executive Order 12333, the Department of Defense (DOD) and other Departments or Agencies of the United States Government as governed by Memoranda of Agreement (MOAs) with those Agencies and the Intelligence Community/DOD. Adherence to U.S. Federal and DOD standards is required before a particular system can be employed in joint or combined operations. The DOD Directive 4630.5 states that for purposes of compatibility, interoperability, and integration all command, control, communications, and intelligence (C^3I) systems developed for use by U.S. forces are considered to be for joint use.

1.6 Authority

The National Imagery and Mapping Agency (NIMA) is the proponent for the NITFS suite of standards. The Defense Information Systems Agency (DISA) is the Lead Standardization Authority (LSA) with the Defense Standardization Program for the NITFS suite of standards. The Director, Central Intelligence (DCI) is the Intelligence Community authority for mandatory NITFS compliance. The Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (ASD/C^3I) is the

DOD authority requiring compliance with the NITFS. The NIMA/ETAS is the Test Program Authority and provides management oversight for the NITFS Test and Evaluation Program. The JITC, an element of the DISA, is the Executive Agent to NIMA/ETAS for execution of the NITFS Test and Evaluation Program. Figure 1-1 depicts these organizational relationships.

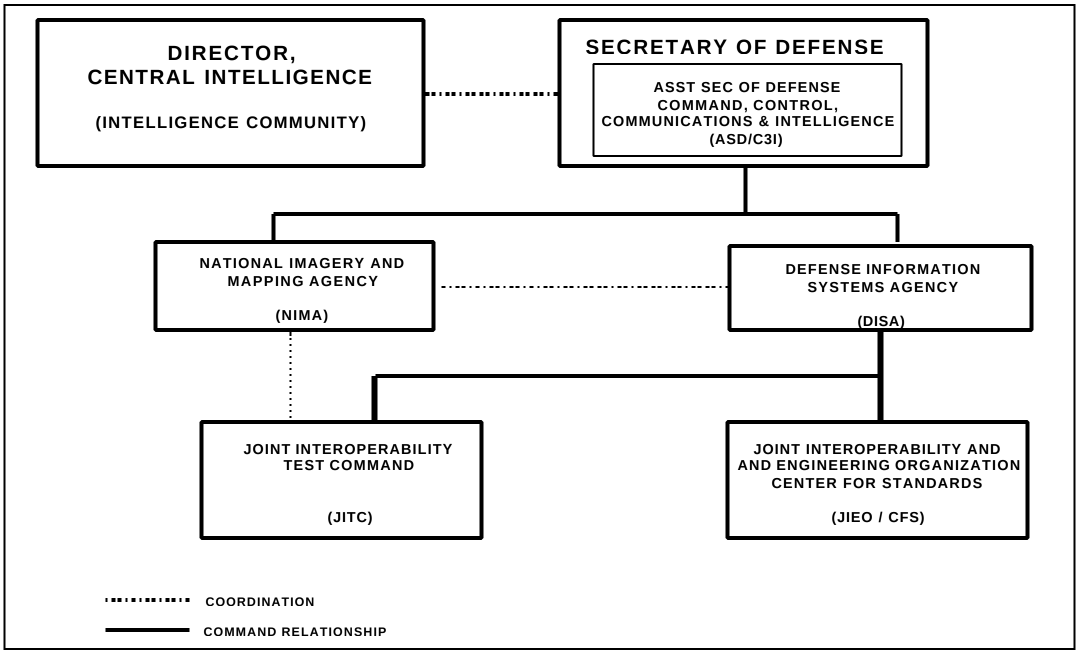

Figure 1-1. NITFS Test Organizational Relationships

1.7 Definitions

For the purpose of this specification, the following terms are defined as stated:

1.7.1 Certification (Interoperability)

Confirmation by DISA that a National Security System (NSS) and Information Technology System has undergone appropriate testing; that the applicable standards and requirements for compatibility, interoperability, and integration have been met; and a system is ready for joint and/or combined use. See JCSI 6212B.

(Note: For the NITF 2.0 test program, the term ‘System Certification’ was used to designate those systems (hardware and software) which implemented both NITF 2.0 and TACO2 and successfully completed NITFS compliance testing.)

1.7.2 Compliance Registration (Standards Compliance)

A statement attesting to the fact that an implementation, product or component has been tested as meeting NITFS applicable compliance criteria. The degree of compliance is recorded in a registry.

1.7.3 NITFS Test and Evaluation Facility

The personnel, equipment, data, and facilities for conducting NITFS compliance testing and maintaining the NITF program for NIMA along with policies, procedures, planning, etc.

1.7.4 Common Coordinate System

The virtual row and column coordinate space against which all NITF file components are ultimately referenced. The location of NITF components with attachment level of zero is referenced to the origin of the Common Coordinate System. The extent of the common coordinate system is defined by the complexity level designation.

1.7.5 Compatibility, Interoperability, and Integration (CII)

A policy set by DOD and the Joint Staff defining the requirements certification process and identifying assessment criteria. See JCSI 6212A and JIEO Circular 9002.

1.7.6 Configuration Item

A specific component of hardware and/or software that has an impact on NITFS compliance.

1.7.7 Configuration Management

A discipline applying technical and administrative direction and monitoring to:

- Identify and document the functional and physical characteristics of a configuration item.
- Control changes to those characteristics.
- Record and report change processing and implementation status.

1.7.8 Developmental System

A system that has not been approved for use and/or production.

1.7.9 Digital Imagery System

The equipment and procedures used in the collection, storage, display, manipulation, analysis, annotation, exchange, and/or transmission of imagery and imagery products.

1.7.10 Dissemination System

A system with functional requirements to distribute digital imagery via electronic communications facilities. Imagery processing is primarily focused on preparing the data for the eccentricities (e.g. constrained bandwidth, noise environment, etc.) of the communications channels across which it will be disseminated. Representative systems include the Dissemination Element (DE), Global Broadcast System (GBS), etc.

1.7.11 Exploitation System

A system with functional requirements to analyze, exploit, and extract information from digital imagery to produce an exploited imagery product. Representative systems include Image Data Exploitation System (IDEX), NIMA Softcopy Exploitation Systems as defined by the NIMA Imagery Information Exploitation Environment (NIIEE), Common Exploitation Workstation (CEW), etc.

1.7.12 Fielded System

A system that has been approved for use and/or production.

1.7.13 Implementation Under Test (IUT)

A candidate implementation of any portion of the NITFS suite of standards for which compliance testing is being performed. An implementation does not necessarily comprise a full imagery system.

1.7.14 Library System

A system with functional requirements to catalogue, store, and retrieve digital imagery. Representative systems include Image Product Archive (IPA), Image Product Library (IPL), NIMA Libraries, etc.

1.7.15 NITFS Compliance

The ability of an implementation to create and output NITFS compliant files and/or to accept NITFS files and recognize the component parts as prescribed in the NITFS Test and Evaluation Program Plan.

1.7.16 NITFS Component Compliance

A statement to the fact that an item (as opposed to a full implementation) has been tested for compliance to a specific subset of the NITFS compliance criteria.

1.7.17 Native Mode

The intrinsic attributes and operational mode of an imagery system. When an imagery system's architecture, design, and/or internal representation for images, graphics, labels, text, and/or other data is not in accordance with the NITFS, its native mode is considered to be other than NITFS.

1.7.18 NITF

The National Imagery Transmission Format. The term NITF is often used to describe a file that is formatted according to the NITFS. The term usually inherits the context of the latest version of NITF when the version is not specifically identified.

1.7.19 NITFS

The National Imagery Transmission Format Standard (NITFS) is comprised of the suite of standards applicable to the formatting and exchange of digital imagery. The term is used when addressing the overall national imagery standardization effort.

1.7.20 NITF Version 1.1

The initial version of NITF implemented for which a formal testing program was established. Requirements for compliance with NITF Version 1.1 are fully described in the NITF Version 1.1, Volume I, NITF Certification Plan Policy and Volume II, Certification Plan Processes and Procedures.

1.7.21 NITF Version 2.0

The second version of NITF implemented for which a formal testing program was established. Requirements for compliance with NITF Version 2.0 were originally fully described in Joint Interoperability and Engineering Organization (JIEO) Circular 9008, NITFS Certification Test and Evaluation Program Plan. JIEO 9008 has been superceded by N105 and contains applicable program information for NITF version 2.0

1.7.22 NITF Version 2.1

The third version of NITF establishing the formal compliance test program and is documented in N105.

1.7.23 Pack

To create or construct an NITF file within the set of conditions and constraints defined for compliance with the NITFS.

1.7.24 Primary Imagery System

The equipment and procedures used in the electronic collection, storage, and exchange of original quality, non-exploited imagery and imagery products.

1.7.25 Production System

A system with functional requirements to generate digital imagery from sensor sources. Representative systems include Common Imagery Processor (CIP), Digital Production System (DPS), Point Positioning Production System (PPPS), etc.

1.7.26 Secondary Imagery Dissemination System (SIDS)

The equipment and procedures supporting the process of post-collection electronic dissemination of Command, Control, Communications, and Intelligence (C^3I) data, over a time interval ranging from near-real-time to a period of days, at a quality level determined by receiver requirements.

1.7.27 System Under Test (SUT)

A candidate imagery system for which NITFS compliance testing is being performed.

1.7.28 Tactical System

A system with requirements to operate when deployed into the battlefield; often characterized by the need to obtain data communications from military tactical communication channels vice fixed plant communications typical of commercial civilian organizations.

1.7.29 Unpack

To interpret and make appropriate use of the imagery, data, and associated information contained in an NITF compliant file. In most instances, this includes the capability to accurately display and/or print the contents of an NITF file.

1.7.30 NSGI Architecture Framework

The interrelated set of NSGI Architecture components that includes the Operational Architecture, the Technical Architecture, the Systems Architecture, and the Data Architecture. The Operational Architecture identifies the operational element, activities, and information flows. The Technical Architecture identifies applicable standards and conventions that govern systems implementation and operation. The Systems Architecture overlays system capabilities onto requirements and identified standards to provide a map of current and future capabilities. The Data Architecture provides the common data modeling and terminology baseline needed to articulate and integrate the other component architecture views.

1.7.31 USIGS Interoperability Profile

The USIGS Interoperability Profile (UIP) defines the profile for software interface standards to be used to achieve interoperability between multiple clients and servers within the United States Imagery and Geospatial System architecture.

1.8 Test Program Concept

The NITFS Test and Evaluation Program is composed of the NITFS Test and Evaluation Facility, policies, procedures, and administrative and planning actions required to achieve and sustain an imagery implementation's compliance with the NITFS and interoperability within the NSGI through testing. The test program supports both the DOD and the Intelligence Community objectives for ensuring an interoperable format for the exchange of digital imagery products among heterogeneous systems.

1.8.1 National Imagery and Mapping Agency

The NIMA/ETAS oversees the process whereby imagery systems achieve and sustain NITFS compliance and interoperability through the NITFS Test and Evaluation Program. Initial compliance testing of an imagery system is achieved at the designated test facility, the JITC, or at alternate locations as approved by the JITC. Compliance to standards and interoperability within NSGI is sustained through retesting, as necessitated by changes to the NITFS, changes to (or problems with) tested NITFS configuration items, or when directed by NIMA/ETAS, as long as the imagery system is operational.

1.8.2 Joint Interoperability Test Command

The JITC serves as NIMA/ETAS's executive agent for execution of NITFS test related activities. The JITC has established an NITFS testing facility that supports compliance testing of NITFS capable implementations, validation testing of proposed additions to NITFS, and other NITFS related test activities.

1.9 NITFS Implementation and Use Policies

The following policies apply to the implementation and use of the NITFS:

1.9.1 General

Those systems, subsystems, and components within the United States Imagery and Geospatial System which exchange digital imagery shall achieve compliance with the NITFS as specified by the USIGS Architecture Framework, the USIGS Interoperability Profile (UIP), and the Joint Technical Architecture (JTA).

1.9.1.1 NITF Version 1.1. NITF 1.1 implementation began in 1989. NITF 2.0 implementation began in 1993. To support interoperability during the transition from NITF 1.1, all NITF 2.0 compliant systems were required to allow for the proper interpretation and use of NITF Version 1.1 formatted files and the creation of NITF Version 1.1 compliant files. The requirement for NITF 2.0 systems to create NITF 1.1 files is now optional. NITF 1.1 only systems should no longer be used in the field. However, due to the extensive existence of legacy NITF 1.1 files, NITF 2.0 and NITF 2.1 systems may elect to continue to interpret NITF 1.1 files if the implementations operational concept reflects a need to interpret NITF 1.1 files.

1.9.1.2 NITF Version 2.0. All currently fielded imagery systems should be at least NITF 2.0 compliant with plans in place to upgrade/replace to NITF 2.1 capabilities.

1.9.1.3 NITF Version 2.1. . All NITF 2.1 compliant systems typically have a mode of operation that allows for proper interpretation and use of NITF Version 2.0 formatted files and that limits the creation of an NITF file content to the constraints of NITF version 2.0. Developmental systems shall be tested for and achieve NITF 2.1 compliance prior to fielding. NITF 2.1 capable systems may continue to properly interpret NITF Version 1.1 files if called for by the systems concept of operations.

1.9.1.4 Distributed Applications. Some developers may choose to implement systems that distribute NITFS functions across several processing platforms that are networked together. In such cases, the systems will be evaluated as a whole in determining which NITFS attributes and associated compliance criteria apply to each component of the system. In any case, provision shall be made for the system to fully satisfy the Complexity Level (CLEVEL) criteria for its applicable operational requirements before the system will be registered as NITFS compliant.

1.9.1.5 NITFS Components. Developers may choose to submit components and/or products that implement only a portion of the NITFS compliance requirements for testing and registration. The component shall be tested for compliance to the applicable standards. Component registration does not mean that any implementation that uses the registered component is deemed to be fully compliant with NITFS. Use of the registered component may, however, expedite test and evaluation of the implementation for compliance registration.

1.9.1.6 TACO2. The use of TACO2 continues today in some user communities. Although it is no longer required to obtain NITFS compliance registration, if implemented, it must pass NITFS compliance testing.

1.10 Points of Contact

1.10.1 NITFS Technical Board (NTB)

National Imagery and Mapping Agency
ATTN: ETAS (Mail Stop P-24)
12310 Sunrise Valley Drive
Reston, VA 20191-3449
Phone: (703) 262-4400
Fax: (703) 262-4401
URL: http://164.214.2.51/ntb

1.10.2 NITFS Test Information, Test Scheduling, Implementation Consulting

Joint Interoperability Test Command
NITFS Test and Evaluation Facility
ATTN: JTD
Building 57305
2001 Brainard Road
Fort Huachuca, AZ 85613-7020
Phone: (520) 538-5458 or 5494
Fax: (520) 538-5257
STU: (520) 538-5458
Email: jitcn@fhu.disa.mil
URL: http://jitc.fhu.disa.mil/nitf

1.10.3 Imagery Standardization and G/ISMC Information

National Imagery and Mapping Agency
ATTN: ETAS (Mail Stop P-24)
12310 Sunrise Valley Drive
Reston, VA 20191-3449
Phone: (703) 262-4400
Fax: (703) 262-4401
URL: http://164.214.2.51

2 GENERAL NITFS IMPLEMENTATION COMPLIANCE

2.1 General

2.1.1 NITFS Compliance Criteria

The NITFS compliance criteria are derived from the suite of NITFS documents and are documented in NIMA document N0105. NITF file components, attributes, allowable field values, formats, and field lengths are fully described in the NITFS documents.

Since the NITFS is very flexible, it has many options, the use of which must be constrained for implementation if file exchange interoperability is to be achieved. The compliance criteria identify the features, capabilities, formats, field values, ranges, and associated boundary conditions of the NITFS against which an implementation is tested for compliance.

2.1.2 Pack/Unpack

For the purposes of this document, the term "pack" means to create or construct an NITF file within the set of conditions and constraints defined for compliance with the NITFS. The term "unpack" means to interpret and properly display imagery data (images and symbols) and accurately process associated information contained in an NITF file. In most instances, this includes the capability to accurately display and/or print the contents of an NITF file. Under some circumstances, unpacking a file results in a non-displayed product such as re-packing another file resulting from a translation or conversion process. For example, an imagery library or gateway server, often with no human involvement or intervention, may support translation or conversion services. In these cases, the resulting files will be evaluated using the applicable test criteria that pertain to the documented requirements of the specific interface involved. An implementation may be registered as having a pack-only capability, an unpack-only capability, or both a pack and unpack capability depending on the fielding intent and desire of the sponsor.

2.1.3 NITFS Compliance Principles

The NITFS compliance criteria are intended to strike a balance between fully implementing all the requirements in the standards and the planned operational requirements of the actual system(s) implementing the standard. The history of imagery systems is replete with examples of systems being deployed for use in environments for which they were not originally intended to operate. This fact drives the need to establish baseline requirements from the standards that are applicable to all implementations regardless of perceived operational requirements. Where clear architectural guidance exists, the applicable test criteria for the required services and features will be selected from among the criteria established in this plan. The cardinal principles are:

2.1.3.1 The packing implementation shall ensure all produced NITF files are NITFS compliant within the bounds of the established complexity levels. When the implementation also supports unpacking, it must be capable of properly unpacking (and portraying when applicable) any file that it is able to pack.

2.1.3.2 The unpacking implementation shall ensure the information from NITF files is presented as the originator intended, at least for the fundamental segments of the file (images, symbols and text).

2.1.3.3 When unpacking NITF files with unrecognized content (e.g. content that cannot be properly interpreted or presented by the implementation, for example extension data), the implementation shall have a means to alert the system operator or administrator that the file(s) has unrecognized content in addition to what is being presented or interpreted.

2.1.4 Native Mode Rule

The 'Native Mode Rule' refers to the intrinsic attributes and operational capabilities of an imagery system. Those implementations offering features or attributes in their native mode of operation that directly correlate with elements defined in NITF 2.1, such as supporting the creation of symbol annotation, will be required to support those features and attributes in accordance with the NITFS.

2.2 NITFS Complexity Levels (CLEVELs)

Implementations of the NITFS are categorized and tested according to their ability to pack and/or unpack various CLEVELs of NITFS formatted files. This concept allows NITFS to be implemented on a wide range of hardware platforms with various levels of internal resources while maintaining a baseline level of interoperability between all compliance tested systems. For NITF 2.1, four CLEVELs have been defined, CL03, CL05, CL06, and CL07. A summary of the attributes of each CLEVEL is listed in Table 2-1. Files shall be marked at the lowest CLEVEL for which they qualify.

2.3 Elements of NITFS Compliance

Table 2-1 contains an overview summary of the NITF 2.1 compliance criteria for general reference. The specific attributes and compliance test requirements are described in NIMA document N0105. N0105 details the specific field values, ranges, and boundary conditions of the NITF file format required for compliance testing. These include specific test conditions for ARIDPCM Compression, Bi-Level Compression, JPEG Compression, Vector Quantization Decompression, CGM, TACO2, and NITF version 1.1 and 2.0 backward compatibility.

Unpack applications must be able to fully interpret any compliant file within the supported complexity level. Pack applications must ensure no files are produced which extend beyond the allowed features and ranges of the applicable complexity level of the file being packed. Proper interpretation of the table is further defined by the NITFS Test Program Plan, N0105.

Table 2-1. NITF 2.1 Compliance Criteria Summary*

Feature	Complexity Level			
	3	5	6	7
Common Coordinate System (CCS) Extent (origin) To max (row, column)	00000000, 00000000 To 00002047, 00002047	00000000, 00000000 To 00008191, 00008191	00000000, 00000000 To 00065535, 00065535	00000000,00000000 To 99999999,99999999
Maximum File Size	50 Mb - 1byte (52,428,799)	1Gb -1byte (1,073,741,823)	2Gb -1 byte (2,147,483,647)	10 Gb-1 byte (10,737,418,239)
Image Size Image(s) placed within CCS extent	0002-2048 Rows X 0002-2048 Cols (R & C <= 2048)	0002-8192 Rows X 0002-8192 Cols (R or C > 2048)	0002-65536 Rows X 0002-65536 Cols (R or C > 8192)	0002-99999999 X 0002-99999999 (R or C > 65536)
Image Blocking (Rectangular blocks allowed)	Single and Multiple Blocks 0001-2048 Rows X 0001-2048 Cols	Single and Multiple Blocks 0001-8192 Rows X 0001-8192 Cols	Multiple blocking is mandatory for images that exceed 8192 pixels per row or column. 0001-8192 Rows	X 0001-8192 Cols
Monochrome (MONO) No Compression	Single Band 1, 8, 12, 16, 32, 64 Bits per pixel (NBPP)	With and without LUT	IC=NC, NM	Image Mode (IMODE) = B
Color 1 or 8-Bit (RGB/LUT) No Compression	Single Band 1, 8 Bits per pixel (NBPP)	With LUT	IC=NC, NM	IMODE = B
Color 24-Bit (RGB) No Compression	Three Bands 8 Bits per pixel (NBPP)	No LUT	IC=NC, NM	IMODE = B,P,R,S
Multispectral (MULTI) No Compression	2-9 bands 8, 16, 32, 64-bits per pixel per band With and without LUT in each band IC = NC, NM IMODE =B, P, R, S	2-256 bands 8, 16, 32, 64-bits per pixel per band	With and without LUT in each band IMODE =B, P, R, S	2- 999 bands 8, 16, 32, 64-bits per pixel per band With and without LUT in each band IC = NC, NM IMODE =B,P,R,S
JPEG DCT Compression Monochrome (MONO)	Single Band 8 & 12 Bit sample (NBPP)	No LUT	IC=C3, M3	IMODE B
JPEG DCT Compression Color 24-Bit (RGB)	Three Bands 8-Bit Sample per band (NBPP) No LUT IC=C3, M3 IMODE = P			

Table 2-1 NITF 2.1 Compliance Criteria Summary* (cont'd.)

Feature	Complexity Level			
	3	5	6	7
JPEG Compression Color 24-Bit (YCbCr601)	Three Bands 8 Bit Sample per band (NBPP) No LUT IC=C3, M3 IMODE = P			
Downsampled JPEG DCT Monochrome (MONO)	Single Band Single Block Only 8-Bit sample (NBPP) No LUT IC=I1 IMODE = B (Image size may not exceed 2048 pixels per Row or Column)			
JPEG Lossless Compression Monochrome (MONO)	Single Band 8, 12 and 16-Bit Sample (NBPP) With or without LUT IC = C5, M5 IMODE = B (This feature is optional for implementation.)			
JPEG Lossless Compression 24-Bit Color (RGB)	Three Bands 8-Bit Sample per band (NBPP) With and Without LUT IC = C5, M5 (This feature is optional for implementation.)			
JPEG 2000 Compression Monochrome (MONO)	1 Band 1-32 bits per Pixel per Band With and without LUT IC = C8 IMODE = B Note: LUTs are typically only useful when the data is compressed numerically lossless.			
JPEG 2000 Compression Mapped Colour (RGB/LUT)	1 Band 1-32 bits per Pixel per Band With LUT IC = C8 IMODE = B Note: LUTs are typically only useful when the data is compressed numerically lossless.			
JPEG 2000 Compression Colour (RGB)	3 Bands 1-32 bits per Pixel per Band No LUT IC = C8 IMODE = B Note: The JPEG 2000 colour transform may be used as part of the compression and decompression process when IREP=RGB.			

Table 2-1 NITF 2.1 Compliance Criteria Summary* (cont'd.)

Feature	Complexity Level			
	3	5	6	7
JPEG 2000 Compression **Colour (YCbCr601)**	3 Bands 1-32 bits per Pixel per Band No LUT IC = C8 IMODE = B Note: When IREP=YCbCr601, it signifies that the data representation was YCbCr prior to the JPEG 2000 compression process. The internal JPEG 2000 colour transform shall not be used.			
JPEG 2000 Compression **Multiband (MULTI)**	1 to 9 Bands 1-32 bits per Pixel per Band With and without LUT IC = C8 IMODE = B	1 to 255 Bands 1-32 bits per Pixel per Band With and without LUT IC = C8 IMODE = B		1 to 999 Bands 1-32 bits per Pixel per Band With and without LUT IC = C8 IMODE = B
Bi-LEVEL Compression **(MONO)**	Single Band , single Block 1-Bit per pixel (NBPP) With and without LUT IC = C1, M1 COMRAT = 1D, 2DS, 2DH IMODE = B (Image size may not exceed 8192 pixels per row by 2560 pixels per column)			
Bi-LEVEL Compression **RGB/LUT**	Single Band single Block Only 1-Bit per pixel (NBPP) With LUT IC = C1, M1 COMRAT = 1D, 2DS, 2DH IMODE = B (Image size may not exceed 8192 pixels per row by 2560 pixels per column)			
VQ Compression	Single Band/Block 8 Bits per pixel (NBPP) 4x4 Kernel organized in 4 tables IC = C4, M4 IMODE = B			
VQ Monochrome (MONO)	With and without LUT IMODE = B			
VQ 8-bit color (RGB/LUT)	With LUT IMODE = B			
Multispectral (MULTI) Individual Band **JPEG Compression**	2 to 9 bands 8, 12-bits per pixel per band No LUT IMODE =B, S IC = C3, M3	2 to 255 bands 8, 12-bits per pixel per band No LUT IMODE =B, S IC = C3, M3		2 to 999 bands 8, 12-bits per pixel per band No LUT IMODE =B, S IC = C3, M3

Table 2-1 NITF 2.1 Compliance Criteria Summary* (cont'd.)

Feature	Complexity Level			
	3	5	6	7
Multispectral (MULTI) Multi-Component Compression	2 to 9 bands 8, 12-bits per pixel per band No LUT IMODE =B, P, S IC = C6, M6 (This feature is optional for implementation.)	2 to 255 bands 8, 12-bits per pixel per band No LUT IMODE =B, P, S IC = C6, M6 (This feature is optional for implementation.)		2 to 999 bands 8, 12-bits per pixel per band No LUT IMODE =B, P, S IC = C6, M6 (This feature is optional for implementation.)
Elevation Data (NODISPLY)	Single Band 8, 12, 16, 32 and 64-Bits per pixel (NBPP) No LUT IC = NC IMODE = B ICAT = DTEM, ISUBCATn code from DIGEST Part 3- 7 (or BCS spaces (0x20)) Applicable TREs: Standard Geospatial Support Data Extensions (GeoSDE), DIGEST Part 2 Annex D (This feature is optional for implementation.)			
Location Grid (NODISPLY)	Two Bands 8, 12, 16, 32 and 64 -Bits per pixel (NBPP) No LUT IC = NC IMODE = B, P ICAT = LOCG, ISUBCATn = CGX, CGY or GGX, GGY Applicable TREs: Standard Geospatial Support Data Extensions (GeoSDE), DIGEST Part 2 Annex D (This feature is optional for implementation.)			
Matrix Data (NODISPLY)	2 to 9 Bands 8, 16, 32, and 64-bits per Pixel per Band, No LUT in any Band IMODE=B,P,R,S (This feature is optional for implementation.)	2 to 255 Bands 8, 16, 32, and 64-bits per Pixel per Band, No LUT in any Band IMODE=B,P,R,S (This feature is optional for implementation.)		2 to 999 Bands 8, 16, 32, and 64-bits per Pixel per Band, No LUT in any Band IMODE=B,P,R,S (This feature is optional for implementation.)
Number of Image Segments Per File	0 to 20 Segments	0 to 100 Segments		
Number of CGM Graphic Segments Per File	0 to 100 Segments			
Aggregate Size of Graphic Segments Per File	1 Mb maximum	2 Mb maximum		
CGM Graphic Profile	MIL-STD-2301A			
Number of Text Segments Per File	0 to 32 Segments			

Table 2-1 NITF 2.1 Compliance Criteria Summary* (cont'd.)

Feature	Complexity Level			
	3	5	6	7
Text Format Codes Supported	STA, UT1, MTF, U8S			
Text Data Per Segment	00001 to 99999 bytes			
Tagged Record Extensions (TRE)	Tagged Record Extensions may appear in the UDHD, XHD, UDID, IXSHD, SXSHD, TXSHD fields and in the "TRE_OVERFLOW" DES regardless of CLEVEL. Only approved Tagged Record Extensions listed in the Data Extension Register are allowed.			
Number of Data Extension Segments (DESs) Per File	0 to 10 Only approved DES(s) listed in the Data Extension Register are allowed.			
Currently Approved DESs	TRE_OVERFLOW STREAMING_FILE_HEADER			
Number of Reserved Extension Segments (RESs) Per File	None			
Currently Approved RESs	None			
NITF 2.0	All unpack capable implementations must properly interpret any compliant NITF 2.0 file of all comparable CLEVEL(s) as implemented for NITF 2.1. Implementations capable of packing NITF 2.0 files must be able to create NITF 2.0 formatted files within the NITF 2.0 constraints for the comparable CLEVEL(s) as implemented for NITF 2.1. NITF 2.1 CLEVEL — NITF 2.0 CLEVEL 7 — N/A 6 — 6 5 — 5, 4 3 — 3, 2, 1			
NITF 1.1	All unpack capable implementations must properly interpret any compliant NITF 1.1 file.			
TACO2	Tactical systems, and those systems with requirements to interface with tactical systems.			

*Note: This table only provides an overview summary of compliance criteria. Proper interpretation of the table is specified in the text of this chapter and associated appendices.

2.4 NITFS Compliance Basic Functional Requirements

2.4.1 NITF Pack

2.4.1.1 An implementation must be able to pack NITF compliant files within the constraints of the CLEVEL file types for which compliance is desired. An implementation must at least support packing the NITFS CLEVEL attributes corresponding with those available in its native mode of operation. For example, if the native mode supports graphical annotations, the implementation must support graphical annotation according to the NITFS.

2.4.1.2 If a system has an image capture or input device, the implementation must support the CLEVELs of the image size(s) that can be captured. Additionally, it must support the boundary conditions for the supported CLEVEL.

2.4.1.3 An implementation is not required to implement all NITF attributes available at any particular CLEVEL. The set of pack features implemented is somewhat at the discretion of the system sponsor. It is the responsibility of those acquiring or intending to use a particular implementation to ensure that the needed packing features are present. Whatever set of features are implemented; they must be done within the constraints of the appropriate CLEVEL and will be thoroughly tested.

2.4.1.4 An implementation that packs an NITF file must have a means to ensure that the file meets the specific complexity level intended and does not exceed the boundary conditions for that CLEVEL file type.

2.4.2 NITF Unpack

2.4.2.1 An implementation must be able to unpack any NITF compliant file at the CLEVEL for which compliance is being tested. The capability for unpack must be equal to or greater than the CLEVEL capability for packing. It must also unpack any NITF file packed at a lesser CLEVEL. Hence, there is a stringent requirement for an unpacker to be robust enough to handle all NITF file features (even if it can't pack the feature) that may be invoked by any packing implementation of equal CLEVEL or below.

2.4.2.2 An implementation attempting to unpack a file packed at a higher CLEVEL may do its best to properly interpret and use the file. Upon detecting the unsupported CLEVEL of the file, the implementation must at least alert the system operator of the event and provide the option to abort continuation of the unpack process. This must be done without adversely disrupting the system operation (such as requiring a re-boot or re-initialization of the system). If the application allows the operator the option to proceed with the unpack operation, the operator must be alerted of the potential for disruption of operation and potential incompleteness of any resulting presentation.

2.4.2.3 As long as the segment offset lengths in the file header are accurate, the implementation must be able to skip past erred segments and any segments containing non-supported optional features or attributes. The implementation must otherwise properly interpret remaining file segments. The operator must be notified about segments that cannot be properly interpreted.

2.4.3 Nested CLEVELs

All NITF implementations must be capable of performing the basic NITFS file processing functions associated with each lower CLEVEL below that to which it is being tested/registered. All unpack implementations must be able to unpack any lower level compliant NITF file. All pack implementations must mark NITF files at the lowest CLEVEL that supports unpacking of the file, regardless of the maximum CLEVEL capability of the packing implementation. Generally, pack implementations should be able to pack NITF files of each CLEVEL below which it is capable in order to interchange files with other implementations of lower CLEVELs. When so required by the system sponsor, the system must be able to pack NITF files at each lower CLEVEL with contents that do not exceed the boundary conditions for each respective CLEVEL.

2.4.4 Common Coordinate System (CCS)

One of the differences between CLEVELs in Table 2-1 is the CCS size constraint. These constraints define the boundary rectangle of the combined displayable elements (image and graphic segments) contained within an NITF file for each respective CLEVEL. All pack capable implementations must constrain the size and location of displayable elements within the boundary of the respective CLEVEL of the file being packed. All unpack capable implementations must support the full extent of the Common Coordinate System size of the CLEVELs for which compliance is sought and apply the background color as specified by the originator of the file.

2.4.5 JPEG 2000 Compression

All unpack capable implementations must support JPEG 2000 decompression.

2.4.6 JPEG Discrete Cosine Transform (DCT) Compression

All unpack capable implementations must support JPEG decompression using the DCT, Huffman Entropy Encoding, and 8-bit and 12-bit precision mode of operation. All pack capable implementations with requirements to support JPEG compression must implement JPEG DCT using the specifications and guidance contained within MIL-STD-188-198A and do so within the bounds of the criteria established for unpacking. Implementations must support the use of restart markers in the compressed data.

2.4.7 Downsampled JPEG

All unpack capable implementations must support all features of Downsampled JPEG decompression. Pack capable implementations with requirements to support Downsampled JPEG compression must only pack this type of image segments within the bounds of the compliance criteria established for unpacking. All Downsampled JPEG image segments will be single band and single block; no larger than 2048 pixels per row and per column. (Note: These are constraints imposed by the Downsampled JPEG specification).

2.4.8 Lossless JPEG

Unpack capable systems may optionally support Lossless JPEG decompression. Pack capable implementations, with requirements to support Lossless JPEG compression, must only pack these type of image segments within the bounds of the compliance criteria established for unpacking.

2.4.9 Bi-Level Compression

All unpack capable implementations must support Bi-Level decompression using the Huffman Entropy Encoding. They must support unpacking in all three modes: One-Dimensional coding, Two-Dimensional coding with standard vertical resolution, and Two-Dimensional coding with high vertical resolution. Pack capable implementations with requirements to support Bi-Level compression must do so within the bounds of the criteria established for unpacking. All Bi-Level image segments will be single band and single blocked.

2.4.10 Vector Quantization (VQ) Compression

All unpack capable implementations must support VQ decompression and must comply with the specifications and guidance contained within Mil-Std-188-199 and the criteria established for unpacking. Pack capable implementations with requirements to support VQ compression must only pack VQ compressed image segments within the bounds of the criteria established for unpacking. Producers of VQ compressed image segments are solely responsible for the means of generating code tables resulting in appropriate quality of the decompressed imagery.

2.4.11 ARIDPCM Compression

The use of ARIDPCM compression is limited to NITF 1.1-formatted files. All unpack capable implementations must support decompression of ARIDPCM compressed image segments contained in NITF 1.1 formatted files. Pack capable implementations with requirements to support NITF 1.1 with ARIDPCM compression must do so within the bounds of the criteria established for unpacking.

2.4.12 CGM Graphics

All implementations must support unpacking NITF files that contain CGM graphic segments. Those implementations that support annotation using graphics in their native mode must support packing of CGM graphic segments. The applicable profile of CGM for NITF 2.1 is that described by MIL-STD-2301A. The applicable profile of CGM for NITF 2.0 is that described by MIL-STD-2301.

2.4.13 Bit-Mapped Symbols

The use of bit-mapped symbols is limited to legacy NITF 1.1 and 2.0 formatted files. All unpack capable implementations must support the unpacking and display of NITF version 1.1 and 2.0 files that contain bit-mapped symbols (graphic segments). NITF 2.1 pack capable implementations supporting graphics must only use CGM formatted graphics unless they are re-packing (into NITF 2.0) legacy NITF 2.0 files with existing bit-mapped symbols.

2.4.14 Monochrome

All unpack implementations must support unpacking monochrome image segments with the following NBPP pixel depths: 1, 8, 12, 16, 32, and 64 bits per pixel with ABPP pixel depths of 1, 8, 12, 11-16, 32, and 64 bits per pixel. All pack capable implementations with the requirement to pack monochrome image data must do so within the bounds of the criteria established for unpacking.

2.4.15 Color

All unpack capable implementations must support the unpacking and display of color image segments. (The display device does not necessarily need to be a color display.) Both single band (NBPP=1 or 8) with look-up-table (LUT), and three band (NBPP=8 for each band, total of 24 bits) must be supported. All pack capable implementations with the requirement to pack color image data must do so within the bounds of the criteria established for unpacking.

2.4.16 Multispectral

All unpack capable implementations must support the unpacking and display of multispectral image segments containing up to nine bands for CLEVEL 3 implementations, 256 bands for CLEVEL 5 and 6, and 999 bands for CLEVEL 7 implementations. All pack capable implementations, with requirements to pack multispectral image data, must do so within the bounds of the criteria established for unpacking.

2.4.17 Nodisplay Image Representation

Unpack capable implementations may optionally support image segments with matrix data having an Image Representation (IREP) of NODISPLY. When supported, the implementation must pass the data field content to the appropriate matrix data application according to the ICAT value for further processing. Implementations without a requirement to support no display matrix data must not be adversely affected when image segments containing such data are encountered. At the very least, the operator must be notified about segments that cannot be properly interpreted. Pack capable implementations with requirements to support the no display representation of matrix data must do so within the bounds of the criteria established for unpacking.

2.4.17.1 Elevation Data

Unpack capable implementations may optionally support exploitation of elevation matrix data contained within an image segment. Those systems that choose to implement this feature must do so in accordance with the criteria detailed in DIGEST 2.0, Annex D. In general, when a file contains an image segment with pixel data, a corresponding image segment with elevation matrix data and the appropriate Geospatial Support Data Extensions (GeoSDE), the implementation must be able to indicate the elevation for all pixels within the image pixel array that have elevation data associated with them. The implementation must also present the associated accuracy information given in the GeoSDE. All pack capable implementations with the requirement to pack elevation matrix data must do so within the bounds of the criteria established for unpacking.

2.4.17.2 Location Grid Data

Unpack capable implementations may optionally support exploitation of location grid data contained within an image segment. Those systems that choose to implement this feature must do so in accordance with the criteria detailed in DIGEST 2.0, Annex D. In general, if a file contains an image segment with pixel data, a corresponding image segment with location grid data and the appropriate GeoSDE, the implementation must be able to indicate the location coordinates for all pixels within the image pixel array that have location data associated with them. The implementation must also present the associated accuracy information given in the GeoSDE. All pack capable implementations with the requirement to pack location grid data must do so within the bounds of the criteria established for unpacking.

2.4.18 Masked Tables

All unpack capable implementations must properly interpret and use block and pixel mask tables. Unpack capable implementations must interpret and properly use the pad pixel value when defined in masked tables. A pad pixel value of zero must be treated as transparent. Pack capable implementations that insert block and/or pixel mask tables must populate them with accurate offset and related values.

2.4.19 Tagged Record Extensions (TREs)

TREs may appear in the following fields: UDHD, XHD, UDID, IXSHD, SXSHD, TXSHD, and the “TRE_OVERFLOW” DES regardless of CLEVEL. Only G/ISMC approved Tagged Record Extensions are allowed as shown in the TRE portion of the NITFS Tagged Extension Registry. As a minimum, unpack capable implementations must at least ignore TREs and properly unpack the segment in which the TRE exists. If the implementation supports the interpretation of TREs, it must also do so when the TREs happen to be located in a TRE_OVERFLOW DES.

2.4.20 Data Extension Segments (DESs)

Only G/ISMC approved DESs are allowed as shown in the DES portion of the NITFS Tagged Extension Registry. All unpack capable implementations must be able to interpret NITF files containing the STREAMING_FILE_HEADER DES. If the implementation supports the interpretation of TREs, it must also support the TRE_OVERFLOW DES. As a minimum, unpack capable implementations must at least ignore other DESs and properly unpack other supported file segments.

2.4.21 Reserved Extension Segments (RESs)

Only G/ISMC approved RESs are allowed as shown in the RES portion of the NITFS Tagged Extension Registry. As a minimum, unpack capable implementations must at least ignore RESs and properly unpack other supported file segments.

2.4.22 TACO2

All tactical systems, and those systems with requirements to interface with tactical systems, must provide a means for exchanging files. If TACO2 is chosen as a communications protocol, the IUT must demonstrate the capability to configure TACO2 parameter settings. TACO2 supporting systems may support and if so demonstrate point-to-point and Secure Telephone Unit-3rd Generation (STU-III) capability.

2.4.23 Communications Channels

All systems, and/or components within a system, must support the exchange of NITF files across whatever standard (ANSI, ISO, FIPS, Commercial, etc.) communication channel/protocol that is provided with the system/component. The file exchange capability must be supported between components within the system as well as between systems.

2.4.24 Physical Exchange Media

Systems with exchangeable media capability intended for distribution or exchange of imagery products, (e.g. magnetic disk, tape, optical disk, etc.) must be able to exchange NITF files via the media. All systems must provide some means to exchange NITF files for compliance test purposes. Most systems have some type of media peripheral(s) to at least support system operation and maintenance that can be used for this purpose. Alternative arrangements to complete compliance testing must be coordinated with the JITC Test and Evaluation Facility personnel when this is not the case.

2.4.25 NITF 1.1 Files

All NITF 2.1 unpack capable implementations may elect to support the unpack and interpretation of NITF version 1.1 files if the concept of operations calls for such support. All NITF 2.1 implementations are discouraged from packing NITF 1.1 files in order to allow the eventual elimination of legacy 1.1 files through attrition.

2.4.26 NITF 2.0 Files

All NITF 2.1 unpack capable implementations must be able to unpack any NITF version 2.0 compliant file as defined in the N0105. All pack capable implementations may optionally support the capability to pack NITF files within the constraints of NITF version 2.0 as defined in N0105. See Appendix K, Constraints for NITF 2.0 compliance.

2.4.27 Date Handling

Implementers must provide a statement summarizing their approach for resolving date handling associated issues. The summary must cover the NITF application, the operating system, and the platform upon which the product resides.

2.4.27.1 The following is some primary examples of date usage:

- Calculate the duration between two dates
- Calculate date based on starting date and plus or minus duration
- Calculate day of week, day of month, week of year, and month of year
- Evaluate Leap Year correctly
- Compare two dates
- Convert between various date representations
- Reference same date data addressed with different variables
- Store, retrieve, and display date data
- Move date data into memory
- Move date data across all interfaces

2.4.27.2 NITFS Form CTR-5, Date Handling System Awareness Checklist, in Appendix B provides the developer with questions that will assist in assembling the summary statement.

2.5 NITF 2.0 Criteria

2.5.1 CLEVELS 1 through 6

The NITFS Test Program Plan, N0105, defines the NITF 2.0 compliance criteria for digital imagery products. The following table provides a summary of NITF 2.0 compliance test criteria. This table, extracted from N0105, is provided here for convenience of the reader. Refer to the latest revision of N0105 for the authoritative version of this table.

Table 2-2. NITF 2.0 Compliance Criteria Summary

Compliance Level	* 1	2	3	4	5	6
Common Coordinate System Size (Pixels)	0064-1024 V X 0064-1024 H	0064-1024 V X 0064-1024 H	0064-2048 V X 0064-2048 H	0064-4096 V X 0064-4096 H	0064-8192 V X 0064-8192 H	0064-65536 V X 0064-65536 H
Image Blocking	Single	Single	Single and Multiple 32^2, 64^2, 128^2, 256^2, 512^2, 1024^2	Single and Multiple 32^2, 64^2, 128^2, 256^2, 512^2, 1024^2	Single and Multiple 32^2, 64^2, 128^2, 256^2, 512^2, 1024^2	Multiple 32^2, 64^2, 128^2, 256^2, 512^2,1024^2
Monochrome (uncomp)	8 Bits\Pixel With & w/o LUT IMODE = B	8 Bits\Pixel With & w/o LUT IMODE = B	8 Bits\Pixel With & w/o LUT IMODE = B	8 & 16 Bits\Pixel With & w/o LUT IMODE = B	8 & 16 Bits\Pixel With & w/o LUT IMODE = B	8 & 16 Bits\Pixel With & w/o LUT IMODE = B
JPEG (mono)	8 Bit sample IMODE B	8 Bit sample IMODE B	8 Bit sample IMODE B	8 & 12 Bit sample IMODE B	8 & 12 Bit sample IMODE B	8 & 12 Bit sample IMODE B
Color 8 Bit (RGB/LUT) No Compression	No	Single Band W/LUT IMODE=B	Single Band W/LUT IMODE=B	Single Band W/LUT IMODE=B	Single Band W/LUT IMODE=B	Single Band W/LUT IMODE=B
Color 24 Bit (RGB) uncomp	No	Three Bands No LUT IMODE=B,P	Three Bands No LUT IMODE=B,P,S	Three Bands No LUT IMODE=B,P,S	Three Bands No LUT IMODE=B,P,S	Three Bands No LUT IMODE=B,P,S
JPEG (color RGB)	No	8 Bit Sample IMODE=P	8 Bit Sample IMODE=P	8 Bit Sample IMODE=P	8 Bit Sample IMODE=P	8 Bit Sample IMODE=P
JPEG (YCbCr)	No	8 Bit Sample IMODE=P	8 Bit Sample IMODE=P	8 Bit Sample IMODE=P	8 Bit Sample IMODE=P	8 Bit Sample IMODE=P
Bi-Level Image	1bpp image w/wo LUT	1bpp image w/wo LUT	1bpp image w/wo LUT	1bpp image w/wo LUT	1bpp image w/wo LUT	1bpp image w/wo LUT
Bi-LEVEL Compression	COMRAT= 1D,2DS,2DH IMODE = B	COMRAT= 1D,2DS,2DH IMODE = B	COMRAT= 1D,2DS,2DH IMODE = B	COMRAT= 1D,2DS,2DH IMODE = B	COMRAT= 1D,2DS,2DH IMODE = B	COMRAT= 1D,2DS,2DH IMODE = B
Inset Image Overlays	0-4	0-4	0-19	0-19	0-19	0-19
Symbols	0-100	0-100	0-100	0-100	0-100	0-100
Aggregate Size	128 Kbyte max	128 Kbyte max	0.5 Mbyte max	1 Mbyte max	1 Mbyte max	1 Mbyte max
Bit Map Symbol Colors (1 BPP)	N,K,W	N,K,W, R,O,B,Y	N,K,W, R,O,B,Y	N,K,W, R,O,B,Y	N,K,W, R,O,B,Y	N,K,W, R,O,B,Y

Table 2-2 NITF 2.0 Compliance Criteria Summary (cont'd.)

Compliance Level	* 1	2	3	4	5	6
Object Symbols	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed
CGM SYMBOLS	PREFERRED	PREFERRED	PREFERRED	PREFERRED	PREFERRED	PREFERRED
Labels 1-320 characters each; color options same as for Bit-map Symbols	0-100 2,048 char max	0-100 2,048 char max	0-100 2,048 char max	0-100 2,048 char max	0-100 2,048 char max	0-100 2,048 char max
Text	0-5 Files 100,000 chars max. aggregate	0-5 Files 100,000 chars max. aggregate	0-32 Files 100,000 chars max. aggregate	0-32 Files 100,000 chars max. aggregate	0-32 Files 100,000 chars max. aggregate	0-32 Files 100,000 chars max. aggregate
Controlled Tags	Controlled tags may appear in the following fields: XHD, IXSHD, SXSHD, LXSHD, TXSHD, and 'Controlled Extensions' DES regardless of CLEVEL.					
Registered Tags	Registered tags may appear in the following fields: UDHD, UDID, and 'Registered Extensions' DES regardless of CLEVEL.					
Data Extension Segment	FUTURE USE Only for Systems that require use.	FUTURE USE Only for Systems that require use.	FUTURE USE Only for Systems that require use.	FUTURE USE Only for Systems that require use.	FUTURE USE Only for Systems that require use.	FUTURE USE Only for Systems that require use.
Reserved Segment	FUTURE USE Only for Systems that require use.	FUTURE USE Only for Systems that require use.	FUTURE USE Only for Systems that require use.	FUTURE USE Only for Systems that require use.	FUTURE USE Only for Systems that require use.	FUTURE USE Only for Systems that require use.
VQ Compression	4x4 Kernel 4 table w/wo masking	4x4 Kernel 4 table w/wo masking	4x4 Kernel 4 table w/wo masking	4x4 Kernel 4 table w/wo masking	4x4 Kernel 4 table w/wo masking	4x4 Kernel 4 table w/wo masking
VQ Monochrome	w/wo LUT IMODE = B	w/wo LUT IMODE = B	w/wo LUT IMODE = B	w/wo LUT IMODE = B	w/wo LUT IMODE = B	w/wo LUT IMODE = B
VQ 8-bit color	No	with LUT IMODE = B	with LUT IMODE = B	with LUT IMODE = B	with LUT IMODE = B	with LUT IMODE = B
TACO2	ALL SYSTEMS MUST SUPPORT NITF FILE EXCHANGE USING TACO2 PROTOCOL					

* 01 File < 1,213,000 bytes so that it fits on a 3.5" or 5.25" floppy disk.

Note: This table only provides an overview summary of certification criteria. Proper interpretation of the table is specified in the text of this chapter. CLEVEL "99" is used to designate an NITF 2.0 file not within the 1 to 6 CLEVEL definition.

2.5.2 STREAMING FILE HEADER DES

There is no known producer of the Streaming File Header DES and as such, there is no requirement to generate or interpret it. The original concept was as follows for NITF 2.0 and 2.1 and is provided as information:

NITF 2.0 (CLEVEL 7) Notice 2 to MIL-STD 2500A added CLEVEL 07 to mark NITF 2.0 files that use STREAMING_FILE_HEADER DES. In some operational circumstances (e.g. those with critical time or storage constraints) all the information (incomplete length fields) needed to populate the header fields may not be available at the start of file creation and transfer. STREAMING_FILE_HEADER, Data Extension Segment shall be used to provide the data needed to complete the file header. Incomplete length fields shall be populated with the character "9" (0x39) as a placeholder. Systems receiving a file with an incomplete header shall locate the DES and interpret the data in the DES as though it is actually located at the beginning of the file. The system may restore the file header fragment from the DES to populate the header. Any modification of this file shall result in the file being stored with a fully compliant and complete header and the Streaming File header DES removed. The STREAMING_FILE_HEADER DES for NITF 2.1 files is non-CLEVEL dependent. Each of the four NITF 2.1 CLEVELs (03, 05, 06 and 07) may make use of the SFH DES in NITF 2.1.

2.6 NITF 1.1 Compliance Criteria

2.6.1 Minimum Compliant NITF Field Values and Ranges

The following subset of NITF capabilities has been prescribed to ensure a common level of functionality with systems using NITF version 1.1. Related message parameters are described below.

1. Image/Sub-image Parameters. Imagery will be gray scale and may be from 8 x 8 to 512 x 512 pixels, 8 bits-per-pixel. Images may be either uncompressed or compressed using ARIDPCM. Since sub-images may be overlaid on a base image, there may be from 0 to 5 images per message. The size of the largest image in the message may be up to 512 columns by 512 rows. The aggregate size of all remaining images within a message must not exceed 50 percent of the base image.

2. Symbol Parameters. Symbols will be bit-mapped and may be 1 to 512 lines of 1 to 512 pixels per line, 1 bit-per-pixel, in white foreground on black background (N), black foreground on transparent background (K), or white foreground on transparent background (W). There may be 0 to 100 symbols per message. The maximum aggregate size of all symbols within a message must not exceed 262,144 bits.

3. Label Parameters. Labels will be in STA between 0 and 320 characters long. They may be white foreground (text) on transparent background, white on black, black on transparent or black on white. There may be 0 to 100 labels per message. The aggregate size of all labels within a message must not exceed 2,000 STA characters.

4. Text Parameters. Text files will be composed of STA characters. There may be 0 to 5 text files per message. The aggregate size of all text files within a message must not exceed 10,000 STA characters.

5. Display and Attachment levels. Although NITF 1.1 included display and attachment levels, there is one significant difference when compared to how NITF 2.0 and 2.1 implement them. NITF 1.1 allowed a display level of 0 (Zero). A zero display level is not allowed in NITF 2.0 and 2.1. ,therefore, care must be taken when converting between these formats to logically adjust Display levels and their associated attachment levels.

2.6.2 Minimum Compliance Capabilities:

2.6.2.1 Receive/Interpret (Unpack) Capabilities. An NITF compliant Receive (unpack) capable system must be able to receive and unpack any minimum compliant NITF file.

2.6.2.2 Transmit/Generate (Pack) Capabilities. An NITF compliant Transmit (Pack) system must be able to pack and transmit a minimum compliant NITF file that will include selected combinations of:

- 0 images per message (Note: in NITF 1.1 “files” were referred to as “messages."
- At least 1 image per message
- Compressing imagery with ARIDPCM using at least 1 rate (optional)
- 0 symbols per message
- At least 1 symbol per message, if there is no symbol waiver
- 0 labels per message
- At least 1 label per message, if there is no label waiver
- 0 text files per message
- At least 1 text file per message, if there is no text waiver

2.7 Date Handling Compliance Criteria:

2.7.1 Although most date handling related issues have been resolved through the update of applications and operating systems, some specific date handling issues will remain for some time. The most significant issue remaining has to do with converting between legacy formatted files (1.1 and 2.0) and NITF 2.1.

2.7.2 All presentation to users of dates will use four-digit year regardless of the internal or NITF file representation of the date.

2.7.3 All date sensitive manipulation or calculations will be done with due consideration for the appropriate century.

2.7.4 For NITF 2.0 and NITF 1.1 formatted files, the implementation must associate century according to the Window Date Rule established by NIMA. It must be noted, however, that the application of the window date rule must be logically applied and not arbitrarily. For example, Dates of Birth found in some TREs cannot be interpreted using the Window Date Rule as it may result in improper interpretation. i.e., some born in 1946 would be interpreted as not born yet or having a negative birth date.

1. For NITF header and subheader date fields (TBD001),

2. For product specific data fields (TBD002)

2.8 Use of CLEVEL 99:

CLEVEL 99 was introduced in NITF version 2.0 to accommodate certain systems/programs that needed to produce compliant NITF files using features outside the constraints of the existing CLEVEL definitions. The use of this CLEVEL is discouraged and should not be used, as most NITFS test systems will not be able to interpret the file. The predominant use of CLEVEL 99 is for files that exceed the 2-gigabyte file size constraint of CLEVEL 06.

3 COMMON NITFS IMPLEMENTATION PRACTICES & GUIDELINES

3.1 General

3.1.1 All data in ECS-A or BCS-A populated NITF Header and Subheader Fields are left justified and padded to the right boundary with BCS Spaces (code 0x20).

3.1.2 All header and subheader fields that are designated as required (R or <R>) must be present and contain valid data within the specific range.

3.1.3 All header and subheader fields that are designated as conditional (C or <C>) are present only if indicated by the value of one or more preceding fields and must contain valid data within the specific range.

3.1.4 All Data types (Segments) must be placed following the NITF header fields in the following order: Image Segment(s), Graphic Segment(s), Text Segment(s), and Data Extension Segment(s)

3.2 Originating Station Identification (OSTAID)

The Originating Station ID is a required alphanumeric field in the NITF file header that contains the identification code or name of the organization, system, station, or product. This field may not contain all BCS-A spaces (0x20). Generally, the user can set this field either at file creation time or through some default (header) setting depending on the CONOPS.

3.3 Product Identification and File Naming

3.4 Date and Time Fields (FDT, IDATIM, TXTDT)

3.4.1 The File Date and Time (FDT) field contains the UTC time (Zulu) of the origination of the file. The value in this field is updated each time the file is modified and saved.

3.4.2 The Image Date and Time (IDATIM) field contains the date and time of the image acquisition. Once populated, the content of this field is never changed. The importance of this field is often over-looked or misunderstood. Image analysts often compare images of a given area to determine changes over time. If the IDATIM is changed to anything other than the actual acquisition time, it is obvious what kind of problem that could create. Libraries use this field to catalogue an image for discovery and retrieval by users, so again, it is important that it maintain the actual acquisition date and time.

3.4.3 The Text Date and Time (TXTDT) field contains the time of the text origination. The field value is updated any time the text content is modified and saved.

3.4.4 Hyphens are used for unknown components of the date and time field. There may be legacy systems that used unique methods for handling the generation of date and time information prior to the official process being approved. NOTE A method will be added to document these ad-hoc methods probably in System Description

3.5 Security Fields

3.5.1 General

3.5.1.1 The NITFS provides a mechanism for internally recording security markings and handling instructions for the overall file as well as individual data segments within the file. Generally, the same capability available for marking portions of a hard copy document can be applied when marking an NITF file. Each Image, Graphic, Textual, and Metadata segment within an NITF file can be independently marked and the overall NITF file can be marked to represent the accumulative classification of the individual segments within the file.

3.5.1.2 The NITFS does not specify security policy or concept of operations for secure handling of imagery and related data. The standard simply provides the means (security fields) for including security markings in NITFS formatted data files. System sponsors, developers, and users should work together at the community and imagery system level to apply a combination of technical and procedural practices to address security. This section provides information and guidance to support this process. Sponsors and Developers can assist users and security managers by considering and making implementation choices that facilitate achieving proper security handling of NITF files. A brief description of how security marking is handled in the NITFS is as follows.

- NITF 2.1: The concept in NITF 2.1 for security handling is similar to that traditionally used for hard copy documents based on the Controlled Access Program Coordination Office (CAPCO) guidelines and Executive Order (EO) #12958. The NITF 2.1 data fields for security directly correlates to the security elements of information defined in EO #12958.

- NITF 2.0: NITF 2.0 also has a robust marking capability but were defined prior to the publishing of EO #12958. Legacy data production centers continue to produce and disseminate data with security marking conventions that pre-date EO #12958. Even so, the security data field values can be interpreted and used within the guidelines of current security policy established at individual facilities or operations centers based on CAPCO guidelines. Recommended practice for correlating NITF 2.0 security fields with the EO #12958-based NITF 2.1 security fields is provided in appendix G.

- NITF 1.1 (Legacy): A limited capability existed for NITF 1.1 security marking which although unique, has evolved and been improved upon in later versions of the NITFS.

3.5.1.3 Common Implementation Considerations

3.5.1.3.1 File type conversions. When systems convert file types that do not have internal security information to NITF, a method may be required to ensure operator/human intervention is accomplished to ensure the NITF security fields are properly populated when a new file is generated from an external format. I.e., TIFF, GIF, TFRD.

Converting security field information between NITF 2.1 to 2.0 may not be a one-for-one conversion depending on the specific situation. To provide a common practice for conversion, a transliteration scheme is provided in appendix G for use within the NITFS community.

3.5.1.3.2 Security marking preservation. Some imagery applications convert NITF to an internal format for data processing, exploitation, etc. purposes. The modified imagery data may then be exported in NITFS format. Care must be taken that proper security marking of the data is maintained throughout the process. Consideration must be given that adding "value" to the data may also increase the required security marking for the value-added product.

3.5.1.3.3 Security information alteration. Since each segment in an NITF file has its own set of security fields, care must be taken when an NITF file is altered to ensure that security information is also logically altered. For example if a “(S) SECRET” file is being changed to include a “TOP SECRET” segment the overall file classification must altered to “(TS) TOP SECRET” accordingly. As with hard copy documents, human intervention should be considered a must when this occurs. Implementers can assist users by incorporating user-alerts into the interface when such changes occur.

3.5.1.3.4 NITFS Data Integrity/Security. The NITFS provides a mechanism to allow Digital Signatures to be applied to NITF file through the use of PKI compatible Tagged Record Extensions. (NOTE: The NTB has not fully validated and approved these TREs).

3.5.1.4 Community/System Implementation Considerations

3.5.1.4.1 Primary NITF data producers. Primary producers of NITFS files should ensure the security fields are properly populated before dissemination at the time of production, as failure to do so will create security issues for downstream users of the data.

3.5.1.4.2 ELT/Workstations. ELT Graphical User Interface (GUI) should be developed in a manner that ensures the operator is made fully aware of the security values located in the security field set in an NITF file being interpreted/viewed. Unless the interface is developed to read, interpret, and make the information available in human readable form for both viewing and in some cases editing by the operator, full advantage of the security fields cannot be realized. It is important for the GUI to prominently display the overall NITF file classification using an “always on top” banner type label.

Incorporating features such as drop-down menus, user alerts, and access controlled configurable default field values can be beneficial to facilitating proper security.

3.5.1.4.3 Image Libraries. Sponsors and developers of image libraries should consider the security marking and handling of NITF files when ingesting, converting and disseminating them. A combination of automated and human intervention procedures may be required to ensure proper security marking and handling is accomplished.

3.5.1.4.4 Image Guards. Applications with a primary function to provide some level of automatic downgrading of NITF files or movement between classification levels; i.e., Radiant Mercury and ISSEGuard. These applications are generally required to undergo formal security accreditation in addition to achieving NITFS compliance before fielding.

3.5.2 Background

For a US File Security Classification System, the following documents will provide information assisting in the population of the security group fields.

- Executive Order 12958, Classified National Security Information, 17 April 1995.

- DCID 1/7, Security Controls and Dissemination of Intelligence Information, 30 June 1998. (U/FOUO)

- Controlled Access Program Coordination Office (CAPCO), Intelligence Community Classification and Control Markings Implementation Manual and Register.

- IC Chief Information Officer, Intelligence Community Inter-Domain Transfer Policy, 9 November 1999, Draft. (U/FOUO)

- FIPS PUB 10-4, Countries, Dependencies, Areas of Special Sovereignty, and Their Principal Administrative Divisions. April 1995.

3.5.3 File Generation/Packing Guidelines

3.5.3.1 General

3.5.3.1.1 Ability to establish default settings in imagery application software for security field population. Developers should consider how to assist users in properly handling security of NITF files by building in ways for them to easily access view and if necessary modify security information in the headers. There is always a danger in having the software do some things automatically without user knowledge or input. For example, the operator should always be involved in the changing of security information in an NITF file.

3.5.3.1.2 One way to assist users and help ensure proper population of security information is to provide ‘drop down menu lists’ for content selection vice unaided free text entry. This reduces or eliminated the chance of unapproved security terms/words/codes being used.

3.5.3.1.3 GUI for lists to show 'human' view for selection along with actual code value:

- Allowance for operator to override list selection with free text entry
- Maintenance/editing of drop down list entries
- Master lists and pared down short lists
- For NITF 2.1 fields
- For NITF 2.0 fields

3.5.3.2 File Unpack/Interpret Guidelines

3.5.3.2.1 Banner presentation of security markings for human view per CAPCO guidelines

- Map NITF 2.1 field values/codes to CAPCO banner presentation
- Map NITF 2.0 field values/codes to CAPCO banner presentation
- When presenting actual security field content:
  - Show actual code/value in the field, and
  - Show the expanded presentation of the field code/value for human view

3.5.3.2.2 Country Codes. There has been confusing and often conflicting guidance being issued as to the use of two character country codes or three character country codes. Developers should continue to use FIPS 10-4 2-character codes.

3.6 File Background Color (FBKGC)

The concept of file background color was introduced during the NITF 2.0 era (Change Notice 2). An interoperability problem was discovered in the field when the receiver's default background color (color of the 'canvas area' established by the extent of the Common Coordinate System) was different from the originator's background color. This mismatch created the potential for the originator's symbol/text annotations to not be visible on the receiver's screen. To allow the designation of FBKGC without disrupting the integrity of the format, the first three bytes of the ONAME field were re-designated as the FBKGC field for use in specifying the file background color. The values placed in the FBKGC field are to be interpreted as three 8-bit binary RGB values in Red, Green, and Blue order. The use of the FBKGC field continues in NITF 2.1.

Per the ISO BIIF standard, the fields within the NITF headers are constrained to be UTF-8 encoded characters. Unfortunately, the use of the binary RGB value in the

FBKGC field deviates from this constraint of the ISO standard, a fact for which awareness only came after a large number of systems had already implemented the feature. Consequently, NITFS will continue to use the FBKGC field as currently specified while acknowledging the minor deviation from the BIIF standard. Implementers are cautioned that values placed in this field may adversely disrupt the logical sequence of a UTF-8 encoded text stream if/when attempting to read this field as a character field.

Implementers need to accommodate the dual use of the FBKGC/ONAME field in NITF 2.0 files due to the possibility of older files not having a FBKGC value in the first three characters of what was the ONAME field. The following logic is a recommended practice for coping with the NITF 2.0 situation:

- For purposes of setting the background color for display of the NITF composition, interpret the file as if the FBKGC field exists with a proper RGB value. Even if the field was populated with the first three characters of the originator's name, the character codes can be used as if they were an RGB value to establish a background color.

- When presenting the content of the ONAME field to the user, include the FBKGC field value and let the user discern whether it is an RGB value or the first three characters of the ONAME value.

- Retain the FBKGC/ONAME value 'as is' when resaving the file unless expressly edited by the user modifying the file. Force the use of the split FBKGC/ONAME fields if/when the user decides to edit/modify the fields.

- See appendix F for recommended practices when automatically doing file conversion services.

3.7 Originator's Name and Phone Number (ONAME, OPHONE)

Historically the use of the ONAME and OPHONE fields has varied from system to system. In some cases direct operator action must/may be taken to populate these fields while some systems may provide default values that can be changed by the operator. The use of these fields should be considered by the CONOPS at all points/times in the lifecycle of an NITF file. It is difficult to establish steadfast rules as is it may not be possible in the evolving imagery architecture to assume a file will be confined to a particular user community. Given that, an operator's name and phone is essentially "parsible" information. The Application Summaries contained in this document provide the information on how particular systems are populating these fields. The following is a general guideline:

[EDITOR'S NOTE: We are providing these as a starting point, comments are welcome.]

Producer: Primary imagery sources populate with general source if classification level allows it, NOTE: there are TREs where sensors/producers provide origination type information.

Secondary Dissemination Point, i.e., ground station: Imagery simply passing through a ground system would not alter the information as it comes from the producer.

Exploitation Workstation: Probably the first point of population where the primary analyst should apply the information.

Follow on exploitation: When further exploitation is made the analyst should update the ONAME and OPHONE with their information.

Archiving: Upon ingest into an image library the fields should retain the incoming information.

3.8 Image Representation

The IREP field is intended provide information to indicate the general kind of image that is represented. For example, an image where each pixel is represented based on a Red Green and Blue color value would be RGB. This field should be used in conjunction with the ICAT, ISUBCAT and IREPBAND fields to interpret the significance of each band in the image.

[EDITOR'S NOTE: Add discussion on IREP=MULTI when extracting bands from multiple band data. E.g., relationship using MULTI vs. MONO, RGB, or RGB/LUT with the extracted bands.]

3.9 Image Category and Product Discovery Attributes

The intent of the ICAT field in the image subheader is to provide general category of in the image segment. For example, a Synthetic Aperture Radar would have an ICAT of SAR and Map would have an ICAT of MAP. This field is generally not intended to be used for making processing decisions regarding the image segment.

Processing information needed by a system can be found in the other image subheader fields. This filed can be useful for discovery and retrieval for image archives. I.e., A user may want to retrieve all the SAR image tied to a geographical area.

3.10 ICORDS/IGEOLO

3.10.1 When populated, the NITFS image subheader ICORDS/IGEOLO fields provide a bounding polygon (four points) for the coverage of the image data on the earth. The coordinates in these fields are intended to provide general orientation/coverage only, and are not intended for any interpretation other than to establish the approximate location on the earth (e.g. for data discovery/retrieval purposes. For applications that require precise and accurate location information, the use of support data from appropriate TREs is required.

3.10.2 To help meet tight production and dissemination timelines, some imagery collection and production systems are known to populate IGEOLO with rough approximations of the corner points even when the actual imagery products have support data (TREs) that allows more accurate and precise determination of the corner point geographical locations. This practice can result in an exploitation/mensuration tools getting different geographical location values for the corner points when using the support data as compared to those populated in the IGEOLO field. Applications/tools that present geographical coordinates to the user need to have some readily apparent means to identify the source of data and means for calculating positional values. E.g. derived from linear interpolation from IGEOLO corner point values or grid point matrices, RPC equations, camera model parameters, replacement camera model, with or without use of elevation data, etc.

3.10.3 When four corner points are included in the file and the image is not covering the entire image display space the corner points may not represent the corner pixel in the displayed image. In these cases, the corner point should represent the pixel where the intelligent ground point is. For example where a horizon is in the image the corner point would not represent the point in the sky but rather the point on the ground nearest see figure below.

[Figure TBD003]

3.11 Image and Data Compression

3.11.1 The NITFS incorporates the use of various image compression algorithms to facilitate different operational requirements. Generally, they are as follows:

3.11.2 JPEG Lossy and Lossless compression: Used for continuous tone types of imagery such as photographic images.

3.11.3 Vector Quantization: Used for compressing maps. This compression is used primarily by NIMA to compress maps. For this reason NITFS applications are only required to decompress and display VQ compressed NITFS image segments.

3.11.4 Bi-Level or Facsimile compression. This compression algorithm is used for two color images of one bit-per-pixel and complies with the category 3 Facsimile standard to allow for interoperability with facsimile images.

3.11.5 ARIDPCM Used in NITF version 1.1 ARIDPCM was the compression used prior to the incorporation of JPEG. Creation of ARIDPCM is not allowed in NITF 2.0 or 2.1. Systems that may encounter NITF 1.1 files should allow for the decompression of legacy ARIDPCM NITF 1.1 files.

3.12 Reduced Resolutions

Proper marking, identification and use of the image magnification/reduction factor value in the Image Magnification (IMAG) field of the Image Subheader are critical to a variety of image exploitation processes. This is particularly true, for example, when TREs containing support data referenced to the original source image row/column grid are preserved/copied into reduced (or enlarged) resolution image segments. To make proper use of the original (unmodified) support data, it is essential to maintain the correlation of the pixel value row/column indices in the magnified/reduced image array to their original row/column grid positions upon which the support data is based.

3.12.1 Unpack

3.12.1.1 Presentation of the pixel values in each image segment are aligned with the row/column reference grid of the Common Coordinate System (CSS) regardless of the individual image resolution as expressed in the IMAG field of each image segment. The first pixel of each image segment is located in the CSS at the row/column point indicated in the ILOC field relative to the attachment level reference point.

3.12.1.2 When using image support data (e.g. TREs) for image exploitation functions, the magnification (or reduction) factor, relative to the original source image resolution upon which the support data is based, must be included in the exploitation process.

3.12.1.3 When the IMAG field is populated with the designated default value, 1.0 (or 1.00), the image support data is interpreted as being directly correlated with the pixel array data in the image segment.

3.12.1.4 When decimal values (vice the /2, 14, /8, etc. convention) appear in the IMAG field to indicate the magnification (or reduction) factor, the potential impact of the available precision in the field must be considered in the 'error budget' of exploitation processes using the value.

3.12.1.5 When an ICHIPx TRE is available for the image segment, the reduction/magnification value in the SCALE_FACTOR field takes precedence over the corresponding, but potentially less precise, magnification/reduction value in the IMAG field. (NOTE: It is recommended that the implementation provide a means to alert the user if the values in the SCALE_FACTOR and IMAG fields are inconsistent when performing exploitation functions involving resolution considerations.

3.12.1.6 When exploiting JPEG 2000 compressed image data, multiple resolutions of the image data may be available for extraction from the compressed data stream. Some compressed data streams may not include all the data (code blocks) needed to extract the full resolution upon which the support data is based. The correlation of the pixel value row/column indices in the magnified/reduced image array to the row/column grid positions upon which the support data is based must be maintained regardless of which available resolution of the image data is extracted from the compressed data stream.

3.12.2 Pack

3.12.2.1 An NITF file may be packed with multiple image segments, some of which have different resolutions (different IMAG values). When doing so, the image segments are placed in the NITF Common Coordinate System (CCS) using the ILOC field values to identify the row/column position (relative to the attachment level reference point) of the first pixel of each image array in the CCS regardless of individual image segment resolution.

3.12.2.2 The value in the IMAG field of each image segment represents the resolution magnification (or reduction) factor of the segments pixel array data as compared with the original source resolution of the image data upon which the image segment's support data is based.

3.12.2.3 When the resolution of the image pixel array data and associated support data directly correlate, the IMAG field is populated with the designated default value, 1.0 (followed by a space character), or alternatively, 1.00.

3.12.2.4 For reductions that are reciprocals of non-negative powers of two (2), the IMAG field is populated using the /2 (for 1/2), /4 (for 1/4), etc. convention. Otherwise, decimal values are used to indicate the magnification (or reduction) factor.

3.12.2.5 When the precision available in the IMAG field is not adequate to support the intended exploitation of the image and its support data, the ICHIPx TRE (SCALE_FACTOR field) is used to contain the increased precision reduction/magnification value. The values placed in the IMAG and SCALE_FACTOR fields must be consistent with one another, varying only in representation and precision. (NOTE: The factor value representation in the SCALE_FACTOR field is the reciprocal of the value representation approach used in the IMAG field.)

3.12.2.6 When the image data is JPEG 2000 compressed, the IMAG field value is populated with the highest resolution available for extraction from the compressed image data stream relative to the original source image data upon which the image segments support data is based.

3.13 Image Data Mask Tables (TBD004)

3.14 NITFS Common Coordinate System (CCS)

A basic concept employed by the NITF is that of the CCS. The concept is simply that all of the displayable elements in an NITF file fall within a virtual bounding rectangle of those elements. It is that resulting bounding rectangle that is identified as the CCS for a particular NITF file. The primary impact is that the CCS has an impact on the CLEVEL of the file. The CCS is independent of the display device but some means such as panning must be available to allow the operator visual access to all of the CCS.

3.15 Image, Graphic/Symbol, and Text Overlays

3.15.1 NITF allows the non-destructive overlaying of graphic data within the CCS of an NITF file. This is a significant feature of the NITF. The factors that impact the use of this capability are Display and Attachment levels as well as relative locations of overlays within the CCS.

3.15.2 Implementers should consider the impact on overlays when performing functions such as rotating and zooming. For example, if an image is rotated that has an overlaid graphic the graphics meaning and significance may change if it is not rotated with the image. Generally, there are three ways to handle this situation. First the overlay can be rotated with the image maintaining its relative position and then “Burned in” to the image. Second, the overlay is automatically removed from the rotated image. The third and preferred method is to rotate the overlay in a manner that allows it to remain as a nondestructive graphic.

3.16 Text Segments (TBD005)

The NITFS provides for the inclusion within an NITF file of textual segments. These segments may be in the following formats:

STA - Standard ASCII, basic character set

MTF - Standard ASCII, basic character set

UT1 - Standard ASCII, extended character set

U8S - UTF-8 2-byte character encoding

3.17 Tagged Record Extensions

3.17.1 Within NITF 2.1, the primary method of packaging metadata is through the application of TREs. TREs represent a set of configuration managed data segments that may contain a variety of information related to the entire NITF file or a portion of the NITF file. The following principles or concepts are applicable to TREs:

1. They generally are configuration controlled and published to avail themselves to the NITF community.

2. They are uniquely named and registered to ensure their integrity is preserved and controlled.

3. The last character is generally used to "version" the TRE so that as it is changed/updated its root name will still indicate its relationship with previous versions.

4. TREs are usually grouped on the "register" by user groups, i.e., airborne related TREs.

5. Anyone may nominate a new TRE. Generally, the concept is to use an existing TRE if it will accomplish the objective or create a new version if only minor modifications are needed to the resulting new TRE will be of use to the target users.

3.18 Data Extension Segments

Data Extension Segments are a mechanism to allow stand alone data types to be incorporated in an NITF file.

3.19 NITFS Usability

3.19.1 Usability Guidelines

The NITFS documents do not currently identify requirements for the usability of systems that implement NITFS. A system can be in technical compliance with the standards, yet not be well suited for use in its targeted user environment. The following usability factors are based upon observations made during past NITFS compliance tests. The purpose is to raise awareness of human factor considerations when developing a system. Implementers are encouraged to identify additional usability factors pertinent to the fielding objectives of the NITFS system being developed.

3.19.2 Target Audience Description

The developer has prepared a target audience description for the system and used it in the design and development of the system. An appropriate Human Factors Engineering (HFE) and Safety evaluation has been conducted.

3.19.3 Operator’s Manual

An up-to-date operator's manual for the system was available at the time of compliance testing.

3.19.4 Consistent User Interface

The system has a consistent user interface with the appearance of a single integrated application. There is no perception of needing to exit and enter multiple routines to handle NITF operations. There is no need to enter commands at the operating system prompt once the application is started.

3.19.5 Header/Subheader Defaults

The system does not require an operator entry for each and every NITF file header or subheader field value. It provides some mechanism for establishing default values and automatic calculation of values where appropriate.

3.19.6 Header/Subheader Edit

The system does not use hard coded header/subheader defaults that cannot be changed without re-coding and recompiling the program. The system provides edit capabilities for header/subheader values in a controlled manner depending on the access privilege of different levels of users.

3.19.7 Screen and Imagery Board Correspondence

A method is provided to handle the circumstance when the screen or other rendering device does not have the same pixel display capacity as the imagery processing board. There are clear procedures for setting up the appropriate parameters for proper image display. There is some means to alert the operator that the rendered image may be cropped because the display device does not handle the full image size as received (when no roaming or panning capability is provided).

3.19.8 Automatic Rendering

NITF file components are automatically displayed according to the NITF file header values without operator intervention; i.e., the operator is not required to read NITF header values and manually place components of the file for display.

3.19.9 Direct Text Entry

The system allows for the entry of text without the operator needing to be aware of special procedures for insuring only the NITFS STA, UT1, U8S and MTF set of characters (without special word processing control codes, but with proper CR/LF line terminators) are entered into the NITF file.

3.19.10 User Alerts

There is some method to alert the operator that text or image comment fields are included within the NITF file being viewed and there is a convenient means to view the contents. The operator is alerted to other aspects regarding the file being viewed that are not readily apparent from the image display (such things as: user defined or extended data is included in the file; the image has color components but has been modified for display on a monochrome system; the file is in NITF 1.1, 2.0 or 2.1 format; security code words are included in the file headers; particular components could not be properly parsed or interpreted, etc.).

3.19.11 Automatic Assist

The implementation assists the operator in preparing NITF files that do not exceed the established boundary conditions for a specific CLEVEL. There is no excessive dependence on operator knowledge or procedures to insure only compliant files are packed.

4 ARCHITECTURE-RELATED NITFS IMPLEMENTATION GUIDELINES

4.1 General

Within the NSGI architecture there has evolved separate communities or sub architectures each with unique requirements; i.e., National, Airborne/Tactical. At the same time the objective NSGI architecture provides a homogeneous environment where data can easily be accessed and used between these individual communities, across the Global Information Grid (GIG). The NITFS has been designed to provide sufficient functionality to serve the entire NSGI community. In doing so the features supported by the NITFS fall into two significant areas, required and optional. This allows the acquisition community to properly size NITFS capable systems such that program cost are reduced while still affording a baseline level of interoperability across the NSGI. Full interoperability at the user level can only be achieved, however, if the optional NITF features are properly selected for support during the acquisition process. This encompasses understanding the data flow and interfaces involved with the subject system.

4.2 Archetypes (TBD006)

4.3 Source Production Systems

4.3.1 Producers. Generally, these sources generate imagery. The platform type can vary. The following are known NITF related systems (Note: Existence in this section/list does not assume active NITFS compliance, please consult the NITFS registry http://jitc.fhu.disa.mil/nitf/nitf.htm):

4.3.1.1 National Technical Means (NTM)

4.3.1.2 National Production Systems

1. Enhanced Production System (EPS). The EPS produces compressed and uncompressed, unexploited, single segment NTM images in NITF version 2.0 format files.

2. Low Cost Media (LCM). The LCM system produces compressed and uncompressed, unexploited, single segment NTM images in National Imagery Transmission Format (NITF) version 2.0 format files.

3. Dissemination Element (DE). The DE is a system that is designed to provide users with National Imagery on a near-real-time basis.

4.3.1.3 NIMA In-house Production Products (DPPDB, CIB, CADRG)

4.3.1.4 NIMA Out-sourced DPPDB Producers. The DPPDB provides the warfighter with a deployable resource, in a computer workstation environment, that can quickly and accurately derive latitude, longitude, and elevation.

1. Raytheon DPPDB Production System (RDPS).
2. Orbital DPPDB System (ODPS)
3. Harris Geospatial Information Production System (GIPS)

4.3.1.5 NIMA Outsourced Controlled Image Base (CIB) Producers. CIB is a dataset of orthophotos, made from rectified grayscale aerial images. CIB supports various weapons, C3I theater battle management, mission planning, digital moving map, terrain analysis, simulation, and intelligence systems.

1. Orbital Image CIB Production System
2. Raytheon CIB Production System

4.3.1.6 Airborne Producers

1. Global Hawk
2. Common Imagery Processor (CIP) Ground Station. CIP is intended to accept input from several image/sensor sources and from them produce NITF 2.1 and 2.0 compliant files.
3. Tactical Exploitation System (TES)
4. Tactical Input Segment (TIS)
5. Tactical Exploitation Group (TEG)
6. Tactical Unmanned Aerial Vehicle (UAV). The TUAV system provides intelligence collection and targeting capability as a direct support asset to the Brigade Commander and his staff.
7. Senior-Year Electro-Optical Reconnaissance System (SYERS)
8. Joint Surveillance Target Attack Radar System (Joint STARS) Common Ground Station (CGS) Group. The Joint STARS CGS is a mobile multi-sensor Command, Control, Communications, Computers, and Intelligence (C4I) Imagery Intelligence tactical data processing and evaluation center.
9. Common Imagery Ground/Surface System (CIGSS) Screener
10. SHAred Reconnaissance Pod (SHARP)
11. ASARS 2 Improvement Program (AIP)

4.4 Exploitation Applications

4.4.1 Government Developed Explotation Systems

1. Integrated Exploitation Capability (IEC). The IEC provides users with an imagery exploitation suite of capabilities focused on the specific varieties of NITF version 2.0 products available from National sources.

2. Global Command and Control System (GCCS)

3. Joint Services Imagery Processing System - Navy (JSIPS-N)

4. Commercial Application Work Station (CAWS) (Comprised of MATRIX and MET)

5. Multisource Automatic Target Recognition with Interactive Exploitation (MATRIX). The MATRIX is a prototype demonstration softcopy image and analysis, support data processing and display system designed to support imagery exploitation requirements, such as Indications & Warning, target monitoring, and dynamic targeting.

6. MET

7. Front End Processing Environment (FPE)

8. Multisource Intel Toolkit (MINT)

4.4.2 Commercial Exploitation Products

1. ERDAS IMAGINE. ERDAS IMAGINE is an image, mapping, and visualization product.

2. PARAGON family of applications. Paragon Imaging, Inc. Electronic Light Table (ELT) products provide image processing and exploitation capability or, in some cases, limited display and exploitation functionality for a wide variety of users.

3. Digital Imagery Exploitation Production System (DIEPS).

4. Air Force Research Laboratory (AFRL). The primary objective of the AFRL Image Viewer is to display NITF files, Universal Data Format (UDF) hyperspectral imagery, JPEG, GIF, and PNG images.

5. PhotoTelesis Image & Communication Environment (ICE). ICE 4.0 provides imagery capture and tactical communication functions to the Lightweight Video Reconnaissance (LVRS) Army program and the Over-The-Horizon (OTH) Airborne Sensor Information Systems Navy program.

6. RemoteView

7. Visual Information Technology (VITec). This commercial software product provides users with the capability to display, parse, and exploit NITF files.

8. Whiteboard

9. Power Image

10. Common Spectral Measurement and Signature Intelligence (MASINT) Exploitation Capability (COSMEC). The COSMEC is a spectral processing software package focusing on analysis and interpretation of spectral data.

4.5 Archive and Dissemination Applications

1. Image Product Library (IPL). The IPL plays a significant role in the NSGI Architecture providing for the storage, cataloging, discovery, retrieval, and delivery of imagery products to users of the USIGS.

2. NIMA Library (NL). The NL plays a significant role in the NSGI Architecture by providing for the storage, cataloging, discovery, retrieval, and delivery of imagery products to USIGS users.

3. Demand Driven Direct Digital Dissemination (5D)

4. Information Access Service (IAS)

5. NMA Common Client (CC)

6. Digital Products Data Warehouse (DPDW)

4.6 Management Applications

1. Imagery Exploitation Support System (IESS)

2. Air Force Mission Support System (AFMSS)

3. National Exploitation System (NES)

4. Template's Enhanced Integration Tool (EIT)

4.7 Commercial Imagery Providers

1. Space Imaging

2. DigitalGlobe Quickbird 02 (QB02). The QB02 is an imagery collection and production system that produces high-resolution earth images in a variety of processing levels.

3. Orbital Image

4.8 Specialized Applications and Code Libraries

a. NITF Services Library (NSL). The NSL is a set of Application Program Interfaces (APIs) that will be used to provide NITF and imaging capabilities for the latest release of DII COE software. This is in support of the Joint Department of Defense

(DOD) community and specifically the Defense Information Systems Agency. Application developers will use the public APIs provided by the NSL to process, display, and create NITF products. The NSL is being included in the Defense Information Infrastructure (DII) Common Operating Environment (COE) as a COE Component of the Imagery Toolkit (IMTK). The NSL will eventually become the mandated set of APIs to use when processing NITF, North Atlantic Treaty Organisation (NATO) Secondary Imagery Format (NSIF), and Basic Imagery Interchange Format (BIIF) imagery in the DII COE.

b. KODAK NITF Services Library. The Kodak Image Analysis Framework (IAF) Re-useable Software Libraries were developed for a Kodak customer specifically to view NITF images that are typical of data structures coming from national sources, i.e., single band, uncompressed, and JPEG compressed integer data. Additionally, the IAF can alert the system operator if the image being processed meets selected characteristics as identified in the image sub-header and/or two Support Data Extension (SDE) data fields.

c. Case Executive The CASE Executive Utility was developed to exploit SAR MASINT complex data.

d. Synthetic Imagery Generator (SIGS). The SIGS is a computer-based system that provides rapid generation of photorealistic synthetic imagery.

e. NITF Imagery Management System (NIMS)

5 TEST AND EVALUATION (TBD007)

5.1 General

Test and Evaluation of imagery related systems consists is a process that should be undertaken throughout the acquisition and operational lifecycle of a system. Testing in conducted internally by the developer at the code, module and integration level. In addition, both standards compliance and interoperability testing are conducted usually by an external independent agency. Registers are usually maintained by testing organizations to list system compliance testing statues.

6 INTEROPERABILITY

6.1 General (TBD008)

This is a placeholder for establishing a chapter to deal with interoperability testing of systems based on their intended use within the USIGS Architecture as detailed by the USIGS Architecture Framework (UAF) and the USIGS Interoperability Profile (UIP).

For those systems managed by/under the DODIIS management board refer to the following publications for additional guidance on interoperability testing.

- DODIIS Migration System Instructions, to DODIIS Executive Agent, Program Managers, and Developers, February 1997
- DISA/JITC Interoperability Certification Test Program Plan, For the Department of Defense Intelligence Information Systems, DODIIS Migration Systems (DRAFT) Version 2.0, May 1998
- United States Imagery and Geospatial Information System Architecture Volume II, USIGS Interoperability profile, June 1998

7 Standards Compliance

General: There are a multitude of International Federal and Military standards that exist and in varying combinations may apply to a particular system. Generally, there are two types of testing conducted to determine compliance internal or self-testing and independent testing. Independent testing is the better of the two in that it reduces the chances of multiple interpretations of the same standard. Often compliance can be attained by integrating a known registered software module, i.e., JPEG compression software.

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Appendix A -- List of Acronyms

ACCESSID	Access ID
AIS	Automated Information System
ANSI	American National Standards Institute
ARIDPCM	Adaptive Recursive Interpolated Differential Pulse Code Modulation
ASCII	American Standard Code for Information Interchange
ASD/C^3I	Assistant Secretary of Defense for Command, Control, Communications, and Intelligence
BCS	Basic Character Set
BCS-A	Basic Character Set - Alphanumeric
BCS-N	Basic Character Set - Numeric
BERT	Bit Error Rate Test
BIIF	Basic Image Interchange Format
BIT	Binary Digit
BPP	Bits-per-pixel
BPS	Bits Per Second
BWC	Bandwidth Compression
C^3I	Command, Control, Communications, and Intelligence
C^4I	Command, Control, Communications, Computers, and Intelligence
CADRG	Compressed ARC Digitized Raster Graphic
CCE	Continuous Comprehensive Evaluation
CCITT	Consultative Committee for International Telegraph and Telephone
CCS	Common Coordinate System
CEDATA	Controlled Extension Data
CEL	Controlled Extension Length
CETAG	Controlled Extension Tag
CEW	Common Exploitation Workstation
CFHD	Corrected File Header
CFS	Center For Standards
CGM	Computer Graphics Metafile
CIB	Controlled Image Base
CII	Compatibility, Interoperability, and Integration
CINC	Commander In Chief
CINCS	Commanders In Chief
CIO	Central Imagery Office
CIP	Common Imagery Processor
CJCSI	Chairman, Joint Chiefs of Staff Instruction
CLEVEL	Compliance Level (for NITF 2.0) Complexity Level (for NITF 2.1)
CMY	Cyan, Magenta, Yellow
COMSEC	Communications Security
COMRAT	Compression Rate Code

Appendix A: List of Acronyms (cont'd.)

C/S/A	CINCs/Services/Agencies
CR	Carriage Return
CR/LF	Carriage Return/Line Feed
CTE	Compliance Test and Evaluation
CTS	Clear to Send
CY	Calendar Year
DATA	Data Buffer Sequence
DBMS	Database Management System
DCD	Data Carrier Detect
DCI	Director, Central Intelligence
DCT	Discrete Cosine Transform
DDN	Defense Data Network
DE	Dissemination Element
DES	Data Extension Segment
DIA	Defense Intelligence Agency
DIRINT	Director of Intelligence
DIS	Draft International Standard
DISA	Defense Information Systems Agency
DMA	Defense Mapping Agency
DOD	Department of Defense
DPPDB	Digital Point Positioning Data Base
DPS	Digital Production System
DQT	Define Q-Table
DSPO	Defense Support Project Office
DTR	Data Terminal Ready
EHD	Extended Header Data
EIA	Electronic Industries Association
FDCT	Forward Discrete Cosine Transform
FDX	Full Duplex
FEC	Forward Error Correction
FBKGC	File Background Color
FIPS	Federal Information Processing Standard
FPU	Floating Point Unit
FTP	File Transfer Protocol
GBS	Global Broadcast System
GeoSDE	Geospatial Support Data Extension
GIAS	Geospatial and Imagery Access Specification
G/ISMC	GSMC and ISMC
GOSIP	Government OSI Profile

Appendix A: List of Acronyms (cont'd.)

GSMC	Geospatial Standards Management Committee
GUI	Graphical User Interface
H-TABLE	Huffman Table
HDLC	High-Level Data Link Control
HDX	Half Duplex
HFE	Human Factors Engineering
HUFFVALS	Huffman Values
IAMP	Imagery Acquisition Management Plan
IAS	Imagery Access Specification
IC	Image Compression
ICAT	Image Category
ICMP	Internet Control Message Protocol
ICS	Intelligence Community Standard
IDEX	Image Data Exploitation System
IEC	International Electrotechnical Commission
I/O	Input/Output
IFDCT	Inverse Forward Discrete Cosine Transform
IITSMP	Imagery Information Technology Standards Management Plan
IMODE	Image Mode
IP	Internet Protocol
IPA	Image Product Archive
IPL	Image Product Library
IR	Infra red
IREP	Image Representation
ISMC	Imagery Standards Management Committee
ISO	International Organization for Standards
ISP	International Standardized Profile
IUT	Implementation Under Test
JIEO	Joint Interoperability and Engineering Organization
JINTACCS	Joint Interoperability Tactical Command and Control System
JITC	Joint Interoperability Test Command
JPEG	Joint Photographic Experts Group
JTA	Joint Technical Architecture
LAN	Local Area Network
LBC	Label Background Color
LDATA	Last Data (packet of every buffer)
LF	Line Feed
LTC	Label Text Color
LUT	Look-up Table

Appendix A: List of Acronyms (cont'd.)

MBZ	Must Be Zero
MIL-HDBK	Military Handbook
MIL-STD	Military Standard
MMU	Memory Management Unit
MOA	Memoranda of Agreement
MOT	Means of Testing
MRTFB	Major Range and Test Facility Base
MTF	Message Text Format
NATO	North Atlantic Treaty Organization
NBPP	Number of Bits Per Pixel
NCCB	NITF Configuration Control Board
NETBLT	Network Block Transfer
NSGI	National Systems for Geospatial Intelligence
NIIEE	NIMA Imagery Information Exploitation Environment
NIMA	National Imagery and Mapping Agency
NITF	National Imagery Transmission Format
NITFS	National Imagery Transmission Format Standard
NSA	National Security Agency
NSIF	NATO Secondary Imagery Format
NTB	NITFS Technical Board
NUMDES	Number of Data Extension Segments
NUMRES	Number of Reserved Extension Segments
OASD/C^3I	Office of the Assistant Secretary of Defense for C^3I
ODASD/I	Office of the Deputy Assistant Secretary of Defense for Intelligence
ODCSINT	Office of the Deputy Chief of Staff for Intelligence
ODNI	Office of the Director of Naval Intelligence
OJCS	Organization of the Joint Chiefs of Staff
OSI	Open Systems Interconnection
PIAE	Profile for Imagery Archive Extensions
POC	Point of Contact
PPBS	Planning, Programming, and Budgeting System
PEM	Program Element Monitor
POSIX	Portable Operating System Interface for Computer Environments
PPPS	Point Positioning Production System
Q-Table	Quantization Table
RAM	Random Access Memory
REDATA	Registered Extension Data
REL	Registered Extension Length

RES	Reserved Extension Segment

Appendix A: List of Acronyms (cont'd.)

RETAG	Registered Extension Tag
RFC	Request for Change
RGB	Red Green Blue
RST	Re-Start Marker
RTS	Request To Send
SAMI	Symbology and Annotation for Mapping and Imagery
SAR	Synthetic Aperture Radar
SDE	Support Data Extensions
SIDS	Secondary Imagery Dissemination System
SLIP	Serial Line Internet Protocol
SPIA	Standards Profile for Imagery Archives
STA	Standard ASCII
STANAG	Standardized NATO Agreement
STU-III	Secure Telephone Unit-3rd Generation
SUT	System Under Test
TACO2	Tactical Communications Protocol 2
TBD	To Be Determined
TBR	To Be Researched
TBP	To Be Published
TCP	Transmission Control Protocol
TD	Transmit Data
TIS	Technical Interface Specification
TMDE	Test, Measurement and Diagnostic Equipment
TRE	Tagged Record Extension
UAF	USIGS Architecture Framework
UCS	Universal Multiple Octet Coded Character Set
UDHD	User Defined Header Data
UDID	User Defined Image Data
UIP	USIGS Interoperability Profile
USA	United States Army
USAF	United States Air Force
USIGS	United States Imagery and Geospatial System
USMC	United States Marine Corps
USN	United States Navy
UTC	Coordinated Universal Time (i.e. ZULU)
VIMAS	Visible, Infrared, and Multispectral Airborne Sensor

VQ Vector Quantization

Appendix A: List of Acronyms (cont'd.)

WAN Wide Area Network

YCbCr Y=Brightness of signal, Cb=Chrominance (blue), Cr=Chrominance (red).
YCM Yellow, Cyan, Magenta
YIQ Intensity, Inphase, Quadratu

Appendix B – NITFS Abstract Collection Model

B.1 INTRODUCTION

B.1.1 Purpose. This appendix describes the abstract imaging models that form the foundation for the proper use and application of NITFS products that contain prominent groups of Support Data Extensions (SDE). The purpose is to specify a common basis of understanding for those involved in the specification, implementation, validation testing, and eventual compliance testing of systems that use NITF products containing SDEs. This appendix also addresses the implications of extracting (chipping) portions of image products while maintaining the integrity of the associated support data.

B.1.2 Scope. The abstract models described in this appendix address the following groups of NITF Tagged Record Extensions:

- National Technical Means Support Data Extensions (NSDE)
- Airborne Support Data Extensions (ASDE)
- Raster Product Format Support Data Extensions (RPFSDE)
- Digital Point Positioning Data Base Support Data Extensions (DPPDBSDE)
- Geospatial Support Data Extensions (GeoSDE)

B.1.3 Background. To be provided.

B.1.4 References

STDI-0002

STDI-0001

NITF Implementation Requirements Document (NITFIRD)

MIL-STD-2411

MIL-STD-2411-1

MIL-STD-2411-2

MIL-PRF-89041A

MIL-PRF-89038 with Amendment 2

MIL-PRF-89034 with Amendment 1

B.1.5 Definitions

1. Bar (WAMTI). A portion (strip) of a WAMTI frame.

2. Block, NITF. An indexed (row/column) structural unit of pixels (sub-array) within an NITF file. Often referred to as a 'tile'.

3. Block, Coverage. A defined coverage area of pixel values for which the attributes and parameters within a TRE(s) are applicable. Sometimes referred to as a 'scan block'.

4. Canted Search Scene. A series of search mode scenes where the direction of each scene center line varies. For example, a series of short scans along a winding canyon conducted as a single planned imaging operation.

5. Frame. An image collected from a framing-mode sensor or a spot-mode sensor. An imaging operation (scene) may consist of collecting one or more frames (images).

6. Frame (WAMTI). A unit of SAR data when operating in the Wide Area Moving Target Indicator (WAMTI) mode. The WAMTI Frame data may be subdivided into 'Bars'.

7. Image. A row/column (line/sample) array of pixel values (imagery data) the mission planner has identified for collection within a collection scene. The imagery data that results from an imaging operation of a sensor. An image is often subdivided into indexed rows/columns of blocks/tiles. One or more images may comprise a scene.

5. Mission Identifier / Mission Number. An identification of the specific collection mission that identifies the imagery collection mission to automated management systems and their users.

9. Moving Target Search Mode(s). An imaging operation mode wherein the detected information is moving targets instead of pixels.

10. Operation Number. Within a collection mission, there may be numerous collection tasks or objectives to collect data for specific areas of interest. Each task/objective for an area of interest results in an imaging operation. One or more images can be collected during an imaging operation. A unique operation number (index value or count) is assigned to each imaging operation to differentiate among separate imaging operations. The operation number is part of the information used by external systems to track products that result from the imaging operation task/objective.

11. Point Mode(s). (TBD009)

12. Scene. A planning concept used somewhat differently depending on the context of the planned collection. An imaging scene is a single image, or a collection of images that provides contiguous coverage of an area of interest. This term is often used interchangeably with 'imaging operation' and 'image'. A collection scene may be initiated by three types of planning processes: (1) Collection Plan; (2) Re-Tasking; and (3) Unplanned/Immediate.

13. Scene Number vs. Operation Number. There are several conventions for assigning scene and operation numbers. For example, presume a mission is planned to collect imagery over three areas of interest. The first area can be satisfied with a single image collection (first imaging operation, 1 image/scene); the second area requires 4 images (second imaging operation, 4 images/scenes); the third area requires 1 image (third imaging operation, 1 image/scene). In this example, one means of indexing is to re-initializing the scene number index for each new Operation number (i.e., Op1, Sc1; Op2, Sc1, Sc2, Sc3, Sc4; Op3, Sc1). However, some collection systems internally manage imaging operations by a simple indexing of each instance of single image collection, whether or not there are more than one image being collected for the scene. This indexing approach uses the first scene number of the imaging operation as the Operation Number (i.e., Op1, Sc1; Op2, Sc2, Sc3, Sc4, Sc5; Op6, Sc6). There is no right or wrong approach. The objective is to establish a unique means of tracking/managing imaging operations. (The second approach does greatly reduce the number of actual imaging operations that can be tracked in a single mission because it precludes the re-initialization of scene numbers for each imaging operation).

14. Search Mode(s). Generally a mode of continuous imaging. It may consist of continuous line scanning or a series of frame shots, a series of Spot collections, etc.

15. Spot Mode(s). A SAR imaging operation mode similar to frame modes for electro-optical cameras. The detected image is of a specific size (vice continuous scan) aimed at a center point.

B.2 ABSTRACT COLLECTION MODEL

B.2.1 Model Overview. The model focuses on the following inter-related aspects of imagery collection and production:

a. The planning means (model) for describing how the data is to be collected.

b. The image model for orienting, ordering and structuring the actual collected data to correlate with the collection-planning model.

c. The model for packing the collected data (abstract image model) into physical NITF files while maintaining association with the abstract imaging operation.

d. The means of clearly associating pixels in NITF files with their original position in the initial collection imaging operation and the associated attributes and parameters from the original collection.

e. The means for mission planning systems, imagery product management systems, archive and dissemination systems, exploitation systems, etc. to correlate physical NITF files with the original product tasking, imaging, and production attributes.

B.2.2 Planning Model. The planning part of the model attempts to generalize how system operators describe what is to be collected. The main objective is to create a common understanding of how ‘data elements’ used in the file header, image subheader and SDE fields correlate to the collection planning processes. Automated process management systems desire to track the work flow from imagery requirement initiation, to planning the collection, executing the collection, processing the collected data, exploiting the collection, all the way through product(s) delivery, archive and dissemination. Consequently, the ‘data element’ terms applicable to the planning process must be used consistently throughout the entire process.

B.2.3 Image Data Collection Model. The collected pixel data is eventually stored in NITF formatted files, either by on-board processing or processing at the ground station. The sensor produces the imagery data using (and constrained by) its available modes of collection based on its view of the image/scene to be captured as described by the collection plan. Regardless of the physical sensor processes used to collect the image data, there is an implied (abstract) image/scene structure that makes up the imaging operation. This ‘abstract image scene’ may be of a nature or size that all of it never gets realized in a physical sense as a single entity (e.g. a single computer file). It is therefore useful to have an abstract model of the row/column (line/sample) matrix/grid of the data as originally collected by the sensor as described in the collection plan. This abstract image has attributes and parameters associated with each pixel based on sensor outputs and navigational aids associated with the collection process. Some aspects of exploitation processing of the physical NITF files may require mapping pixels in the NITF files to their ‘as collected’ position within the original collection grid (abstract image) to make better use of the support data associated with the image.

B.2.3.1 Abstract Image Model. The abstract image consists of the row/column array(s) of pixels collected by a single imaging operation of the sensor (as inherently defined for that specific type of sensor). The array(s) of pixels may be blocked (tiled). Each block is given a reference row/column number beginning with row 1, column 1: 1,1; 1,2, ... 1,C; 2,1; 2,2; ...2,C; ..... R,1; R,2 ... R,C. Each contiguous row/column array can be conceived of as a single NITF image segment (IM) that is not constrained by field size constraints or other physical constraints imposed by current state of computer operating systems. The bounds are determined by the sensor’s mode of operation. Some of these abstract images may be physically stored as single NITF IM segments. Or, for various reasons, the abstract image may be ‘segmented’ (i.e., divided) into multiple NITF IM segments.

B.2.3.2 Image attributes and parameters. There are support data associated with the abstract image that describe the attributes and parameters about the image collection. In some instances, the area of coverage (scope) of the data is the entire set of pixels in the abstract image. In other instances, the parameters/attributes are different for various portions of the abstract image. Therefore, a means must exist to identify the 'coverage' of parameters and attributes with respect to the entire abstract image.

B.2.3.3 Image Segmentation. An imaging scene may be logically segmented (e.g. segment AA, segment AB, etc.) There are two circumstances for 'segmenting' an abstract image:

- The single image scene is so large, that it needs to be logically divided into portions to ease physical storage and indexing constraints (e.g. row/column pixel counts; block number counts, etc.).

- To treat the multi-image scene collection scenario as if it were a single image entity. For this case, each image (sub-scene) in the imaging operation scene is designated as a segment (AA, AB, AC, etc.) of the overall abstract image.

B.2.3.4 Image Attribute Coverage Blocks. Each image segment (AA, AB, AC, etc) may be virtually subdivided into 'Coverage Blocks'. When the attributes and parameters about the pixels within an image segment varies across the segment, 'Coverage Blocks' shall be defined to associate attribute and parameter data (e.g. SDE data) with the appropriate pixels within the segment to which the data is applicable. Some systems refer to this concept as 'Scan Blocks'.

B.2.3.5 Patches. Patches are an example of parameters/attributes varying across the pixels of an abstract image. Consider a continuous SAR search scene. As 'batches' of SAR phase history data are processed into pixels, the resulting set of pixels (Patch) has parameters/attributes unique to that process. The correlation of the support data with the appropriate pixels (area of coverage) must be maintained when packing the abstract image into NITF file structures. The potential exists for the set of pixels within a patch to be physically stored in a single NITF IM segment, across several NITF IM segments, or for multiple patches to be stored within a single NITF IM segment. Additionally there could be a single IM segment or multiple IM segments stored within a single NITF file.

B.2.3.6 Processing Image Data into NITF Files. There are four principle scenarios available when processing the collected image data and its associated support data into physical NITF files based on the 'abstract image structure' of the original imaging operation. The four scenarios are:

- Single Abstract Image Packed into a Single NITF IM Segment.
- Multiple Abstract Images Packed into a Single NITF IM Segment.
- Single Abstract Image Packed into Multiple NITF IM Segments.
- Multiple Abstract Images Packed into Multiple NITF IM Segments.

B.2.3.6.1 Single Abstract Image Packed into a Single NITF IM Segment. This is the most straightforward approach for storing the original imaging operation into NITF. Care must still be taken to assure the support data is properly associated with the appropriate pixel coverage. For example, a SAR search scene could potentially be stored in a single NITF IM segment, but would likely have multiple PATCH extensions in the IM segment subheader to identify varying coverage parameters as the along-scan pixel index increases.

B.2.3.6.2 Multiple Abstract Images Packed into a Single NITF IM Segment. This approach results in a 'mosaic' of the multiple image collection scenes pieced together into a single NITF image segment (IM). When the 'support data' varies for each of the original 'pieces', the BLOCK TRE or another means is needed to correlate multiple sets of support data to the applicable 'coverage' areas within the IM segment.

B.2.3.6.3 Single Abstract Image into multiple NITF IM Segments. Several circumstances drive this approach. Perhaps production timeliness objectives force an asynchronous multiprocessing approach wherein the abstract image needs to be divided into multiple data bundles for processing as individual NITF files. Or perhaps multiple small files, rather than a few huge files, better serve limited processing capacity at the product user location. Several options need to be considered:

B.2.3.6.3.1 Single IM Segment per NITF File. A single abstract image could be stored as multiple NITF files, each NITF file having a single IM segment. For this case, there must be some means provided to associate where the pixel coverage of each file relates to the overall abstract image. There must be a means to associate support data coverage with applicable pixel data coverage. The proper local/global application of support data parameters and attributes must be clearly discernable.

B.2.3.6.3.2 Multiple IM Segments per NITF file. A single abstract image could be stored as multiple NITF files, each NITF file having multiple IM segments. This option should be avoided since the Libraries, Mission Planning, and Exploitation Management systems don't deal well at this time with multiple IM segments in a single NITF file. Therefore, this specification does not pursue this option further.

B.2.3.6.4 Multiple Abstract Images Packed into Multiple NITF IM Segments. This case is just a combination of the previously described three cases. Each of the multiple abstract images can be packed into individual NITF IM segments. Selected groupings of the abstract images could be packed into individual NITF IM segments. Finally, individual instances of the abstract images could be packed into multiple NITF IM segments. Appendix D provides standard IDs, naming conventions, and product identifiers.

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Appendix C – Image Array and Pixel Geometry

C.1. General

The purpose of this section is to define, clarify, document, and attempt to establish consistency in the interpretation of Pixel Geometry and Pixel-Support Data Extension (SDE) Grid Associations with regard to positioning, mensuration, and image chipping as used in National Imagery Transmission Format (NITF). The goal of this effort is to capture, quantify, and document these complex, but typically undefined, concepts such that NITF applications now and in the future will possess consistent implementations of these concepts.

C.2. Background

Recent testing and experimentation with National Imagery files, various Electronic Light Tables (ELTs), and RULER, has uncovered inconsistent, and sometimes gross, results in simple geographical point extractions from a controlled set of imagery files. Contributing to these aberrations are apparently different interpretations and applications of the following concepts:

- How to associate desired pixel indices/location in the NITF image data value array with the pixel's actual location in SDE Coverage Grid Space ("Pixel-SDE Grid Association"),

- Determining the appropriate geometric/grid reference for the area within a desired pixel ("Sub-Pixel Geometry"),

- Relationship between the terms "LINE and SAMPLE" and "ROW and COLUMN" and their associated indexing conventions as used in the NITFS suite of standards and support data specifications.

- Addressing pixel accumulation associated with reduced resolution data sets (RRDSs) and the related accuracy "losses."

C.3. Discussion

C.3.1. Pixels and Grid Interrelationships

There appears to be little, if any, definition in place for some of the terms and/or concepts previously mentioned. To provide a better understanding of the concepts and problems addressed in this paper, an attempt will be made here to provide substance in these areas. *Pixel-SDE Grid Association* is the concept whereby an ELT must be capable of accurately and consistently identifying ROW and COLUMN index values from the ordered NITF image array. This action answers the "WHICH pixel?" question. Specifically, the ELT must be able to account for interrelationships of, and the affects associated with, image display rotation, alternate resolutions, and derived image product ("chip" or "full" imaging operation) in determining where the pixel "of interest" actually lies in a grid space upon which the associated support data is based. In simpler terms, when an operator selects a single pixel in a rotated, FAF-based or ICHIP-based chip, R5 IMP, etc., can the ELT discern exactly where the selected pixel is in the grid space of the original, unrotated, full, R0 image's support data?

A step-by-step discussion is necessary to identify the theoretical process involved with selecting a pixel of interest and obtaining a geo-point to which it is associated.

In figure C-1, the graphic presented can be thought of as an NITF image rendered for display. The ordered ROW and COLUMN (a.k.a. LINE and SAMPLE) pair of "1,2" correctly identifies the NITF indices of the shaded pixel of interest. (Note: The NITF image array indices are "Zero-based," IAW MIL-STD 2500A, paragraph 5.5.1.1). The identification of this pixel can be thought of as the "pointer and mouse click" action typically performed on an ELT, or other similar device, when attempting to derive a geo-point for a feature/location on a given image.

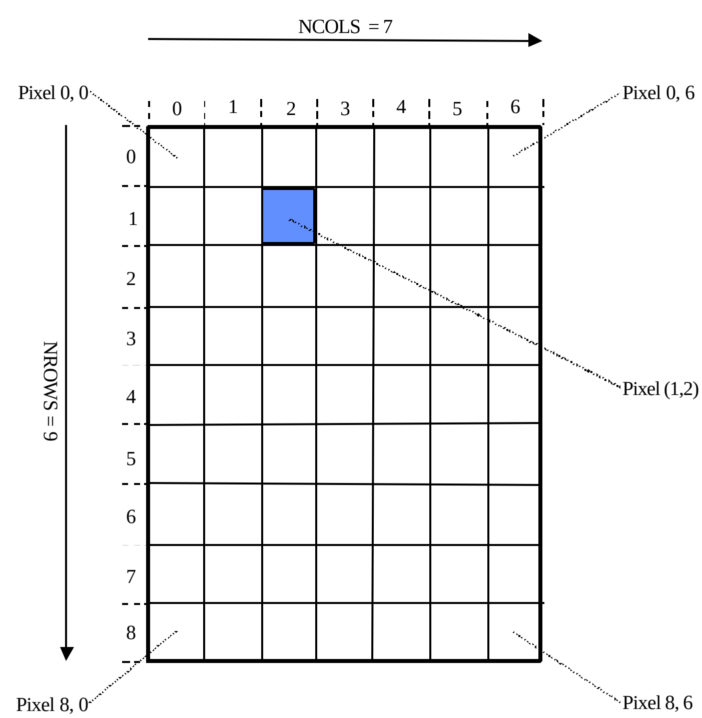

Figure C-1. Storage Array Grid

After the pixel location indices have been determined within the *Storage Array Grid*, a means to refer the pixel of interest to a *Spatial Grid* or physical grid must be established. For this discussion, *Pixel Geometry* will be used to define the process of identifying or establishing a pixel reference index *point* that can be used to represent the physical area covered by the pixel. (Note: In some legacy implementations and documentation, there is the concept of "sub-pixel notation" (for the lack of a better terminology) whereby a pixel is not really a single point but a grid of many points within itself. That is a subject not to be addressed here – but reserved for future discussion. This paper limits discussion to the total area represented by a single pixel in an image array that has not been rotated).

For example, the RULER mensuration engine allows inputs of decimal LINE and SAMPLE values. Also, the ICHIPB specification allows for decimal values in its output product (OP) and full image (FI) grid point references. Considering the existence of decimal pixels, a means must exist to uniformly refer the "collective" pixel to its space within the support data. For imagery that has not been rotated, this means the mid-point of the pixel of interest is centered upon its respective location in SDE space. Continuing with this logic, and using the following figure as an example, one would expect the pixel of interest (1,2) in the image S*torage Array Grid* to be referred to in RULER as LINE (1.5) and SAMPLE (2.5) in the S*patial Grid*.

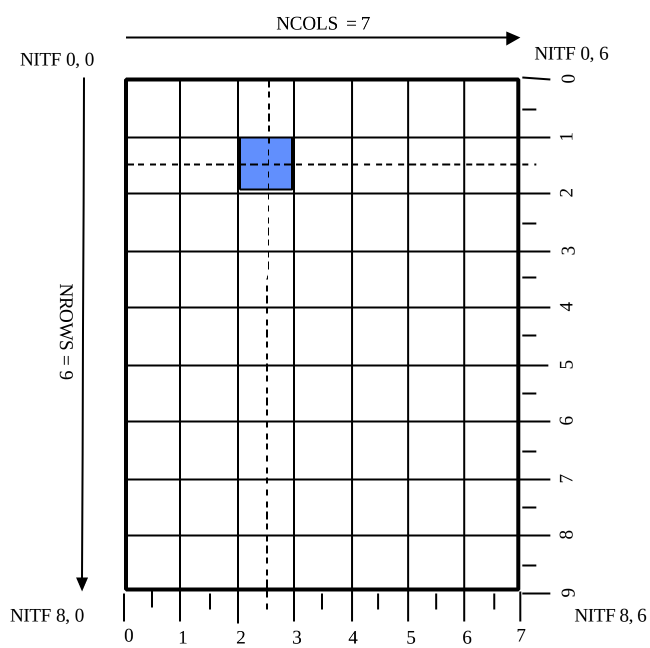

Figure C-2. Spatial Grid

In reality, however, different conventions appear to be employed by ELTs and are just as logical. Using the same example, an ELT might submit LINE and SAMPLE pair (2,3), from a "unit counting" notation rather than the aforementioned "centered-index" notation. Unfortunately, while these conventions are perfectly logical, it is easy to see that dissimilar implementations will yield dissimilar results. And what happens when image rotation or resolution changes? The previous paragraph introduced the subject of *LINE and SAMPLE Assignments,* and some of the confusion and ambiguity that exists within this area. In simple terms, one might think that it would just be "the ordered X-Y pair that represents the pixel of interest." In reality, that is true, but what comprises that ordered pair? As previously stated, two different "ordered pairs" were derived for the same pixel of interest in figure C-2. Other conventions could also be used such as the "image array" notation (1,2), "lower right of the pixel" notation (2,3), etc. While some of these "notations" may seem unusual, and may be, the fact remains, without clear implementation guidance, they can exist.

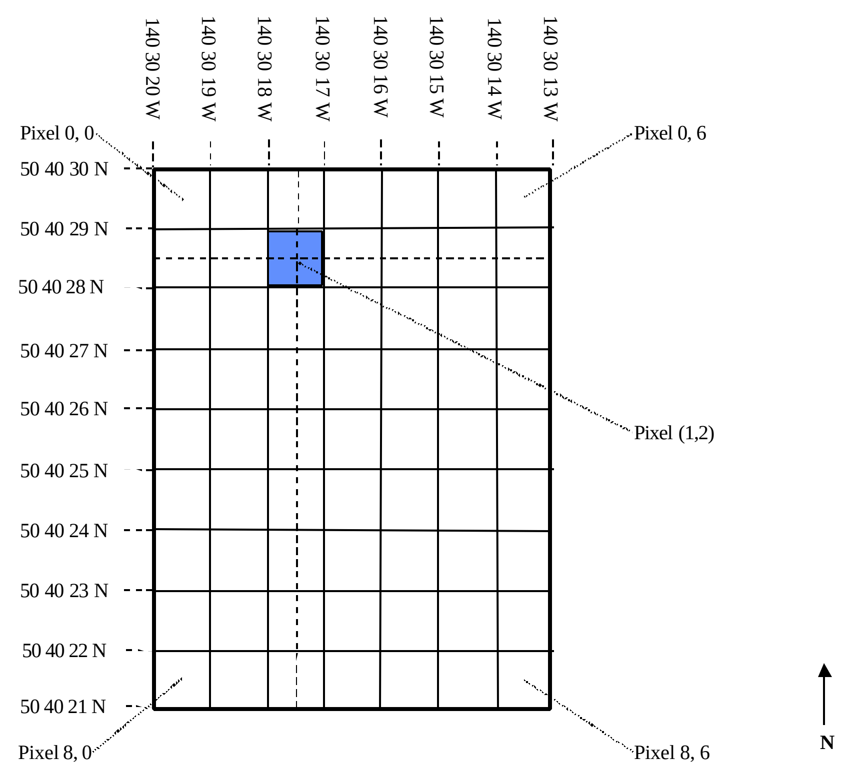

Figure C-3. Geographical Grid

Once the pixel of interest has been identified from the *Storage Array Grid* and assigned its respective position in an associated *Spatial Grid,* the spatial grid references must be applied to a *Geographical Grid* that identifies where the pixel is on the Earth. In today's digital softcopy imagery, the geographical "grid" is typically "formed" from information provided by the image's associated support data; specifically, the information contained within the NITF SDEs. Figure C-3 provides a graphical illustration of where the original pixel of interest (1,2) lies within a (fictitious) geographical grid. For ease of explanation and illustration, the geographical values in Figure C-3 are highly exaggerated, resulting in extreme ground sample distances of approximately 100 feet.

From the information offered in Figure C-3, pixel (1,2) in the original Storage Array Grid theoretically covers a "1-second cell" on the Earth, of which the center-point is at 50 40 28.50N latitude, 140 30 17.50W longitude. Accordingly, these same values would be expected from the ELT (or other device) if the same pixel was selected from an image display and the device subscribed to the transform steps just outlined.

C.3.2. Image Resolution and Pixel Accumulation

With the increased use and general proliferation products that are no longer of the same size and resolution of the original imaging operation, numerous implementations of image "products" are appearing. Clear, consistent, and unambiguous guidance is lacking in many areas regarding the means to identify the true "pedigree" of the new image product. Without such information, any attempt to exploit or perform accurate geo-spatial measurements upon such imagery becomes pure folly. Recent test efforts have uncovered four areas that are in need of additional information and guidance to improve production and interpretation consistency and thereby improve interoperability. These areas are:

- Anamorphic Correction
- Reduced Resolution Data Sets
- IGEOLO, Mensuration, and Support Data
- Algorithms

C.3.2.1. Anamorphic Correction

Also known as "Asymmetrical Correction," anamorphic correction involves pixel alterations which drastically change the dimensions of the originally captured image and thus cause disharmony with the associated support data if left incorrectly or totally "undocumented" in the preferred vehicle, the ICHIPx TRE.

Imagery can be captured in various asymmetrical "modes" and is generally expressed in ratios of cross-scan (columns) versus along-scan (rows). For this discussion, a simple "1x2" capture will be used. In this particular mode, a pixel represents one "unit" of ground sample distance (GSD) in the cross-scan (column) direction, while representing two "units" of GSD in the along-scan (row) direction. Unless corrected, an image of this nature provides a very deceptive visual rendition to the user. For example, consider a building in this uncorrected "1x2" image, with a GSD of 1 meter, that is portrayed with a length and width of 100 pixels. Visually, the image appears square. However, if measurements of the building were made using the given support data, one would find that it is actually rectangular, 100 meters (horizontally) by 200 meters (vertically). Correction of this aberration requires the addition of pixels in the along-scan (row) direction. In this example, an "additional" row of pixels would be included for every row currently in the image. Accordingly, the NROWS of the image doubles in the case of a "1x2" image. After correction, this same building will appear symmetrical in both visual and measurable manners.

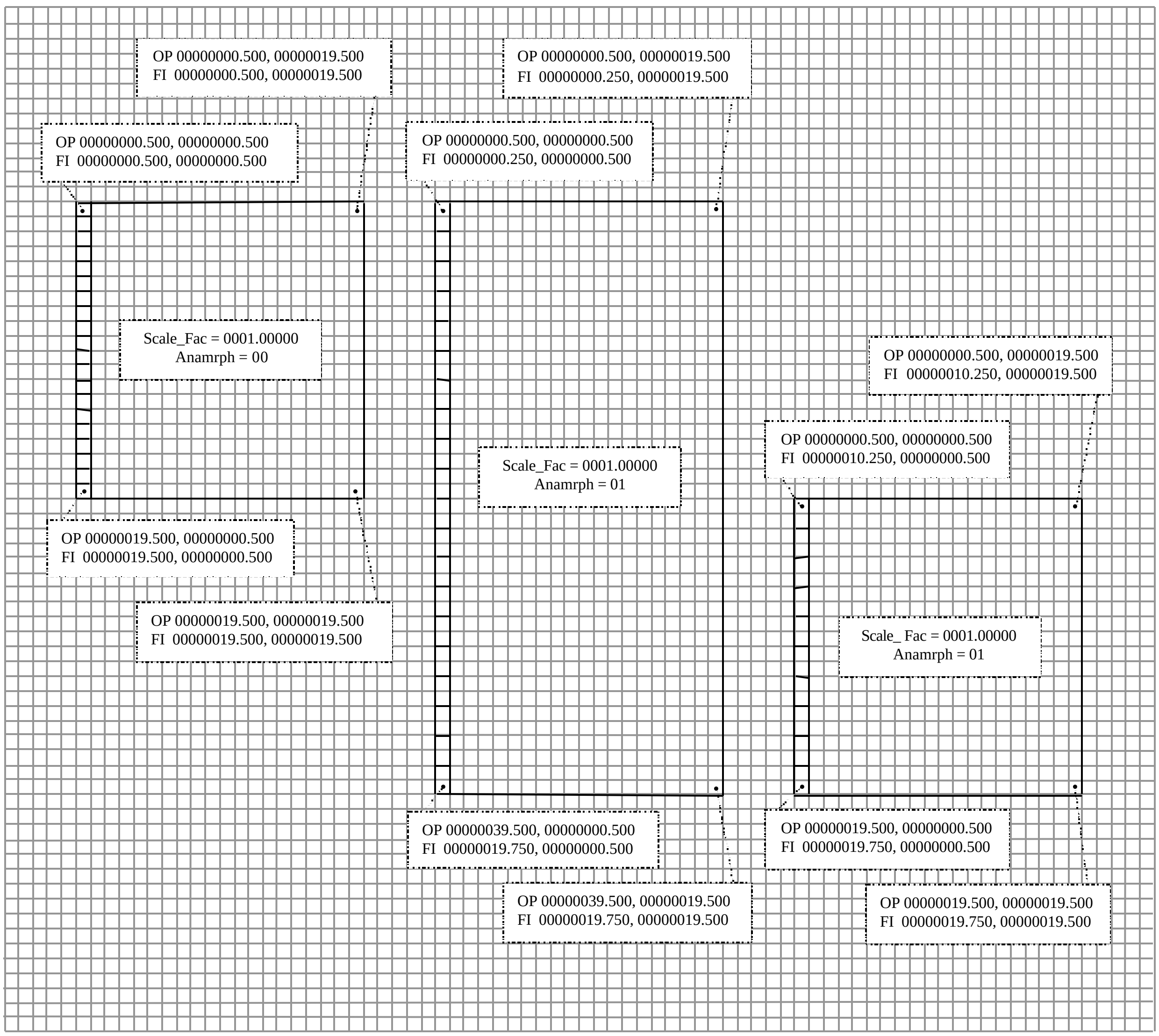

Figure C-4. Anamorphic Correction

In Figure C-4, above, the anamorphic correction process is illustrated. The image is considered to be full or IMAG = "1.0 " resolution. As the practice of including the ICHIPx

TRE for many products is rising, corresponding ICHIPx TRE data necessary to denote the original and subsequent dimensions resulting processing actions are also provided.

In this figure, the theoretical original imaging operation resulted in a product that was 20 pixels by 20 pixels. Continuing across the illustration, anamorphic correction was performed on the original capture, resulting in a "corrected" image of the size NROWS = 40 and NCOLS = 20. Lastly, a chip was cut from the lower half of the corrected original image.

C.3.2.2. Reduced Resolution Data Sets (RRDS)

Reduced Resolution Data Sets permit the handling of large imagery in a smaller, more manageable, scale. The geographical coverage presented in a RRDS remains unchanged, regardless of the resolution; only the physical size of the pixel array is altered. As a result of the actions to reduce the physical size of imagery, pixel accumulation becomes necessary. While there may be many ways to achieve reduced imagery resolutions, the same theoretical result occurs -- pixel accumulation takes place. In simpler terms, a single resulting pixel assumes or represents more visual and geographical space in the reduced resolution than in the full resolution image.

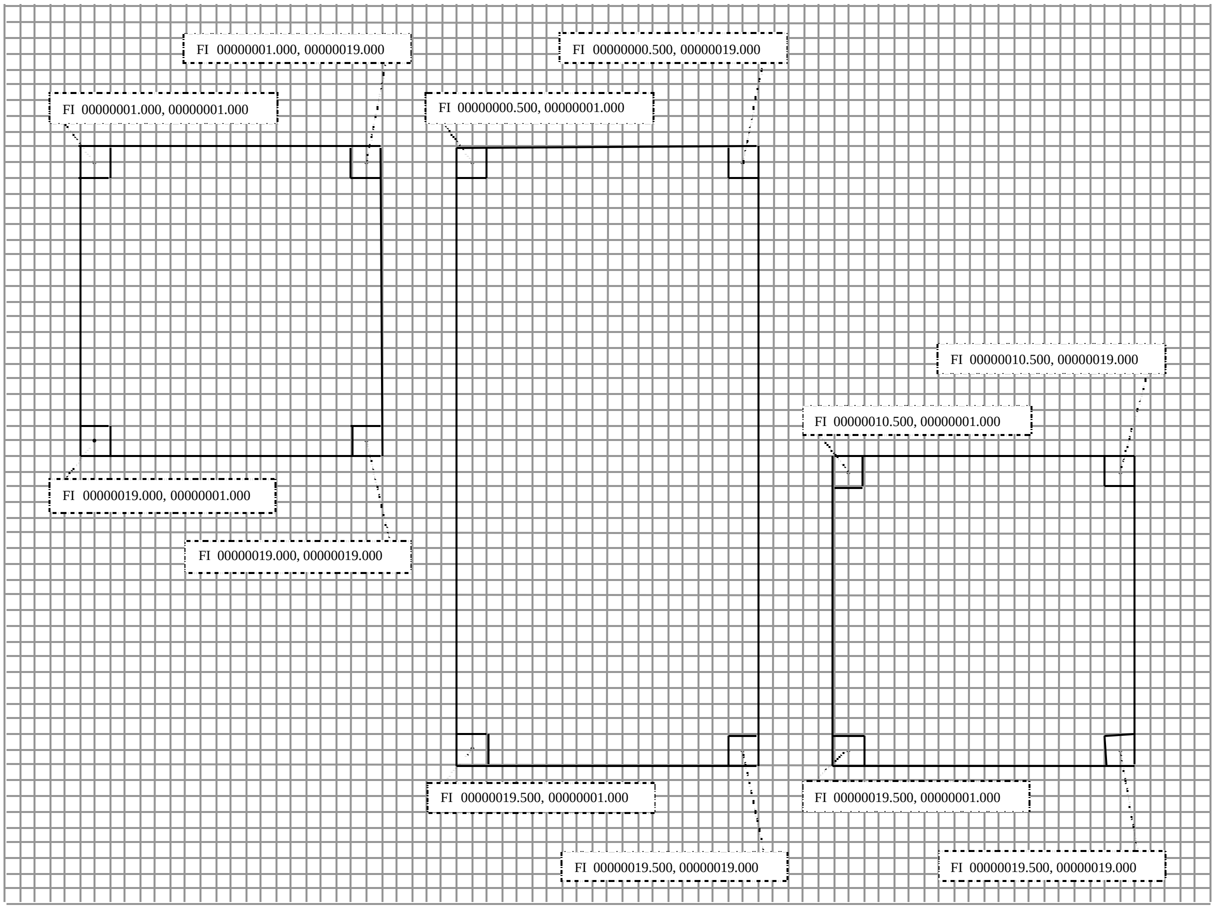

Figure C-5. Pixel Accumulation (/2)

In Figure C-5, above, the pixel accumulation process is illustrated in preparation for generation of a "half res" (IMAG = "/2 ") image. In this case, the full resolution image (a.k.a. "R0") will be reduced by a factor of 2 in both the row and column directions. Accordingly, the resultant image (a.k.a. "R1") area will be ¼ of the original image. Corresponding ICHIPx TRE data, necessary to denote the resultant aggregate pixel locations in the original, full resolution image (FI values) are provided for an asymmetrical image, its anamorphically corrected rendition, and for a chip from the corrected image.

In Figure C-6, below, the resultant RRDSs for the asymmetrical image, its anamorphically corrected rendition, and "corrected" chip are illustrated. Note that one pixel now represents four in the original image's "space." Accordingly, the center of each RRDS corner pixel (OP values) corresponds to the aggregated corners (FI values) of the R0 imagery in Figure C-5.

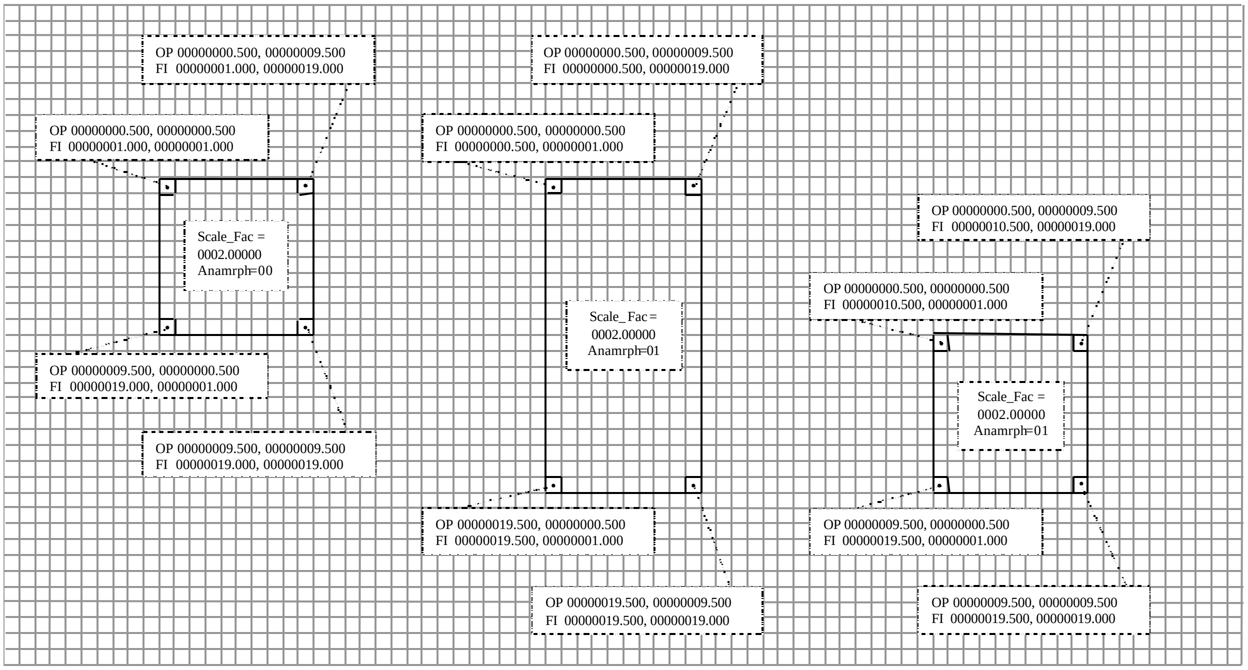

Figure C-6. R1 Reduced Resolution Data Sets

Figure C-7 takes the same original R0 image, as in Figure C-5, and performs pixel accumulation in preparation for generating a "quarter res" (IMAG = "/4 ") image. In this case, the full resolution "R0" image will be reduced by a factor of 4 in both the row and column directions. Accordingly, the resultant "R2" image area will be 1/16 of the original image. Corresponding ICHIPx TRE data, necessary to denote the resultant aggregate pixel locations in the original, full resolution image (FI values) are again provided for the asymmetrical image, its anamorphically corrected rendition, and for a chip from the corrected image.

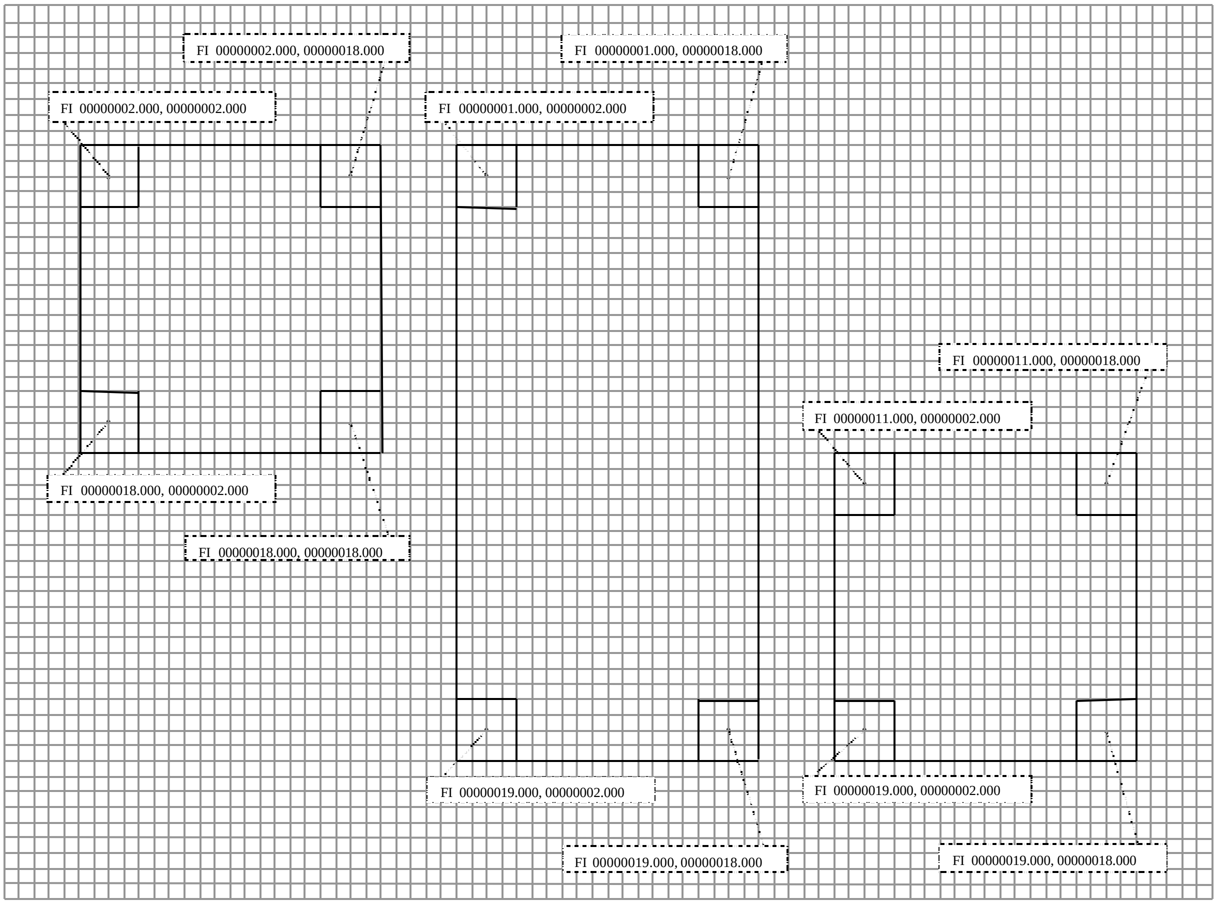

Figure C-7. Pixel Accumulation (/4)

Figure C-8, below, is similar to Figure C-6, except that all values pertain to the resulting R2 imagery.

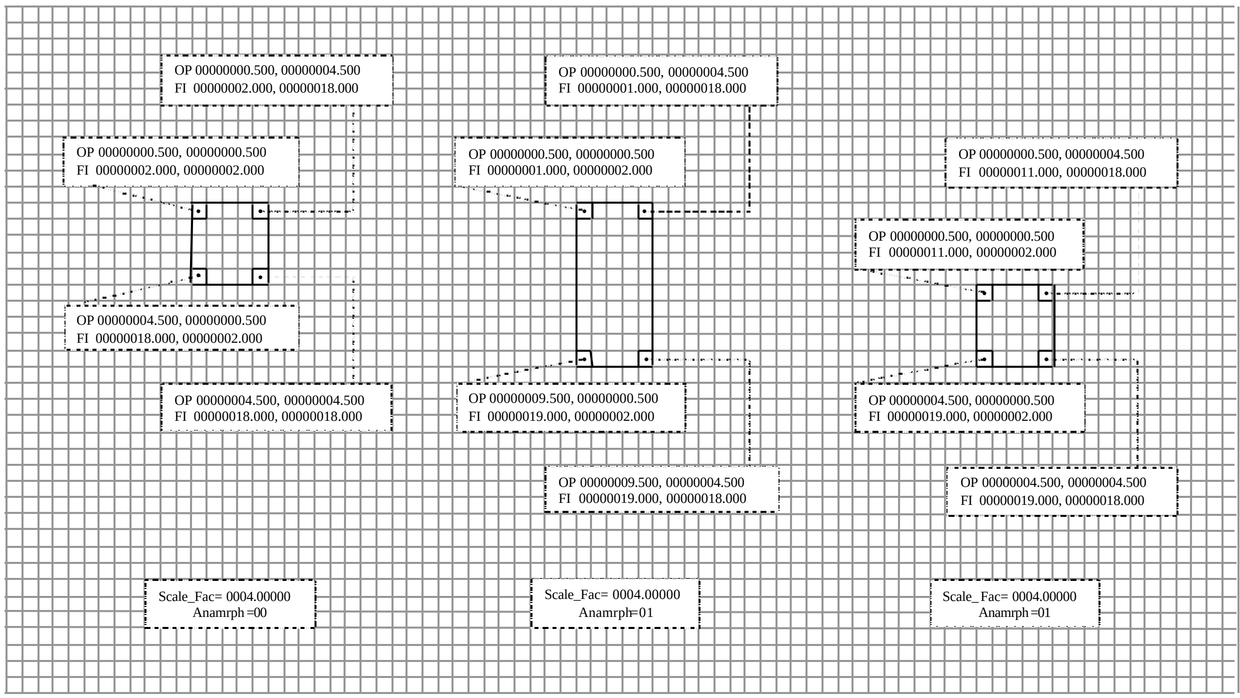

Figure C-8. R2 Reduced Resolution Data Sets

It should be noted that RRDS products can be legitimately produced in various scales. The most common is the legacy "Powers of Two" convention whereby the original image's rows and columns are reduced by a power of two, with the resulting pixel accumulation being the square of the scaling factor. Decimal conventions may also be used. Table 1, below, lists sample values for associated data from both conventions.

Table C-1. Associated RRDS Data

Associated RRDS Data						
R-value	Numeric ScaleFactor (Row/Col Divisor)	IMAG(*)	ICHIPB Scale Factor	R0-to-Rn Pixel Accumulation Ratio	Rn (0.5,0.5) Offset Location in R0	??
R0 -	1 -	"1.0 " "1.0 "	0001.00000 0001.00000	1:1 -	000.5,000.5 -	
R1 -	2 -	"/2 " ."500"	0002.00000 0002.00000	1:4 -	001.0,001.0 -	
R2 -	4 -	"/4 " ."250	0004.00000 0004.00000	1:16 -	002.0,002.0 -	
R3 -	8 -	"/8 " ."125"	0008.00000 0008.00000	1:64 -	004.0,004.0 -	
R4 -	16 -	"/16 " ."062"	0016.00000 0016.00000	1:256 -	008.0,008.0 -	
R5 -	32 -	"/32 " ."031"	0032.00000 0032.00000	1:1024 -	016.0,016.0 -	
R6 -	64 -	"/64 " ."015"	0064.00000 0064.00000	1:4096 -	032.0,032.0 -	
R7 -	128 -	"/128" ."008"	0128.00000 0128.00000	1:16384 -	064.0,064.0 -	
(*) IMAG may be in the "/" format, but only with the values listed, or in any 4-byte decimal format. It should be noted that if decimal format is employed, precision becomes skewed around Scale Factor 16 and larger due to field size limitations. Accordingly, the ICHIPB TRE should always be included to accurately depict the true scale factor of the image.						

C.3.2.3. RRDS IGEOLO, Mensuration, and Support Data

All RRDS IGEOLOs should retain the same values as those of the original full image (R0). This permits consistent, interpolated values to be obtained from the IGEOLO corner points for all image resolutions. While granularity is lost in the scaling process, as can be seen from Table 1, above, virtually no difference should be experienced between geo-spatial measurements made from either the IGEOLO interpolation or mensuration engine-generated values from the support date. The only significance between these values should be as a result of the lesser precision of the IGEOLO value coupled with rounding error during corner point generation or interpolation error during cursor "sweep." This, of course, assumes the algorithm used to generate the IGEOLO from the original image's support data was correct and the image for which it was calculated was of the appropriate size for its stated scale. These expectations become apparent when reviewing Figure C-9, below.

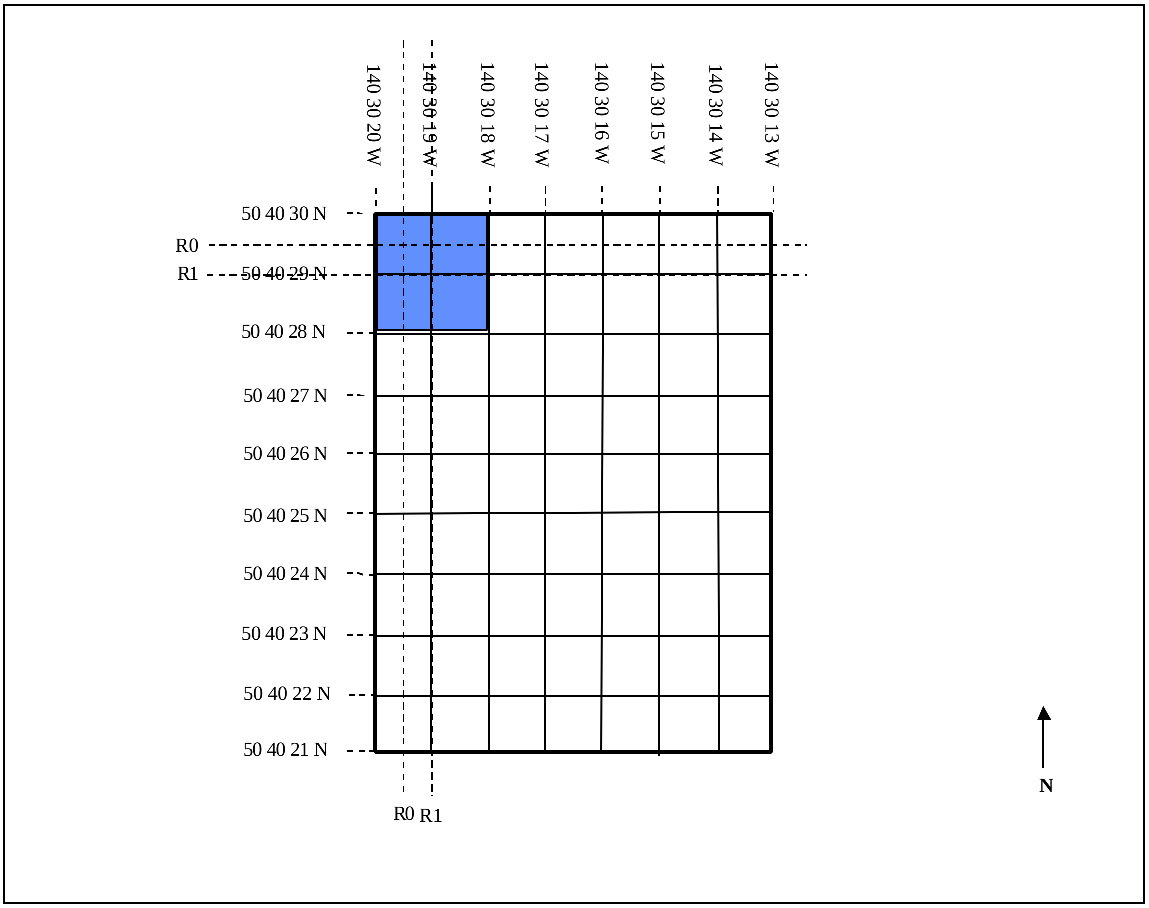

Figure C-9. Geographical Points

When attempting to obtain measurements in this example, one would expect to receive the following geo-point values from either IGEOLO interpolation or mensuration engine results for the first (0,0) pixel of the R0 image:

50 40 29.50N 140 30 19.50W

The shaded area in this illustration represents the first pixel (0,0) in the R1 RRDS of the same image. Expected geo-point values from either of the methodologies above are:

50 40 29.00N 140 30 19.00W

(Note: The theoretical IGEOLO value assumes that the interpolation process is capable of "precision" to 2 decimal places.)

NITF system developers should design their implementations in a manner to generate IGEOLO values accurately from the associated image's support data in the following manner:

UL Corner LAT:	Mensurated Image Pixel Latitude + 0.5 GSD
UL Corner LON:	Mensurated Image Pixel Longitude + 0.5 GSD

UR Corner LAT: Mensurated Image Pixel Latitude + 0.5 GSD
UR Corner LON: Mensurated Image Pixel Longitude - 0.5 GSD

LR Corner LAT: Mensurated Image Pixel Latitude - 0.5 GSD
LR Corner LON: Mensurated Image Pixel Longitude - 0.5 GSD

LL Corner LAT: Mensurated Image Pixel Latitude - 0.5 GSD
LL Corner LON: Mensurated Image Pixel Longitude + 0.5 GSD

(Note: The "0.5 GSD" adjustment accounts for the distance from the center of the pixel of interest to its edge in either the X or Y directions. This is based upon the aforementioned convention whereby the center ("0.5, 0.5") of a pixel is used to generate measurements for the pixel of interest. This example assumes an image in the Northern and Western Hemispheres. Imagery from other hemispheres would have to be adjusted appropriately.)

C.3.2.4. Algorithms

The following algorithms are offered to assist in calculating ICHIPB cornerpoints and were used in determining the values in the aforementioned examples.

(a) To determine ICHIPB OutputProduct cornerpoints ("center-of-pixel") an image:

OP_11_ROW = 1 - 0.5
OP_11_COL = 1 - 0.5

OP_12_ROW = 1 - 0.5
OP_12_COL = (NCOLS / SF) - 0.5

OP_21_ROW = (NROWS / SF * ACF) - 0.5
OP_21_COL = 1 - 0.5

OP_22_ROW = (NROWS / SF * ACF) - 0.5
OP_12_COL = (NCOLS / SF) - 0.5

where: ACF = Asymmetrical Correction Factor and: 1 x 1 = 1.00
1 x 2 = 2.00
2 x 3 = 1.50
etc.

(Note: ACF never applies to the COL direction)

SF = Scale Factor from IMAG and ICHIPB and: 1.0 = 0001.0000 (R0)
/2 = 0002.0000 (R1)
/4 = 0004.0000 (R2)
etc…

NROWS and NCOLS are the dimensions of the original image

(b) To determine a "corrected" and/or "reduced resolution" pixel's location in "uncorrected" and/or "full resolution" pixel grid space (e.g., ICHIPB FI_nn values):

$$\text{UNCORRECTED\_PIX\_LOC} = \frac{\text{CORRECTED\_PIX\_LOC}}{\text{ACF}} \times \text{SF}$$

(Note: When calculating a COL value, ACF is always "1")

(c) Likewise, to determine an "uncorrected" and/or "full resolution" pixel's location in "corrected" and/or "reduced resolution" pixel grid space:

$$\text{CORRECTED\_PIX\_LOC} = \frac{\text{UNCORRECTED\_PIX\_LOC}}{\text{SF}} \times \text{ACF}$$

(Note: When calculating a COL value, ACF is always "1")

Appendix D -- Standard IDs and Naming Conventions

D.0 General

This Appendix identifies general issues and guidance related to Standard IDs and naming conventions. It also identifies community uses of each of them where known.

Several alternative methods for identifying imagery products and assigning file names are in use within the USIGS. The naming conventions addressed in this appendix are:

- Forty-Character File Naming Convention
- Sixty-four Character File Naming Convention
- Moving Target Indicator (MTI) File Naming Convention
- Controlled Image Base (CIB) File Naming Convention
- Compressed ARC Digitized Raster (CADRG) File Naming Convention
- Digital Point Positioning Data Base (DPPDB) File Naming Convention
- DIGEST Appendix E File Naming Convention

D.1 Forty-Character File Naming Convention.

D.1.1 National SDE

D.1.1.1 Forty-Character Naming Convention. This file naming structure consists of a forty-character image identifier followed by suffix extensions as follows:

FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF. rN_PART_nn_OF_mm.NTF

Where:

FFFF…	The Forty-Character Image Identifier (see table B-1).
.NTF	An optional extension to indicate the file is formatted in NITF.
.rN	An extension to indicate the resolution of the image within the file. r0 indicates the image is of original/full resolution. Values of r1 through r9 indicate reduced resolution in factors of 2 (1/2, 1/4, 1/8, 1/16, 1/32, …).
_PART_nn_OF_mm	An extension to indicate that the file is instance “nn” of “mm” total files that comprise the entire product specified by the forty-character identifier. Note: Under some

circumstances, the total number of files comprising the entire product may not be known when the files are initially being produced. In that case, the mm value is set to 00 to indicate the count is unknown. Where possible, the actual count should at least be placed in the last file of the product sequence.

D.1.1.2 Forty-Character Image Identifier. The field structure of the forty-character image identifier is shown in Table B-1. The structure provides a means for uniqueness of product identification and for association of multiple files, that may comprise a single product. Each USIGS image production system using the 40-character identifier convention places additional product specific constraints on the use of the 40-character identifier. The image/product identifier Tagged Record Extension (TRE) specification applicable to the producing systems (i.e., STDIDA, STDIDB, AIMIDA, and AIMIDB) specifies these additional constraints. Maintaining the proper relationships of the identifier sub-field values with the identifier's usage in file headers, image subheaders, identification TREs, and as a file naming convention are critical to proper use and interpretation of imagery products and associated support data.

D.1.1.3 Identifier Field Value Dependency on Data Coverage. Proper population and use of field values used in the identifier depends on the data coverage to which the specific identifier applies. The values for beginning and ending image segments and those for starting and ending block numbers shall be populated from the perspective of the entire data coverage of the identified imaging operation. When the identifier pertains to an entire imaging operation (e.g. IID2/ITITLE), the segment and block indexes shall reflect the full extent of the total data coverage. When the identifier pertains to a portion of the imaging operation (e.g. FTITLE and filename), the segment and block indexes shall reflect the relative location in the entire data coverage of the imaging operation that is included in the identified data portion.

Table D.1. 40-Character Image Identifier (Generic)

Position	**Description**	**Range**
1-7	<u>Image/Product Date</u> The date representing the currency of the image product data; the date the image data was acquired. This date shall be the same as the date recorded in the NITF image subheader IDATIM field.	DDMONYY
8-11	<u>Mission Number, Primary</u> An alphanumeric code that identifies the collection means for the imagery product. E.g. mission project number, DIA-assigned Project Code, aircraft identifier, etc. The allowed values are constrained to the alphanumeric value range or value list specified for the applicable collection system and its associated production system.	Mission and/or collection system specific. See the specification for the applicable product identification TRE.

12-13	Mission Number, Secondary An alphanumeric code that refines/expands the mission number by providing an 'instance' sequence. E.g. a flight number, a fly-over index/count, a re-visit number, etc.	01 – 09 A1 to A9 B1 to B9 … Z1 to Z9 00
14-16	Image Operation Number The index value (count) of the acquisition or collection task/objective that resulted in this product.	000 to 999
17 – 18	Beginning image segment ID A code used in conjunction with other fields in the identifier to characterize multi-segment products. For single-segment products, the value is always 'AA'. For multi-segment products, the value depends on the scope/coverage of the identifier. When the identifier refers to the entire imaging operation, the code is 'AA'. When the identifier refers to a portion of the imaging operation, the code is that of the segment to which the first pixel value in the portion belongs.	AA to ZZ
19 – 20	Reprocess number A code to differentiate different instances of the same image product resulting from reprocessing of the source data and/or enhancement processing of the originally processed image data. The value '00' indicates the data is the originally processed image. Values in the range '00' through '99' represent subsequent instances of reprocessing or enhancement processing.	00 to 99
21 – 23	Replay Replay indicates whether the data was retransmitted or re-stored to overcome exchange errors. Its value allows differentiation among multiple transmissions or exchanges of the same image product. The value '000' indicates that the data is from the initial exchange. Values in the range 'T01' to 'T99' indicate the instance of retransmission. Values in the ranges 'P01' to 'P99' and 'G01' to 'G99' are reserved for future use.	000, G01 to G99, P01 to P99, T01 to T99
24	Reserved for system specific use. The default values for this field are Underscore '_' and the Space character. When using the identifier as a file name, the underscore character shall be used. Either may be used when the identifier is used within NITF subheader or SDE fields.	Underscore "_" Space Character

25 – 26	Starting Column Block (or tile) Number The NITF block column index number for the first block of the image segment present in the actual data coverage to which the identifier is applicable. The column count is relative to the start of the segment specified by the Beginning Image Segment ID. The value depends on the scope/coverage of the identifier. When the identifier refers to the entire imaging segment, the code is ‘01’. When the identifier refers to a portion of the imaging segment, the code is the column index of the block to which the first pixel value in the data coverage belongs. For single block images this field shall contain 01.	01 - 99
27	Flag1 Reserved for system specific indicator flag. Default value is “0”	0
28 – 31	Starting row block (or tile) number The NITF block row index number for the first block of the image segment present in the actual data coverage to which the identifier is applicable. The row count is relative to the start of the segment specified by the Beginning Image Segment ID. The value depends on the scope/coverage of the identifier. When the identifier refers to the entire imaging segment, the code is ‘01’. When the identifier refers to a portion of the imaging segment, the code is the row index of the block to which the first pixel value in the product coverage belongs. For single block images this field shall contain 00001.	0001 - 9999
32 – 33	Ending Image Segment ID For single-segment products, the value is always ‘AA’. For multi-segment products, the value depends on the scope/coverage of the identifier. When the identifier refers to the entire imaging operation, the code is that of the last segment in the imaging operation. When the identifier refers to a portion of the imaging operation, the code is that of the segment to which the last pixel value in the portion belongs.	AA to ZZ
34 – 35	Ending column block (or tile) number The NITF block column index number for the last block of the image segment present in the actual data coverage to which the identifier is applicable. The column count is relative to the start of the segment specified by the Ending Image Segment ID. The value depends on the scope/coverage of the identifier. When the identifier refers to the entire imaging segment, the code is the last column index in the entire segment. When the identifier refers to a portion of the imaging segment, the code is the column index of the block to which the last pixel value in the data coverage belongs. For single block images this field shall contain 01.	01 - 99

27	Flag2 Reserved for system specific indicator flag. Default value is "0"	0
37 – 40	Ending row block (or tile) number The NITF block row index number for the last block of the image segment present in the actual data coverage to which the identifier is applicable. The row count is relative to the start of the segment specified by the Ending Image Segment ID. The value depends on the scope/coverage of the identifier. When the identifier refers to the entire imaging segment, the code is the last row index in the entire segment. When the identifier refers to a portion of the imaging segment, the code is the row index of the block to which the last pixel value in the data coverage belongs. For single block images this field shall contain 00001.	0001 - 9999

[EDITOR'S NOTE: Need to ascertain if the block count indexes should re-initialize at the beginning of each segment (AA, AB, ..). Some legacy systems continue the sequence across segment boundaries. That legacy approach lends no utility in making the AA, AB segment distinctions. We have already seen systems that will exceed the allowed max block row counts if the counts are not reinitialized at segment boundaries. Recommend we specify to re-initialize the counts and find a way to cope with legacy.]

D.2 Sixty-four Character Product Identifier

D.2.1 Sixty-four-Character Naming Convention. This file naming structure consists of a sixty-four-character image identifier followed by suffix extensions as follows:

FFFFFFFFFFFFFFFFFFF…..FFFFFFFFFFFFFFFFFFF.rN_PART_nn_OF_mm.NTF

Where:

FFFF…	The Sixty-four-Character Image Identifier (see table B-2).
.NTF	An optional extension to indicate the file is formatted in NITF.
.rN	An extension to indicate the resolution of the image within the file. r0 indicates the image is of original/full resolution. Values of r1 through r9 indicate reduced resolution in factors of 2 (1/2, 1/4, 1/8, 1/16, 1/32, …).
_PART_nn_OF_mm	An extension to indicate that the file is instance "nn" of "mm" total files that comprise the entire product specified by the forty-character identifier. Note: Under some circumstances, the total number of files comprising the entire product may not be known when the files are initially being produced. In that case, the mm value is set to 00 to

indicate the count is unknown. Where possible, the actual count should at least be placed in the last file of the product sequence.

D.2.2 Sixty-Four-Character Image Identifier. The field structure of the sixty-four-character image identifier is shown in Table B-2. The structure provides a means for uniqueness of product identification and for association of multiple files, that may comprise a single product. Each USIGS image production system using the 64-character identifier convention places additional product specific constraints on the use of the 64-character identifier. The image/product identifier Tagged Record Extension (TRE) specification applicable to the producing systems (i.e., STDIDC) specifies these additional constraints.

D.2.3 Identifier Field Value Dependency on Data Coverage. Proper population and use of field values used in the identifier depends on the data coverage to which the specific identifier applies. The values for beginning and ending image segments and those for starting and ending block numbers shall be populated from the perspective of the entire data coverage of the identified imaging operation. When the identifier pertains to an entire imaging operation (e.g. IID2/ITITLE), the segment and block indexes shall reflect the full extent of the data coverage. When the identifier pertains to a portion of the imaging operation (e.g. FTITLE and filename), the segment and block indexes shall reflect the relative location in the entire data coverage of the imaging operation that is included in the identified data portion.

Table D-2. 64-Character Image Identifier

Position	**Description**	**Range**
1 - 14	<u>Image/Product Acquisition Date and Time</u> The date and UTC time representing the currency of the image product data; the date/time the image data was acquired. This date and time shall be the same as the date recorded in the NITF image subheader IDATIM field.	YYYYMMDDhhmmss
15 - 18	<u>Mission Number, Primary</u> An alphanumeric code that identifies the collection means for the imagery product. E.g., mission project number, DIA-assigned Project Code, aircraft identifier, etc. The allowed values are constrained to the alphanumeric value range or value list specified for the applicable collection system and its associated production system.	Mission and/or collection system specific. See the specification for the applicable product identification TRE.
19 - 33	<u>Mission Number, Secondary</u> An alphanumeric code that refines/expands the primary mission number with further mission-specific identification. E.g., a mission number from an Air Tasking Order.	Mission and/or collection system specific. See the specification for the applicable product identification TRE.

34 - 35	Mission Number, Tertiary An alphanumeric code that refines/expands the significance of the previous two mission number fields by providing an 'instance' sequence. E.g. a flight number, a fly-over index/count, a re-visit number, etc.	01 – 09 A1 to A9 B1 to B9 … Z1 to Z9 00
36 - 40	Image Operation Number The index value (count) of the acquisition or collection task/objective that resulted in this product.	000 to 999
41 - 42	Beginning image segment ID A code used in conjunction with other fields in the identifier to characterize multi-segment products. For single-segment products, the value is always 'AA.' For multi-segment products, the value depends on the scope/coverage of the identifier. When the identifier refers to the entire imaging operation, the code is 'AA.' When the identifier refers to a portion of the imaging operation, the code is that of the segment to which the first pixel value in the portion belongs.	AA to ZZ
43 - 44	Reprocess number A code to differentiate different instances of the same image product resulting from reprocessing of the source data and/or enhancement processing of the originally processed image data. The value '00' indicates the data is the originally processed image. Values in the range '00' through '99' represent subsequent instances of reprocessing or enhancement processing.	00 to 99
45 - 47	Replay Replay indicates whether the data was retransmitted or re-stored to overcome exchange errors. Its value allows differentiation among multiple transmissions or exchanges of the same image product. The value '000' indicates that the data is from the initial exchange. Values in the range 'T01' to 'T99' indicate the instance of retransmission. Values in the ranges 'P01' to 'P99' and 'G01' to 'G99' are reserved for future use.	000, G01 to G99, P01 to P99, T01 to T99
48	Reserved for system specific use The default values for this field are Underscore '_' and the Space character. When using the identifier as a file name, the underscore character shall be used. Either may be used when the identifier is used within NITF subheader or SDE fields.	Underscore "_" Space Character

49 - 50	<u>Starting Column Block (or tile) Number</u> The NITF block column index number for the first block of the image segment present in the actual data coverage to which the identifier is applicable. The column count is relative to the start of the segment specified by the Beginning Image Segment ID. The value depends on the scope/coverage of the identifier. When the identifier refers to the entire imaging segment, the code is ‘01.’ When the identifier refers to a portion of the imaging segment, the code is the column index of the block to which the first pixel value in the data coverage belongs. For single block images this field shall contain 01.	01 - 99
51 - 55	<u>Starting row block (or tile) number</u> The NITF block row index number for the first block of the image segment present in the actual data coverage to which the identifier is applicable. The row count is relative to the start of the segment specified by the Beginning Image Segment ID. The value depends on the scope/coverage of the identifier. When the identifier refers to the entire imaging segment, the code is ‘01’. When the identifier refers to a portion of the imaging segment, the code is the row index of the block to which the first pixel value in the product coverage belongs. For single block images this field shall contain 00001.	00001 - 09999
56 - 57	<u>Ending Image Segment ID</u> For single-segment products, the value is always ‘AA.’ For multi-segment products, the value depends on the scope/coverage of the identifier. When the identifier refers to the entire imaging operation, the code is that of the last segment in the imaging operation. When the identifier refers to a portion of the imaging operation, the code is that of the segment to which the last pixel value in the portion belongs.	AA to ZZ
58 - 59	<u>Ending column block (or tile) number</u> The NITF block column index number for the last block of the image segment present in the actual data coverage to which the identifier is applicable. The column count is relative to the start of the segment specified by the Ending Image Segment ID. The value depends on the scope/coverage of the identifier. When the identifier refers to the entire imaging segment, the code is the last column index in the entire segment. When the identifier refers to a portion of the imaging segment, the code is the column index of the block to which the last pixel value in the data coverage belongs. For single block images this field shall contain 01.	01 - 99

60 - 64	Ending row block (or tile) number The NITF block row index number for the last block of the image segment present in the actual data coverage to which the identifier is applicable. The row count is relative to the start of the segment specified by the Ending Image Segment ID. The value depends on the scope/coverage of the identifier. When the identifier refers to the entire imaging segment, the code is the last row index in the entire segment. When the identifier refers to a portion of the imaging segment, the code is the row index of the block to which the last pixel value in the data coverage belongs. For single block images this field shall contain 00001.	00001 - 09999

D.3 Moving Target Indicator (MTI) File Naming Convention

Table D-3. 40-Character Image ID for MTI Files without Image Segments

Position	Description	Range
1-3	MTI	MTI
4 – 17	Date and time of collection DATIME field from MTIRPB TRE.	YYYYMMDDhhmmss
18 – 37	Mission Number AC_MSN_ID field from ACFTB	Mission Name as specified in the AIP ARS to Ground ICD Table 3.3.1.2.6-1.
38 – 40	Spaces	spaces

D.4 CIB/CADRG/RFP Product Identifiers

[Reference appropriate MIL-PRF docs for specification; show brief summary of the convention here for general awareness and context within this document.]

D.5 DPPDB Product Identifiers

[Reference appropriate MIL-PRF docs for specification; show brief summary of the convention here for general awareness and context within this document.]

D.6 DIGEST GeoSDE

[Reference appropriate DIGEST and STANAG docs for specification; show brief summary of the convention here for general awareness and context within this document.]

D.7 FOR SYSTEMS USING THE NATIONAL TECHNICAL MEANS (NTM) SET OF SUPPORT DATA EXTENSIONS

[Refer to NITFIRD.]

D.8 FOR SYSTEMS USING THE AIRBORNE SUPPORT DATA EXTENSIONS

D.8.1 Management and Tracking of the Imaging Process. Imagery exploitation management systems currently depend on the 40-character product identifier to track the imaging process. Once the imaging collection process is completed, the set of files (one or more) associated with the imaging operation is placed in storage for retrieval. A message is sent to the exploitation management system that the requested imaging operation is complete and product is available for exploitation. The 40-character ID is the means for the management system to identify which file(s) resulted from the task to collect imagery. The following describes the relationship of AIMID, FTITLE, ITITLE/IID2, and the 40-character ID for management of the imaging process.

D.9 Tactical Image ID

STDI-0002 does not provide guidance to the tactical users for file naming, FTITLE, product naming or any relationships between them. It also does not provide guidance for handling derivative imagery products. According to STDI-0002 the additional image identification (AIMIDx) Tagged Record Extension (TRE):

- is a required component of all imagery files (one in each subheader of every NITF image segment).
- is "used for storage and retrieval from standard imagery libraries" and
- provides the forty characters to populate the ITITLE/IID2 field within the image subheader (see table below).

Airborne sensors that generate NITF files frequently populate the AIMID TRE with the allowed default values for a variety of reasons (e.g.; lack of onboard processing capability, lack of information, etc). Several groups within the Intelligence Community (IC) have recognized a problem with image identification (image ID) and have attempted to address the problem separately.

Table D-4. Mapping Between AIMIDB and ITITLE/IID2

(From: STDI-0002, Version 2.1, 16 November 2000)

ITITLE/IID2 Location (Bytes)	AIMIDB Field
1 - 7	ACQUISITION_DATE (formatted as DDMMMYY, where: DD is the day of the month, MMM is a three-letter abbreviation of the month, JAN, FEB, … DEC, YY is the least significant 2 digits of the year).
8 – 11	MISSION_NO
12 – 13	FLIGHT_NO
14 – 16	OP_NUM
17 – 18	CURRENT_SEGMENT
19 – 20	REPRO_NUM
21 – 23	REPLAY
24	Space
25 – 26	START_TILE_COLUMN (least significant 2 bytes)
27 – 31	START_TILE_ROW
32 – 33	END_SEGMENT
34 – 35	END_TILE_COLUMN (least significant 2 bytes)

36 - 40	END_TILE_ROW

D.9.1 Distributed Common Ground/surface Station (DCGS)

The DCGS community uses the image ID to coordinate imagery flow within DCGS elements (e.g., between the Common Imagery Processor (CIP), Imagery Product Library (IPL), screener and exploitation workstations). Sensors, CIP and screeners do not have a standard method for ensuring a unique tactical image ID.

The DCGS community developed an interim solution with the intent of providing the most uniqueness and functionality with the least impact/disruption while accommodating the Imagery Exploitation Support System's (IESS) twenty-four-character (for uniqueness) and IPL's forty-character image ID constraints. The interim solution does not create a new AIMID TRE version. The CIP will continue to populate the AIMIDB TRE with valid data, and edit any fields containing default values, received from the sensors. For the interim solution, the CIP only changes the data sources used to populate the first forty characters of the image subheader ITITLE/IID2 field. The DCGS community plans to implement their interim solution within the CIP, IPL and IESS by December 2003 (preceded by an August 2003 demonstration). Table D-5 displays how the CIP will populate the first forty characters of the ITITLE/IID2 field to create a unique image ID.

Table D-5. DCGS Short Term Unique Image ID Solution

ITITLE/IID2 Location (Bytes)	Current Field Name(s) (from AIMIDB)	New Field Name	New Field Name Description
1-7	ACQUISTION_DATE	ACQUISTION_DATE	No change, reference Table 8-4 in STDI-0002, Version 2.1, 16 Nov 2000 Note: This is the image collection date and not the start of mission date or aircraft takeoff date.
8-11	MISSION_NO	MISSION_NO	No change, reference Table 8-4 in STDI-0002, Version 2.1, 16 Nov 2000 (Format = PPNN, where PP is the DIA project code and NN is the flight/sortie number)
12-16	FLIGHT_NO & OP_NUM	OP_NUM	5-char (numeric) image operation number (00000-99999).
17-18	CURRENT_SEGMENT	PRODUCER_CODE	2-char DOD/DIA producer code. Uniquely defines a producer.
19-24	REPRO_NUM, REPLAY, & Space	PRODUCT_NO	6-char “producer defined” product id number which uniquely defines each product produced by a given producer. This could be a simple one-up product sequence number. See below for example CIP definition.

25 -26	START_TILE_COLUMN	CURRENT_SEGMENT	2-char (alphanumeric) current segment ID. Same as CURRENT_SEGMENT as defined in AIMIDB.
27 - 29	START_TILE_ROW (bytes 27 - 29)	REPLAY	3-char (alphanumeric) replay indicator. Same as REPLAY as defined in AIMIDB.
30 -32	START_TILE_ROW (bytes 30 -31) & END_SEGMENT (byte 32)	PRODUCER_SN	3-char (numeric) producer serial numbers (000-999 or 000-FFF). Defines a unique instance of the producer.
33-40	END_SEGMENT (byte 33), END_TILE_COLUMN & END_TILE_ROW	PRODUCTION_DATIM	8-char (hex) production date/time (GMT represented in hexadecimal as elapsed time in seconds since midnight January 1, 1970.

The “CIP Product Number” is collectively defined as a 6-character field. It consists of three subfields: processing configuration number (1 char, 0-F), product type identification (2 chars, 01-FF), and product sequence number (3 chars, 000-FFF).

Example: If the processing configuration = 1, product type identification = 12, and product sequence number = 25; then the PRODUCT_NO = 10C019 (hex).

D.10 File Name. The file name shall consist of the 57-character identifier contained in the FTITLE field followed by the .NTF extension. The file name represents the actual pixel coverage (in terms of the beginning and ending segment and column/row indexes) in the NITF file.

D.11 FOR SYSTEMS USING THE COMMERCIAL SET OF SUPPORT DATA EXTENSIONS

[Repeat specification sequence similar as done for ASDE, but for STDIDC. Check to see what commercial file naming conventions may be used by Space Imaging and Earth Watch.]

D.12 FOR SYSTEMS USING THE GEOSPATIAL SET OF SUPPORT DATA EXTENSIONS

[Refer to the new Annex E being developed for the DIGEST specification.]

D.13 FOR SYSTEMS USING THE RASTER PRODUCT FORMAT (RPF) SET OF SUPPORT DATA EXTENSIONS

[Refer to RPF Mil-Stds and product Mil-C specs for CIB and CADRG. Show example file naming structure here as extracted from the stds/specs (for reference purposes).]

D.14 FOR SYSTEMS USING THE DIGITAL POINT POSITIONING DATA BASE (DPPDB) SET OF SUPPORT DATA EXTENSIONS

[Refer to DPPDB Mil-Perf and specs for RPF/CADRG. Show example file naming structure here as extracted from the specs. (for easy reference purposes.)]

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Appendix E -- Chipping

E.0 General

This appendix provides information on the chipping process in the NITFS. Chipping, in the context of this document, refers to a subset of image pixels, *and* a full complement of metadata, that has been extracted from another full or partial image. When *properly* organized and structured, the resulting "chip," along with other supporting data (explained later) provides enough "intelligence" to allow imagery users and exploiters to extract information from the pixel subset with the *same* degree of confidence and accuracy as if they were operating within the realm of the original, full imaging operation. Accordingly, an "intelligent" image chip is more than just a dumb "happy snap." In addition to satisfying visual needs, the intelligent chip provides the means for extracting or determining such things as geo-positions, distances, elevations, etc. These activities require an indexing scheme to convert "row and column" pairs within in a chip displayed on a screen to "line and sample" pairs within the original full image product.

For ease of understanding, future references to image "chipping" or "chips" in this appendix implies an intelligent process or subset of image pixels as just described.

E.1 Types of Image Chips

Two categories of image chips are generally recognized: Primary (Unexploited) and Secondary (Exploited). Implementations may support either or both forms of imagery chipping.

E.1.1 Primary/Unexploited Imagery Chipping

Implementations supporting this form of chipping typically cut chips on Fast Access Format (FAF), or image tile, boundaries. Chips cut in this manner will not have been exploited or altered in any way -- the resulting chip is simply a subset of pixels from the original unaltered image and normally will be the only image (IM) segment in the resulting NITF file. Chip files of this nature are characteristic of those produced by the NIMA's Dissemination Element (DE). Although it is not generally required nor in common practice, producers of such chips are, however, encouraged to also include a properly completed ICHIPx Tagged Record Extension (TRE) (discussed later) in the image's IXSHD area, to promote a broader interoperability scope.

E.1.2 Secondary/Exploited Imagery Chipping

Implementations supporting this form of chipping will typically cut chips from any location ("pixel bound" as opposed to FAF/tile bounds) within the original image. Chips of this nature are characteristic of those produced by the Electronic Light Tables (ELTs) or other similar exploitation applications. In addition to the image chip, other exploitation data (segments) such as annotations, textual information, etc., may be included in the NITF file.

E.2 Chipping Paradigms

Whenever pixels are extracted or chipped from another image, a means must be incorporated that enables any recipient of the chip to determine where in the original imaging operation the chip originated. This enables the user to perform functions such as mensuration or geo-positioning within the chip in the same manner as the full image. Regardless of the chipping paradigm employed, all perform the same function: to enable the recipient/interpreter to reference the chip's corresponding location in the original imaging operation.

Currently, there are three acknowledged methodologies for structuring and producing NITF image chips. All are capable of providing the same level of accuracy and confidence; however, only two are officially supported and endorsed by the NIMA community. It is not uncommon to encounter products that employ all three means within the same NITF file/image segment. It should be noted, however, when such a practice is implemented, all chipping paradigms must be consistent and in harmony with each other.

E.2.1 ICHIPx Tagged Record Extension (TRE)

The NIMA-preferred and endorsed means for recording pixel-boundary-chipping information is the ICHIPx TRE. The ICHIPx TRE evolved from the I2MAPD TRE (discussed below), beginning as ICHIPA. Subsequent minor modifications to the ICHIPA brought about the current version, ICHIPB. All NITF producers and interpreters should support the ICHIPB, and if necessary for backward compatibility, the ICHIPA.

In addition to recording pixel/grid boundaries/indices of the chip and those corresponding to the original, full image, the ICHIPB scan block origin and anamorphic correction, as required, and the full image's size.

Developers of new systems are encouraged to place the ICHIPB in all products whether or not they are chips. This helps foster proper use of the TRE, unambiguous image dimension information, and allows for other recording of other actions such as anamorphically corrected reduced resolution data sets (RRDS).

Use, application, and implementation information related to the ICHIPB TRE can found in NIMA's STDI-0002, *Compendium of Controlled Extensions (CE) for the National Imagery Transmission Format (NITF),*

E.2.2 Fast Access Format (FAF)

"FAF chipping" is a practice whereby a chipping TRE is not needed to determine the chip's origin in the original full image space. This practice requires "encoding" the original image's dimensions (usually in 1024x1024 tile/block multiples) within an image ID that is placed in the ITITLE field of the NITF image subheader. This same information can usually be found in any TRE that stores additional image identification data such as the AIMIDB. Then, using the same image ID and re-encoding the new FAF corners of the chip, the new image ID representing the chip is placed in the FTITLE field of the NITF file. Hence, by applying the chip's FAF cornerpoints to the original image, LINEs and SAMPLEs in the full image space can be derived for the chip.

Developers of new applications are discouraged from producing chip files based on the FAF-boundary paradigm just described. New interpreters may consider implementing this paradigm for legacy support reasons only.

E.2.3 I2MAPD Tagged Record Extension (TRE)

The I2MAPD TRE is a legacy product of the Image Data Exploitation (IDEX) system era. It was developed by the Lockheed Martin Corporation (LMCO) to support pixel-bound chipping. It also maintains provisions for information related to image warping, corner-point latitudes and longitudes, and resolution.

Originating as a "proprietary" TRE, it is not endorsed or supported by NIMA. Although not encouraged, some systems have elected to implement the I2MAPD in conjunction with other aforementioned means for a more robust, backward compatible, chipping capability.

There is no known official documentation of the I2MAPD, other than a 1995 User's Guide produced by the LMCO IDEX Program Office. Copies of this .PDF document are available from the JITC NITF Lab, if necessary.

E.3 Support Data

E.3.1 National Technical Means (NTM)

Support data extensions (SDEs) in the National community are generally treated as sacred material, never to be altered for any reason. Such a practice is not known to be documented anywhere -- it is simply an accepted trait of the community. Accordingly, consumers of NTM imagery can process such products with a reasonably high degree of confidence that the image's support data is "as collected" and not likely to have been altered.

Unaltered support data from the sensor to the exploiter minimizes the processing burden on the original and subsequent "producers" of the image data due to the simple "pass it along" philosophy. In this paradigm, processing complexity falls to the interpreter. It is up to the receiver consider such things as chip-to-full image location, scaling, etc., and make appropriate allowances when applying unaltered support data from the "as collected," full resolution image.

E.3.2 Tactical/Airborne

The Airborne Community has elected to provide producers the option to pass support data along "as collected" or altered (recalculated) to correspond to processing actions (chipping, scaling, etc.). This philosophy is inferred in the Airborne Support Data Extensions (ASDEs) area of NIMA's STDI-0002, whereby guidance on recalculation is offered.

While confidence in data may be eroded, and processing burdens increased for producers, in the recalculation paradigm, the interpreter's job is eased since everything has been properly adjusted to *appear* as if the image was collected as presented.

E.4 Other Information

To the maximum extent possible, chips should retain as much of the source image's "historical" information as possible. An application that produces chips should retain all of the original header information to the point that it does not provide false or other misleading characteristics about the product. For example, retaining the original image ID allows the chip recipient to retrieve the full image if additional/adjacent areas of interest are desired. Another example is the image source. Regardless of subsequent processing, the pixels that are in the chip will always have been captured by the same sensor that captured the full image. Maintaining as much of the original information as possible is important from a historical perspective, yielding much about the lineage or pedigree of the product.

E.5 NITF Compliance

Technical and general information regarding implementation, formal assessment, test criteria, etc., is present in the ICHIPB chapter in NIMA STDI-0002.

Appendix F -- NITFS Format Conversion Services

THE TABLES IN APPENDIX F ARE IMMATURE, THEY ARE NOT COMPLETE AND WILL BE MODIFIED BEFORE FINAL PUBLICATION.

F.1 INTRODUCTION

F.1.1 Purpose. To describe common methods for NITFS imagery related format translation or conversion services to assist developers and users of Imagery Exploitation Systems and Archive/Dissemination Applications. Appendix G separately covers converting security fields between formats.

F.1.2 Scope. The translation/conversion services identified herein provide a starting point to assist developers in understanding format conversions currently supported in NITF when taking into account user community, system requirements, compliance, and interoperability. Though the identified translations/conversions are for NITF 2.0 to NITF 2.1, the developer can use the tables as a guide for converting TFRD, TIFF, Sun Raster, and JPEG to either NITF 2.0 or NITF 2.1 and vice versa. Additionally, the users and developers should consider that many new NITF 2.1 file features cannot be converted to NITF 2.0 or other file formats. Hence, the user must upgrade to an NITF 2.1 application that supports these features if they have a real need for them.

F.1.3 Background. Testing of Exploitation and Archive/Dissemination applications in the past have continually demonstrated inconsistencies when attempting to convert NITF products. In many cases, when imagery products with multiple segments are converted, all image segments except the first one in the file were eliminated. This results in a product that, if evaluated independently without using the source product, would appear to be compliant. However, when reviewing the resulting product using the source, the product fails the NITFS compliance evaluation because of data loss. Applications have routinely shown conversion inconsistencies as follows:

1. Attempting to apply the image characteristics of the first image segment to all image segments in the file.

2. Not taking into account the difference in the use of Display and Attachment Levels in relationship to the common coordinate system between the NITF 1.1, NITF 2.0, and NITF 2.1 file formats.

3. Incorrectly converting bit-mapped symbol segments supported in NITF 2.0 to some other graphic or image format. (Note: Continued use of bit-mapped symbol segments within NITF 2.0 files is highly discouraged. NITF 2.1 does not allow the use of bit-mapped symbol/graphic segments.)

4. Incorrectly converting label segments supported in NITF 2.0 to some other graphic or image format. (Note: Continued use of label segments within NITF 2.0 files is highly discouraged. NITF 2.1 does not allow the use of label segments.)

5. Failure to embed the appropriate JPEG Quantization and Huffman tables when converting from NITF 2.0 JPEG compressed image segments that only contain references to external default Quantization/Huffman tables.

6. Incorrect conversion of 1-bit non-compressed image segments supported in NITF 2.1.

7. Incorrect conversion of MIL-STD-2301A CGM features supported in NITF 2.1 to in the earlier MIL-STD-2301 set of features supported in NITF 2.0.

8. Failure to identify unsupported NITF 2.0 image features when converting to NITF 2.0 from NITF 2.1.

- Non-integer images. The CLEVEL constraints for NITF 2.0 only allow for binary and unsigned integer data. NITF 2.1 CLEVELs allow for binary, unsigned integer, signed integer, floating point real, and complex pixel values.

- Masked images. NITF 2.0 only allowed block and pixel masks with non-compressed (NM) and VQ-compressed (M4) pixel data. NITF 2.1 extends the application of block and pixel masks to additional compression options.

- Integer Images. Other than those with an Actual-Bits-Per-Pixel (ABPP) or 8-, 11-, or 12-bit and having an Image Compression (IC) of non-compressed (NC) or JPEG lossy compressed (C3).

9. Failure to identify unsupported NITF 2.0 text formats of UT1 and U8S when converting from NITF 2.1.

10. Directly converting NITF 2.1 File Background Color (FBKGC) field to NITF 2.0 without consideration for older systems that do not support non-ASCII values in this field.

F.1.4 Implementation Considerations. The following implementation considerations should be used when implementing translation/conversion services:

1. Routinely converting NITF 2.0 products to NITF 2.1 should not be necessary as implementations supporting NITF Version 2.1 (MIL-STD-2500B) are backward compatible with NITF 2.0. Note: This appendix does provide guidance on conversion from NITF 2.0 to NITF 2.1.

2. NITF 2.0 does not support many NITF 2.1 features. Current NITF 2.0 users must upgrade to NITF 2.1 applications if they have a need for those features.

3. For many conversions between NITF 2.0 and NITF 2.1, the visual representation displayed to the user will be identical. However, the user must

understand that the internal segment representations may be different. This is a result of differences in file formats that can be successfully converted from one supported segment type to another. Examples are labels to CGM and bit-mapped symbols to 1-bit images.

4. The resulting product must represent what the originator intended at all times or, at a minimum, the originator should be aware of potential problems.

F.2 SUGGESTIONS/RECOMMENDATIONS. Based on results of previous testing, the following are suggestions and recommendations for developers. The goal is to create files that are both compliant and correctly represent the intent of the original data producer. Tables F-1 through F-4 deal with file level and data source considerations. Tables F-5 through F-11 address the mapping of individual data fields within NITF 2.0 and NITF 2.1 file formats.

F.2.1 Segment Data Conversions.

F.2.1.1 NITF 2.0 to NITF 2.1. NITF 2.1 compliance requires backward compatibility to read/interpret NITF 2.0 formatted data. However, tables F-1 and F-2 are provided to assist developers in understanding the imported data fields in the conversion process. (E.g., batch updates of old data holdings to ensure future interpretability, etc.) Table F-1 identifies potential segment exportability considerations and table F-2 provides further information in refining potential conversion considerations to include: image compression, bit-mapped symbols, and labels. Developers should not consider converting NITF 2.0 files containing bit-mapped symbol segments and/or label segments to NITF 2.1 files, since these features are not directly supported in NITF 2.1. Conversion of the information content in these segment types can be accomplished, but it takes a significant programming effort to do so correctly. Converting these NITF 2.0 segments to NITF 2.1 segments requires bit-mapped symbol segments to become image segments and label segments to become CGM graphic segments. This results in additional verification of data segment structures to ensure the converted segments are compliant. Given the potential pitfalls of these types of conversions, other alternatives should be considered before implementing.

Table F-1. File Level Conversions From NITF 2.0 to NITF 2.1

Segments	Exportability	Comments
Image	All	All image types can be converted with appropriate sub-header adjustments.
Symbol	CGM only	CGM symbols can be moved “As-Is” with sub-header adjustments. Bit Mapped symbols must be converted to 1-bit images if conversion is to be allowed. This conversion will require generating a new sub-header. However, recommend files of this nature not be converted.
Label	Not Supported	Labels must be converted to CGM symbols if conversion is to be allowed, this will be done using text, auxiliary color and transparency elements. This conversion will require generating a new sub-header. However, recommend files of this nature not be converted.
Text	All	Text segment can be moved “As-Is” with sub-header adjustments.
DES	All	DES segment can be moved “As-Is” with sub-header adjustments to include the DESTAG.

Table F-2. NITF 2.0 Source Conversion to NITF 2.0 or 2.1 Suggestions

File Type/Convert To	NITF 2.0	NITF 2.1	Comment
Image			Note: For allowed data segment conversions make appropriate sub-header changes, see table F-6.
PVTYPE			
INT	Yes	Yes	INT components can be converted
B	“As-Is”	“As-Is”	If contained in file, move image “As-Is” on any conversion request.
NBPP			
1-bit	“As-Is”	“As-Is”	If contained in file, move image “As-Is” on any conversion request.
8-bit	Yes	Yes	Compression change only.
12-bit	Yes	Yes	Compression change and/or to 8-bit.
16-bit	Yes	Yes	Compression change and/or to 8-bit.
IREP			
MONO	Yes	Yes	Compression change only.
RGB/LUT	“As-Is”	“As-Is”	If contained in file, move image “As-Is” on any conversion request.
RGB	Yes	Yes	Compression change only.
YCbCr601	Yes	Yes	Compression change only.
MULTI	“As-Is”	“As-Is”	If contained in file, move image “As-Is” on any conversion request.
IC			
NC	Yes	Yes	To JPEG Lossy
JPEG Lossy	Yes	Yes	To NC
Downsample	“As-Is”	“As-Is”	If contained in file, move image “As-Is” on any conversion request.
Bi-Level	“As-Is”	“As-Is”	If contained in file, move image “As-Is” on any conversion request.
VQ	“As-Is”	“As-Is”	If contained in file, move image “As-Is” on any conversion request.
Symbols			
Bit-Mapped	“As-Is”	No Not Supported In NITF 2.1	Move “As-Is” in NITF 2.0 to NITF 2.0 conversions. However, do not convert to NITF 2.1 when NITF 2.0 file contains a bit-mapped segment. If a real need exists for converting to NITF 2.1, Bit Mapped symbols must be converted to 1-bit images. This conversion will require generating a new sub-header as well.

File Type/Convert To	NITF 2.0	NITF 2.1	Comment
CGM	“As-Is”	“As-Is”	If contained in file, move CGM “As-Is” on any conversion request. If to NITF 2.1 make appropriate sub-header changes.

Yes - convertible No - do not convert "As-Is" - do not change

Table F-2. NITF 2.0 Source Conversion to NITF 2.0 or 2.1 Suggestions (cont.)

File Type/Convert To	NITF 2.0	NITF 2.1	Comment
Labels	“As-Is”	No Not Supported In NITF 2.1	Move “As-Is” in NITF 2.0 to NITF 2.0 conversions. However, do not convert to NITF 2.1 when NITF 2.0 file contains a label segment. If a real need exists for converting to NITF 2.1, Labels must be converted to CGM symbols, this will be done using text, auxiliary color and transparency elements. This conversion will require generating a new sub-header as well.
Text	“As-Is”	“As-Is”	If contained in file, move Text “As-Is” on any conversion request. If to NITF 2.1 make appropriate sub-header changes.
DES	“As-Is”	“As-Is”	If contained in file, move DES “As-Is” on any conversion request. If to NITF 2.1 make appropriate sub-header changes.

Yes - convertible No - do not convert "As-Is" - do not change

F.2.1.2 NITF 2.1 to NITF 2.0. Tables F-3 and F-4 are provided to help the Software Developer understand the NITF 2.1 data types that are supported in NITF 2.0. In past testing developers have been guilty of converting some NITF 2.1 data types that are not supported in NITF 2.0 and this will cause problems for legacy NITF 2.0 systems.

Table F-3. File Level Conversions From NITF 2.1 to NITF 2.0

Segments	Exportability	Comments
Image	Limited	PVTYPE INT, IREP MONO, with NBPP of 8, 12 or 16 can be moved “As-Is” or with compression conversion, for NBPP 12-bit NC, which is converted to NITF 2.0 11 ABPP in 16 NBPP. PVTYPE INT, IREP RGB, RGB/LUT and YCbCr with NBPP of 8 will be moved “As-Is” or with compression conversion Other PVTYPEs, IREPs or NBPPs not supported. Note: for convertible features make appropriate sub-header adjustments
Graphic	Limited	Only CGM attributes supported in MIL-STD-2301 with sub-header adjustments. Other MIL-STD-2301A CGM attributes not supported.
Text	Limited	TXTFMT of STA or MTF moved “As-Is” with sub-header adjustments TXTFMT of UT1 or U8S not supported
DES	All	Do not convert DES segments.

Table F-4. NITF 2.1 Source Conversion Suggestions

File Type/Convert To	NITF 2.0	NITF 2.1	Comment
Image			Note: For allowed data segment conversion make appropriate sub-header changes.
PVTYPE			
INT	Yes	Yes	INT components can be converted.
B	Bi-level Only “As-Is”	“As-Is”	If contained in file, move image “As-Is” on any conversion request if bi-level. If other than bi-level, prevent file conversions to NITF 2.0.
R	No	“As-Is”	Moved “As-Is” in NITF 2.1 to NITF 2.1 conversions. However, prevent file conversions to NITF 2.0.
C	No	“As-Is”	Moved “As-Is” in NITF 2.1 to NITF 2.1 conversions. However, prevent file conversions to NITF 2.0.
SI	No	“As-Is”	Moved “As-Is” in NITF 2.1 to NITF 2.1 conversions. However, prevent file conversions to NITF 2.0.
NBPP			
1-bit	Bi-level Only “As-Is”	“As-Is”	If contained in file, move image “As-Is” on any conversion request if bi-level. If other than bi-level, prevent file conversions to NITF 2.0.
8-bit	Yes	Yes	Compression change only.
12-bit	Yes	Yes	Compression change and/or to 8-bit.
16-bit	Yes	Yes	Compression change and/or to 8-bit.
32-bit	No	No	Moved “As-Is” in NITF 2.1 to NITF 2.1 conversions. However, prevent file conversions to NITF 2.0.
64-bit	No	No	Moved “As-Is” in NITF 2.1 to NITF 2.1 conversions. However, prevent file conversions to NITF 2.0.
IREP			
MONO	Yes	Yes	Compression change only.
RGB/LUT	“As-Is”	“As-Is”	If contained in file, move “As-Is” on any conversion request.
RGB	Yes	Yes	Compression change only.
MULTI	No	Yes	If uncompressed, move “As-Is” in NITF 2.1 to NITF 2.1 conversions. If compressed allow conversion to NITF 2.1 NC. However, prevent file conversions to NITF 2.0.
YCbCr601	Yes	Yes	Compression change only.
NODISPLY	No	“As-Is”	Moved “As-Is” in NITF 2.1 to NITF 2.1 conversions. However, prevent file conversions to NITF 2.0.

Yes - convertible No - do not convert "As-Is" - do not change

Table F-4. NITF 2.1 Source Conversion Suggestions (cont.)

File Type/Convert To	NITF 2.0	NITF 2.1	Comment
IC			
NC	Yes	Yes	To JPEG Lossy
JPEG Lossy	Yes	Yes	To NC
JPEG Lossless	No	“As-Is”	Moved “As-Is” in NITF 2.1 to NITF 2.1 conversions. However, prevent file conversions to NITF 2.0.
JPEG MS	No	“As-Is”	To NITF 2.1 NC only.
Downsample	“As-Is”	“As-Is”	If contained in file, move “As-Is” on any conversion request.
Bi-Level	“As-Is”	“As-Is”	If contained in file, move “As-Is” on any conversion request.
VQ	“As-Is”	“As-Is”	If contained in file, move “As-Is” on any conversion request.
Mask (NM/Mx)	No	Yes	Convert with-in NITF 2.1 if IC (NM or M3), if not “As-Is” with NITF 2.1. However, prevent file conversions to NITF 2.0.
Graphics	Only MIL-STD-2301 supported “As-Is”	“As-Is”	For conversion to NITF 2.1 move “As-Is” on any conversion request. For conversion to NITF 2.0, move only files containing fully support MIL-STD-2301 features “As-Is” on any conversion request. If to NITF 2.0 make appropriate sub-header changes.
Text			
STA	“As-Is”	“As-Is”	If contained in file, move “As-Is” on any conversion request. If to NITF 2.0 make appropriate sub-header changes.
UT1	No	“As-Is”	Moved “As-Is” in NITF 2.1 to NITF 2.1 conversions. However, prevent file conversions to NITF 2.0 when NITF 2.0 file contains a UT1 text segment.
U8S	No	“As-Is”	Moved “As-Is” in NITF 2.1 to NITF 2.1 conversions. However, prevent file conversions to NITF 2.0 when NITF 2.0 file contains a U8S text segment.
MTF	No	“As-Is”	If contained in file, move “As-Is” on any conversion request. If to NITF 2.0 make appropriate sub-header changes.
DES	“As-Is”	“As-Is”	If contained in file, move “As-Is” on any conversion request. If to NITF 2.0 make appropriate sub-header changes.

Yes - convertible   No - do not convert   "As-Is" - do not change

F.2.2 Header/Sub-header Conversions.

F.2.2.1 File Header. Table F-5 describes file header to file header conversion considerations.

Table F-5. NITF Header Mappings

Field	Description	Size	Format Values NITF 2.0	Type	Mapping	Format Values NITF 2.1	Type
FHDR	File Type & Version	9	NITF02.00	R	Change	NITF02.10 or NSIF01.00	R
CLEVEL	Compliance Level	2	01-07 (other values allowed, but will not be converted.)	R	Possible Change, based on CLEVEL definitions.	03, 05, 06 (other values allowed, but will not be converted.)	R
STYPE	System Type	4	4 Spaces (Reserved)	O	Change	BF01	R
OSTAID	Originating Station ID	10	Alphanumeric (May not be all spaces)	R	Possible Change	BCS-A (May not be all spaces)	R
FDT	File Date & Time	14	DDHHMMSSZMONYY	R	Change	CCYYMMDDhhmmss	R
FTITLE	File Title	80	Alphanumeric	O	"As-Is"	UT-1 (default is all spaces)	R
FSCLAS	File Security Classification	1	T, S, C, R, or U	R	"As-Is"	T, S, C, R, or U	R
Security	Covered in Appendix G	166	See Appendix G	-	See Appendix G	See Appendix G	*
ENCRYP	Encryption	1	0 = Not Encrypted (This field must contain the value 0)	R	"As-Is"	0 = Not Encrypted (This field must contain the value 0)	R
FBKCG	File Background Color	3	0x00 to 0Xff	R	"As-Is" NITF 2.0 to NITF 2.1. For NITF 2.1 to NITF 2.0 kept in range 0x20 to 0x7f.	Unsigned Binary integer (0x00-0xFF, 0x00-0xFF, 0x00-0xFF in Red, Green, Blue order	R
ONAME	Originator's Name	27	Alphanumeric	O	"As-Is"	UT-1 (default is all spaces)	O
OPHONE	Originator's Phone Number	18	Alphanumeric	O	"As-Is"	BCS-A (default is all spaces)	O
FL	File Length	12	Numeric	R	Possible Changes based on segment changes.	Numeric	

HL	NITF Header Length	6	Numeric	R	Possible Changes based on segment changes.	Numeric	R

R = Required, O = Optional, C = Conditional, * = field does not exist, ** = size of data field

Table F-5. NITF Header Mappings (cont.)

Field	Description	Size	Format Values NITF 2.0	Type	Mapping	Format Values NITF 2.1	Type
NUMI	Number of Image Segments	3	Numeric	R	Possible Changes based on segment changes.	Numeric	R
LISH001	Length of Nth Image Sub-header	6	Numeric	C	Possible Changes based on sub-header changes.	Numeric	C
LInnn	Length of Nth Image	10	Numeric	C	Possible Changes based on segment changes.	Numeric	C
NUMS	Number of Graphic Segments	3	Numeric	R	Possible Changes based on segment changes.	Numeric	R
LSSH001	Length of Nth Graphic Sub-header	4	Numeric	C	Possible Changes based on sub-header changes.	Numeric	C
Lsnnn	Length of Nth Graphic	6	Numeric	C	Possible Changes based on segment changes.	Numeric	C
NUML / NUMX	Number of Label Segments	3	Numeric, if conversion required must be changed to CGM Graphics.	R	Cannot be converted	Not allowed in NITF 2.1, must always be “000."	R
LLSH001	Length of Nth Label Sub-header	4	Numeric	C		N/A	*
LLnnn	Length of Nth Label	3	Numeric	C		N/A	*
NUMT	Number of Text Segments	3	Numeric	R	“As-Is” on allowed changes.	Numeric, note only STA and MTF files can be converted, all other text types cannot be converted to NITF 2.0.	R

LTSH001	Length of Nth Text Sub-header	4	Numeric	C	Possible Changes based on sub-header changes.	Numeric	C
LTnnn	Length of Nth Text	5	Numeric	C	“As-Is” on allowed changes.	Numeric	C

R = Required, O = Optional, C = Conditional, * = field does not exist, ** = size of data field

Table F-5. NITF Header Mappings (cont.)

Field	Description	Size	Format Values NITF 2.0	Type	Mapping	Format Values NITF 2.1	Type
NUMDES	Number of DES Segments	3	Numeric	R	"As-Is"	Numeric, Note only NITF 2.0 to NITF 2.1 changes are allowed. No NITF 2.1 files containing DES will be converted to NITF 2.0.	R
LDSH001	Length of Nth DES Sub-header	4	Numeric	C	Changes based on sub-header format.	Numeric	C
LDnnn	Length of Nth DES	9	Numeric	C	"As-Is"	Numeric	C
NUMRES	Number of RES Segments	3	Numeric must be "000." Segment currently not allowed.	R	Cannot be converted	Numeric must always be "000." Segment currently not allowed.	R
UDHDL	User Defined Header Data Length	5	Numeric	R	"As-Is"	Numeric	R
UDHOFL	User Defined Header Overflow	3	A numeric value conversion only allowed in this value is "000."	C	Will not be converted	A numeric value conversion only allowed in this value is "000."	C
UDHD	User Defined Header Data	**	Numeric	C	"As-Is"	Numeric	C
XHDL	Extended Header Data Length	5	Numeric	R	"As-Is"	Numeric	R
XHOFL	Extended Header Overflow	3	A numeric value conversion only allowed in this value is "000."	C	Will not be converted	A numeric value conversion only allowed in this value is "000."	C
XHD	Extended Header Data	**	Numeric	C	"As-Is"	Numeric	C

R = Required, O = Optional, C = Conditional, * = field does not exist, ** = size of data field

F.2.2.2 Image Sub-header. Table F-6 lists suggestions/recommendations for image to mage conversions between NITF formats, if the developer has a real need to convert NITF 2.0 bit-mapped symbols to NITF 2.1 images see paragraph F-2.2.3.

Table F-6. NITF Image Sub-header Mappings

Field	Description	Size	Format Values NITF 2.0	Type	Mapping	Format Values NITF 2.1	Type
IM	File Part Type	2	IM	R	"As-Is"	IM	R
IID/IID1	Image ID	10	BCS-A non-blank; User defined	R	"As-Is"	BCS-A non-blank; User defined	R
IDATIM	Image Date & Time	14	DDHHMMSSZMONYY	O	"As-Is" for date, but format change is needed.	CCYYMMDDhhmmss	R
TGTID	Target ID	17	BBBBBBBBBBOOOOOCC	O	"As-Is"	BBBBBBBBBBOOOOOCC	R
ITITLE/IID2	Image IID	80	BCS-A (Default is spaces)	O	"As-Is"	BCS-A (Default is spaces)	R
ISCLAS	File Security Classification	1	T, S, C, R, or U	R	"As-Is"	T, S, C, R, or U	R
Security	Covered in Appendix G	166	See Appendix G	*	See Appendix G	See Appendix G	*
ENCRYP	Encryption	1	0 = Not Encrypted (This field must contain the value 0)	R	"As-Is"	0 = Not Encrypted (This field must contain the value 0)	R
ISORCE	Image Source	42	Alphanumeric	O	"As-Is"	Alphanumeric	R
NROWS	Number of Significant Rows in image	8	00000064-00065536 (Based on CLEVEL)	R	"As-Is"	00000064-00065536 (Based on CLEVEL), NITF 2.1 allows larger image sizes, but conversions are restricted to this range.	R
NOCLS	Number of Significant Columns in image	8	00000064-00065536 (Based on CLEVEL)	R	"As-Is"	00000064-00065536 (Based on CLEVEL), NITF 2.1 allows larger image sizes, but conversions are restricted to this range.	R
PVTYPE	Pixel value type	3	INT, B	R	"As-Is"	INT, B (Other pixel value types are allowed, but should not be converted.)	R
IREP	Image Representation	8	Alphanumeric Mono, RGB, RGB/LUT, YCbCr601	R	"As-Is"	Alphanumeric Mono, RGB, RGB/LUT, YCbCr601 (Other image representations are allowed, but should not be converted.)	R

R = Required, O = Optional, C = Conditional, * = field does not exist, ** = size of data field

Table F-6. NITF Image Sub-header Mappings (cont.)

Field	Description	Size	Format Values NITF 2.0	Type	Mapping	Format Values NITF 2.1	Type
ICAT	Image Category	8	VIS, EO, IR, SAR, other values allowed, but will not be converted.	R	"As-Is"	VIS, EO, IR, SAR, other values allowed, but will not be converted.	R
ABPP	Actual Bits-per-pixel Per Band	2	01, 08, 11 through 16	R	"As-Is," with exception of 12-bit Non-compressed with NPBB 0f 12-bit.	01, 08, 11 through 16, other values allowed, but will not be converted. Also, only 01 bit bi-level will be converted, and 12-bit Non-compressed with an NBPP of 12-bit will be converted to NITF 2.0 12-bit with NBPP of 16-bit.	R
PJUST	Pixel Justification	1	R	R	"As-Is"	R	R
ICORDS	Image Coordinate System	1	U, G, C, or N, values vary between file formats, correct representation must be assigned.	R	Correct coordinate representation.	U, G, N, S, D or (Default is spaces). Values vary between file formats correct representation must be assigned.	R
IGEOLO	Image Geographic Location	60	ddmmssXdddmmssY (4 times) or ggXYZmmmmmmmmmm (4 times)	C	"As-Is" for representation, but format may change.	±dd.ddd±ddd.ddd (four times) ddmmssXdddmmssY(four times) or zzBJKeeeeennnnn (four times) or zzeeeeeennnnnnn (four times)	C
NICOM	Number of Image Comments	1	0-9	R	"As-Is"	0-9	R
ICOMn	Image Comment N	80	Alphanumeric	C	"As-Is"	Alphanumeric	C
IC	Image Compression	2	NC - No Compression, C1- Bi-Level, C3 - JPEG, other values allowed, but will not be converted.	R	"As-Is"	NC - No Compression, C1- Bi-Level, C3 - JPEG, other values allowed, but will not be converted.	R
COMRAT	Compression Rate Code	4	C1 1D, 2DS, 2DH C3 xx.y Only convertible values. Note: NITF 2.0 files with default table, tables must be embedded for conversion to NITF 2.1.	C	Bi-level "As-Is," For JPEG either "As-Is" or conversion to NC.	C1 1D, 2DS, 2DH C3 xx.y Only convertible values.	C

R = Required, O = Optional, C = Conditional, * = field does not exist, ** = size of data field

Table F-6. NITF Image Sub-header Mappings (cont.)

Field	Description	Size	Format Values NITF 2.0	Type	Mapping	Format Values NITF 2.1	Type
NBANDS	Number of Bands	1	1 or 3, others allowed, but will not be converted.	R	“As-Is”	1 or 3, others allowed, but will not be converted.	R
IREPBANDnn	nnth Band Component Representation	2	R, G, B, Y, Cb, Cr, spaces	R	“As-Is,” except for M to space and space to M.	M, R, G, B, Y, Cb, Cr	R
ISUBCATnn	nnth Band Subcategory	6	Alphanumeric - (Default 6 spaces)	R	“As-Is”	Values other than spaces allowed for non-convertible variations.	R
IFCnn	nnth Band Image Filter Condition	1	N	R	“As-Is”	N	R
IMFLTnn	nnth Band STD Image Filter Code	3	Reserved – 3 spaces	R	“As-Is”	Reserved - 3 spaces	R
NLUTSnn	nnth Band Number of LUTS	1	0, 1 or 3	C	“As-Is”	0, 1 or 3, other values allowed, but will not be converted.	C
NELUTnn	nnth Band Number of LUT Entries	5	For 1 or 3 LUTS move “As-Is."	C	“As-Is”	For 1 or 3 LUTS move “As-Is."	C
LUTDnnn	nnth Band Data of the mth LUT	*	For 1 or 3 LUTS move “As-Is."	C	“As-Is”	For 1 or 3 LUTS move “As-Is."	C
ISYNC	Image Sync Code	1	0	R	“As-Is”	0	R
IMODE	Image Mode	1	B, P, S	R	IMODE R must be changed, other optional or “As-Is."	B, P, S, R	R
NBPR	Number of blocks per row	4	0001-0256	R	NITF 2.0 to NITF 2.1 “As-Is." For NITF 2.1 to NITF 2.0 adjusted blocking assignments.	0001-9999	R
NBPC	Number of blocks per column	4	0001-0256	R		0001-9999	R
NPPBH	# of pixels per block (horiz.)	4	0064-8192 for single blocked images. For blocked images, 0008, 0016, 0032, 0064, 0128, 0256, 0512, 1024.	R		0002-8192	R

NPPBV	# Of pixels per block (vert.)	4	0064-8192 for single blocked images, 0008, 0016, 0032, 0064, 0128, 0256, 0512, 1024.	R		0002-8192	R

R = Required, O = Optional, C = Conditional, * = field does not exist, ** = size of data field

Table F-6. NITF Image Sub-header Mappings (cont.)

Field	Description	Size	Format Values NITF 2.0	Type	Mapping	Format Values NITF 2.1	Type
NBPP	# Of bits-per-pixel per band	2	01, 08, 12, 16	R	“As-Is” except for NITF 2.1 12-bit Non-compressed, will be changed to 16-bit.	01, 08, 12, 16, other values allowed, but will not be converted.	R
IDLVL	Display Level	3	001-999	R	“As-Is”	001-999, Note, conversion will not be done if segment with lowest Display Level is not located (ILOC) at 0,0.	R
IALVL	Attachment Level	3	001-998	R	“As-Is”	001-998	R
ILOC	Image Location	10	RRRRRCCCCC	R	“As-Is”	RRRRRCCCCC	R
IMAG	Image Magnification	4	Alphanumeric	R	“As-Is”	BCS-A	R
UDIDL	User Defined Sub-header Data Length	5	Numeric	R	“As-Is”	Numeric	R
UDOFL	User Defined Sub-header Overflow	3	A numeric value conversion only allowed in this value is “000."	C	Will not be converted	A numeric value conversion only allowed in this value is “000."	C
UDID	User Defined Sub-header Data	**	Numeric	C	“As-Is”	Numeric	C
IXSHDL	Extended Sub-header Data Length	5	Numeric	R	“As-Is”	Numeric	R
IXSOFL	Extended Sub-header Overflow	3	A numeric value conversion only allowed in this value is “000."	C	Will not be converted	A numeric value conversion only allowed in this value is “000."	C
IXSHD	Extended Sub-header Data	**	Numeric	C	“As-Is”	Numeric	C

R = Required, O = Optional, C = Conditional, * = field does not exist, ** = size of data field

F.2.2.3 Bit-Mapped Symbols to Images Sub-header Requirements. This conversion is not recommended, but Table F-7 shows suggestions/recommendations for NITF 2.0 Bit-Mapped Symbols to NITF 2.1 images if required.

Table F-7 NITF Image Sub-header Mappings

Field	Description	Size	Mapping	Field	Description	Size	Format Values NITF 2.1	Type
SY	File part type	2	Change to IM	IM	File Part Type	2	IM	R
SID	Symbol id	10	To Image ID	IID1	Image ID	10	BCS-A non-blank; User defined	R
*	*	*	To all dashes.	IDATIM	Image Date & Time	14	All dashes	R
*	*	*	To all spaces	TGTID	Target ID	17	All spaces	R
SNAME	Symbol name	20	To IID2 first 20 characters, remaining are spaces.	IID2	Image IID	80	BCS-A (Default is spaces)	R
SSCLAS	Symbol security classification	1	To ISCLAS	ISCLAS	File Security Classification	1	T, S, C, R, or U	R
Security	Covered in Appendix G	166	To image security	Security	Covered in Appendix G	166	See Appendix G	*
ENCRYP	Encryption	1	To image ENCRYP	ENCRYP	Encryption	1	0 = Not Encrypted (This field must contain the value 0)	R
*	*	*		ISORCE	Image Source	42	Alphanumeric	R
STYPE	Symbol type	1	For Bit-mapped only, no mapping	*	*	*	*	*
NLIPS	Number of lines per symbol	4	Maps to both NROWS and NPPBV	NROWS	Number of Significant Rows in image	8	00000064-00065536	R
NPIXPL	Number of pixels per line	4	Maps to both NCOLS and NPPBH	NCOLS	Number of Significant Columns in image	8	00000064-00065536	R
*	*	*	Most be set to B	PVTYPE	Pixel value type	3	B	R

R = Required, O = Optional, C = Conditional, * = field does not exist, ** = size of data field

Table F-7 NITF Image Sub-header Mappings (cont.)

Field	Description	Size	Mapping	Field	Description	Size	Format Values NITF 2.1	Type
*	*	*	To Mono or RGB/LUT based on SCOLOR.	IREP	Image Representation	8	Mono, or RGB/LUT	R
*	*	*	Default to VIS.	ICAT	Image Category	8	VIS.	R
NBPP	Number of bits-per-pixel	1	Set both ABPP and NBPP to “01."	ABPP	Actual Bits-per-pixel Per Band	2	01	R
*	*	*	Default to ‘R."	PJUST	Pixel Justification	1	R	R
*	*	*	Default to “ “ space hex 0x20.	ICORDS	Image Coordinate System	1	space	R
*	*	*	Default to “0."	NICOM	Number of Image Comments	1	0-9	R
*	*	*	Normal NC, but NM, if transparent pixels.	IC	Image Compression	2	NC, NM	R
*	*	*	Defaults to “1."	NBANDS	Number of Bands	1	1	R
*	*	*	Either M if IREP Mono or LU if IREP is RGB/LUT	IREPBANDnn	nnth Band Component Representation	2	M, LU	R
*	*	*	Default 6 spaces.	ISUBCATnn	nnth Band Subcategory	6	6 spaces	R
*	*	*	Default to “N."	IFCnn	nnth Band Image Filter Condition	1	N	R
*	*	*	Default 3 spaces.	IMFLTnn	nnth Band STD Image Filter Code	3	3 spaces	R
*	*	*	For Mono 0 or 3 for RGB/LUT	NLUTSnn	nnth Band Number of LUTS	1	0 or 3	C
*	*	*	For RGB/LUT will be set to “00002."	NELUTnn	nnth Band Number of LUT Entries	5	Set to “00002."	C
*	*	*	Two colors based on SCOLOR	LUTDnnn	nnth Band Data of the mth LUT	*	Based on R, O, B or Y of SCOLOR.	C
*	*	*	Default to “0."	ISYNC	Image Sync Code	1	0	R
*	*	*	Default to “B”	IMODE	Image Mode	1	B	R

R = Required, O = Optional, C = Conditional, * = field does not exist, ** = size of data field

Table F-7 NITF Image Sub-header Mappings (cont.)

Field	Description	Size	Mapping	Field	Description	Size	Format Values NITF 2.1	Type
*	*	*	Default to “0001."	NBPR	Number of blocks per row	4	0001-9999	R
*	*	*	Default to “0001."	NBPC	Number of blocks per column	4	0001-9999	R
*	*	*	Maps from NPIXPL.	NPPBH	# of pixels per block (horiz.)	4	0002-8192	R
			Maps from NLIPS.	NPPBV	# Of pixels per block (vert.)	4	0002-8192	R
*	*	*	Default to “01."	NBPP	# Of bits-per-pixel per band	2	01	R
SDLVL	Display level	3	Copy to IDLVL “As-Is."	IDLVL	Display Level	3	001-999	R
SALVL	Attachment level	3	Copy to IALVL “As-Is."	IALVL	Attachment Level	3	001-998	R
SLOC	Symbol location	10	Copy to ILOC “As-Is."	ILOC	Image Location	10	RRRRRCCCCC	R
*	*	*	Default to “ 1.0."	IMAG	Image Magnification	4	“ 1.0”	R
*	*	*	Default to “00000."	UDIDL	User Defined Sub-header Data Length	5	“00000”	R
SLOC2	Second symbol location	10	Not used.	*	*	*	*	*
SCOLOR	Symbol color	1	Used to determine image IREP, IC and LUT.	*	*	*	*	*
SNUM	Symbol number	6	Not used.	*	*	*	*	*
SROT	Symbol rotation	3	Not used.	*	*	*	*	*
NELUT	Number of LUT entries	3	Not used.	*	*	*	*	*
SXSHDL	Extended Sub-header data length	5	Map to IXSHDL.	IXSHDL	Extended Sub-header Data Length	5	Numeric	R
SXSOFL	Extended Sub-header overflow	3	Map to IXSOFL.	IXSOFL	Extended Sub-header Overflow	3	Numeric	C
SXSHD	Extended Sub-header Data	**	Map to IXSHD	IXSHD	Extended Sub-header Data	**	Alphanumeric	C

R = Required, O = Optional, C = Conditional, * = field does not exist, ** = size of data field

F.2.2.4 NITF 2.0 Graphic Sub-header to NITF 2.1 Graphic Sub-header for CGM. Table F-8 shows suggestions/recommendations for mapping graphic sub-headers.

Table F-8 Graphic Sub-headers Mappings

Fields	Description	Size	Format Values NITF 2.0	Type	Mapping	Format Values NITF 2.1	Type
SY	File part type	2	SY	R	Map “As-Is”	SY	R
SID	Symbol id	10	Alphanumeric (May not be all spaces)	R	Map “As-Is”	Alphanumeric (May not be all spaces)	R
SNAME	Symbol name	20	Alphanumeric	O	Map “As-Is”	Alphanumeric	R
SSCLAS	Symbol security classification	1	T, S, C, R, or U	R	Map “As-Is”	T, S, C, R, or U	R
Security	Covered in Appendix G	166	Covered in Appendix G	O	Covered in Appendix G	Covered in Appendix G	R
ENCRYP	Encryption	1	0=NOT ENCRYPTED (This value must be 0)	R	Map “As-Is”	0=NOT ENCRYPTED (This value must be 0)	R
STYPE / SFMT	Symbol type	1	C=CGM	R	Map “As-Is”	C=CGM	R
NLIPS	Number of lines per symbol	4	“0000”	R	Map “As-Is."	*	*
NPIXPL	Number of pixels per line	4	“0000”	R	Map “As-Is."	*	*
NWDTH	Line width	4	“0000”	R	Map “As-Is."	*	*
NBPP	Number of bits-per-pixel	1	“0” for CGM symbols	R	Map “As-Is."	*	*
SRES1	*	*	*	*	See previous 4 values.	Must be “0000000000000."	R
SDLVL	Display level	3	001-999	R	Map “As-Is."	001-999	R
SALVL	Attachment level	3	000-998	R	Map “As-Is."	000-998	R
SLOC	Symbol location	10	RRRRRCCCCC	R	Map “As-Is."	RRRRRCCCCC	R
SLOC2	Second symbol location	10	RRRRRCCCCC	O	*	*	-

R = Required, O = Optional, C = Conditional, * = field does not exist, ** = size of data field

Table F-8 Graphic Sub-headers Mappings (cont.)

Fields	Description	Size	Format Values NITF 2.0	Type	Mapping	Format Values NITF 2.1	Type
SCOLOR	Symbol color	1	Hex 0x20 Space	R	*	*	*
SNUM	Symbol number	6	000000	O	*	*	*
SROT	Symbol rotation	3	000	R	*	*	*
NELUT	Number of LUT entries	3	000	R	*	*	*
DLUT	Symbol LUT data	*	(NEVER APPEAR)	C	*	*	*
SBND1	*	*	*	*	Calculate based on upper left location of Graphic	RRRRRCCCCC	R
SCOLOR	*	*	*	*	Map to “C."	C for color.	R
SBNDS2	*	*	*	*	Calculate based on lower right location of Graphic	RRRRRCCCCC	R
SRES2	*	*	*	*	Map to “00."	Default to “00."	R
SXSHDL	Extended Sub-header data length	5	00000-99999	R	Map “As-Is."	00000-99999	R
SXSOFL	Extended Sub-header overflow	3	000-999	C	Map “As-Is."	000-999	C
SXSHD	Extended Sub-header Data	**	Alphanumeric	C	Map “As-Is."	Alphanumeric	C

R = Required, O = Optional, C = Conditional, * = field does not exist, ** = size of data field

F.2.2.5 Labels to Graphics Sub-header Requirements. This conversion is not recommended, but Table F-9 shows suggestions/recommendations for converting NITF 2.0 labels to NITF 2.1 CGM graphics if required by sponsoring organization. The label character(s) along with the Label Text Color (LTC) and the Label Background Color (LTB) must be used in creating the CGM graphic elements to be included in the CGM graphic segment.

Table F-9 Label Sub-header to Graphic Sub-header

Fields	Description	Size	Mapping	Fields	Description	Size	Format Values NITF 2.1	Type
LA	File part type	2	Map to SY	SY	File part type	2	SY	R
LID	Label id	10	Map “As-Is” to SID.	SID	Symbol id	10	Alphanumeric (May not be all spaces)	R
				Leave all Spaces or create default.	Symbol name	20	Alphanumeric	R
LSCLAS	Label security classification	1	Map “As-Is” to SSCLAS.	SSCLAS	Symbol security classification	1	T, S, C, R, or U	R
Security	Covered in Appendix G	166	Covered in Appendix G	Security	Covered in Appendix G	166	Covered in Appendix G	R
ENCRYP	Encryption	1	Map “As-Is” to ENCRYP	ENCRYP	Encryption	1	0=NOT ENCRYPTED (This value must be 0)	R
STYPE / SFMT	Symbol type	1	Map “As-Is”	STYPE / SFMT	Symbol type	1	C=CGM	R
LFS	Label Font Style	2	Not used.	*	*	*	*	*
LCW	Label cell width	2	Not used.	*	*	*	*	*
LCH	Label cell height	2	Not used.	*	*	*	*	*
*	*	*	Create as “0000000000000."	SRES1	*	*	Must be “0000000000000."	R
LDLVL	Display level	3	Map to SDLVL.	SDLVL	Display level	3	001-999	R
LALVL	Attachment level	3	Map to SALVL.	SALVL	Attachment level	3	000-998	R
LLOC	Symbol location	10	Map to SLOC.	SLOC	Symbol location	10	RRRRRCCCCC	R

Fields	Description	Size	Mapping	Fields	Description	Size	Format Values NITF 2.1	Type
LTC	Label text color	3	Used to create text color element is CGM segment.	*	*	*	*	*

R = Required, O = Optional, C = Conditional, * = field does not exist, ** = size of data field

Table F-9 Label Sub-header to Graphic Sub-header (cont.)

Fields	Description	Size	Mapping	Fields	Description	Size	Format Values NITF 2.1	Type
LTB	Label background color	3	Used to create auxiliary color element is CGM segment.	*	*	*	*	*
*	*	*	Calculate based on upper left location of Graphic	SBND1	*	*	RRRRRCCCCC	R
*	*	*	Map to “C."	SCOLOR	*	*	C for color.	R
*	*	*	Calculate based on lower right location of Graphic	SBNDS2	*	*	RRRRRCCCCC	R
*	*	*	Map to “00."	SRES2	*	*	Default to “00."	R
LXSHDL	Extended Sub-header data length	5	Map “As-Is."	SXSHDL	Extended Sub-header data length	5	00000-99999	R
LXSOFL	Extended Sub-header overflow	3	Map “As-Is."	SXSOFL	Extended Sub-header overflow	3	000-999	C
LXSHD	Extended Sub-header Data	**	Map “As-Is."	SXSHD	Extended Sub-header Data	**	Alphanumeric	C

R = Required, O = Optional, C = Conditional, * = field does not exist, ** = size of data field

F.2.2.6 NITF 2.0 Text Sub-header to NITF 2.1 Text Sub-header. Table F-10 shows suggestions/recommendations for mapping Text sub-headers.

Table F-10 Text Sub-headers Mappings

Fields	Description	Size	Format Values NITF 2.0	Type	Mapping	Format Values NITF 2.1	Type
TE	File part type	2	TE	R	Map “As-Is”	TE	R
TEXTID	Text id	10/7	Alphanumeric (May not be all spaces)	R	Map first 7 bytes “As-Is” to NITF 2.1. Map 7 bytes NITF 2.1 to first 7 bytes of NITF 2.0.	Alphanumeric (May not be all spaces)	R
TXTALVL	*	*	*	*	Map NITF 2.1 3 bytes to bytes 8, 9 & 10 of NITF 2.0 TEXTID. When creating NITF 2.1 from NITF 2.0 map to “000."	000-998	
TXTDT	Text data and time	14	DDHHMMSSZMONYY	O	Map “As-Is” except for format change.	CCYYMMDDhhmmss	R
TXTITL	Text title	80	Alphanumeric		Map “As-Is."	Alphanumeric	
TSCLAS	Text security classification	1	T, S, C, R, or U	R	Map “As-Is."	T, S, C, R, or U	R
Security	Covered in Appendix G	166	Covered in Appendix G	O	Covered in Appendix G	Covered in Appendix G	R
ENCRYP	Encryption	1	0=NOT ENCRYPTED (This value must be 0)	R	Map “As-Is."	0=NOT ENCRYPTED (This value must be 0)	R
TXTFMT	Text format	3	STA or MTF	R	Map “As-Is," STA and MTF only.	STA or MTF, others allowed, but will not be converted.	R
TXSHDL	Extended Sub-header data length	5	00000-99999	R	Map “As-Is."	00000-99999	R
TXSOFL	Extended Sub-header overflow	3	000-999	C	Map “As-Is."	000-999	C
TXSHD	Extended Sub-header Data	**	Alphanumeric	C	Map “As-Is."	Alphanumeric	C

R = Required, O = Optional, C = Conditional, * = field does not exist, ** = size of data field

F.2.2.7 NITF 2.0 DES Sub-header to NITF 2.1 DES Sub-header. Table F-11 shows suggestions/recommendations for mapping DES sub-header, it is recommended that only NITF 2.0 to NITF 2.1 mapping be supported.

Table F-11 DES Sub-headers Mappings

Fields	Description	Size	Format Values NITF 2.0	Type	Mapping	Format Values NITF 2.1	Type
DE	File part type	2	DE	R	Map “As-Is”	DE	R
DESTAG	UNIQUE DES TYPE IDENTIFIER	25	Alphanumeric (May not be all spaces)	R	Make appropriate format changes to “TRE-OVERFLOW."	Alphanumeric (May not be all spaces)	R
DESVER	VERSION OF THE DATA FIELD DEFINITION	2	01-99	R	Map “As-Is."	01-99	
DESCLAS	DES security classification	1	T, S, C, R, or U	R	Map “As-Is."	T, S, C, R, or U	R
Security	Covered in Appendix G	166	Covered in Appendix G	O	Covered in Appendix G	Covered in Appendix G	R
DESOFLW	OVERFLOWED HEADER TYPE	6	UDHD, XHD, UDID, IXSHD, SXSHD, LXSHD, TXSHD	R	Map “As-Is."	UDHD, XHD, UDID, IXSHD, SXSHD, TXSHD	R
DESITEM	DATA ITEM OVERFLOWED	3	000-999	R	Map “As-Is."	000-999	R
DESSDL	Extended Sub-header data length	4	00000-99999	R	Map “As-Is."	00000-99999	R
DESXSHD	Extended Sub-header Data	**	Alphanumeric	C	Map “As-Is."	Alphanumeric	C

R = Required, O = Optional, C = Conditional, * = field does not exist, ** = size of data field

Appendix G -- Security Field Conversion/Mapping

G-1 INTRODUCTION

G-1.1 Purpose.

Describe common practices regarding transliteration of Security Field values between versions 2.0 and 2.1 of the National Imagery Transmission Format Standard (NITFS).

G-1.2 Scope

These security field transliteration practices provide a starting point for establishing a security marking and transliteration plan for implementation of the NITFS (U.S. classification system only). They do not supplant or override security marking policies, procedures, or directives applicable to specific implementing systems or facilities. Implementers and facility managers should consult with the designated security authorities to ensure their system and/or facility security practices comply with current security policies and directives. The conversions between the NITFS and other formats (e.g. SUN Raster, TIFF, JFIF, GIF, PNG, etc.) are not addressed since those formats have no standard metadata provisions for security markings. Proper population and transliteration of NITFS security fields is pertinent to imagery production, dissemination, archiving (libraries), exploitation, automated data guards and their related security implementation policies.

G-1.3 Background

The security field structure and definitions in NITF 2.1 were changed from those in NITF 2.0 to accommodate E.O.12958. There is no direct and easy mapping of data values for all instances of possible security markings between the two field structures. Although population of security fields is very consistent from original source producers (well-known sources), security field population of derived (exploited) classified products varies greatly among operational sites. Since imagery systems are migrating from NITF 2.0 to NITF 2.1, there are present and future requirements to make imagery format conversions within the imagery community. Proper handling of the security fields is critical when performing format conversion services. The practices in this appendix were initially developed in support of the Image Product Library (IPL) program in response to a request for assistance from the developer.

G-1.4 Assumptions

The transliteration practices are based on the following assumptions.

G-1.4.1 The requirement for NITF 2.1 to NITF 2.0 conversions is the greatest.

G-1.4.2 It is beneficial to the community to be able to convert as much data with varying security markings as possible.

G-1.4.3 Most of the original classified NITF 2.0 data is from a group of well-known sources. Since these data sources have known and consistent means of marking security fields, a more simple set of rules for transliteration can be defined.

G-1.4.4 In the near-term most of the original classified NITF version 2.1 data will be generated by airborne sources. Early guidance to these data producers in how best to populate security fields may minimize the impact of NITF 2.1 to NITF 2.0 transliterations that operationally need to be supported.

G-1.4.5 There are now secondary producers of NITF 2.1 products that may vary widely. So preservation of data during conversions is not guaranteed, even if guidance is provided to the airborne community as mentioned above.

G-2 DISCUSSION

To facilitate format conversions, a transliteration scheme and policies are needed for the security fields. In some cases the security fields map one-for-one while in other cases the data does not readily map. As a result there are two major issues: 1) providing developers rules for making the conversions, and 2) resolving policy issues that arise from making conversions between formats where the circumstances do not allow a full and unhindered mapping of all security marking data. The following is an attempt to bring to light the conversion issues.

G-2.1 NITF 2.1 to NITF 2.0

Operationally, most NITF 2.1 data in the near term will be generated by the airborne community (primarily collateral markings), Shuttle Radar Topography Mission data (Unclassified, but limited distribution) and the commercial satellite companies (Unclassified). This situation should generally allow for direct mapping to NITF 2.0 with minor exceptions. Translation will be somewhat more complex when control system/codeword markings are needed, but the complexity can be mitigated by establishing guidelines for marking data that will be facilitate transition from NITF 2.0 to NITF 2.1.

G-2.2 NITF 2.0 to NITF 2.1

Operationally most original source classified NITF 2.0 data is from well-known sources. Generally there are only two fields that do not readily map one-for-one between an NITF 2.0 generated files and NITF 2.1. It should be possible to establish translation rules for markings that come from well-known sources.

G-2.3 Exceptions

Finally, it may be best in some complex marking cases to prohibit, through policy, some format conversions where the security fields do not all map to an acceptable degree. The disadvantage is that it may constrain the movement of data within the community.

As an alternative, when a server receives a conversion request where security enhancement related data (such as downgrading information) will be lost, the user could be notified of the potential loss and be allowed to accept or refuse the converted file.

G-2.4 Recommended Practices

Table G-1 provides the recommended practices for populating NITF 2.0 security fields for compliance with EO 12958. The field specific guidelines in Table G-1 are designed to ease transliteration of NITF 2.0 security fields to NITF 2.1 security fields and postures users of NITF 2.0 for an eventual transition to NITF 2.1. Tables G-2 and G-3 outline suggested near-term transliteration practices for the NITF 2.1 to 2.0 and NITF 2.0 to 2.1 conversion cases. These practices are based on what is believed to be the preponderance of data being produced now and in the near future.

G-3 CONCLUSION

The discussion above is a brief overview of some specific problems regarding the overall security issues, it is not comprehensive on the subject. The issues and proposed practices primarily address the near-term since system developers need guidance now. Action is needed to develop long-term plans/solutions regarding the security issues of which conversions constitutes a portion.

Table G-1. NITF 2.0 Security Fields Application Guidelines for EO 12958

FIELD	NAME/DESCRIPTION	SIZE	VALUE RANGE	TYPE
xSCLAS	**Security Classification** This field shall contain a valid value representing the classification level of the entire file, or the applicable portion (segment) within the file. Valid values are T (=Top Secret), S (=Secret), C (=Confidential), R (= Restricted), U (=Unclassified).	1	T, S, C, R, or U	R
xSCODE	**Codewords** When applicable, this field shall contain a valid indicator of the SCI Control System and associated Sub-Category/Codewords as applicable. A hyphen character is used following a Control System identifier to link sub-category/codeword codes with the system identifier as a character string. A single slash character is used to separate SCI control system identifier strings. When this field is all spaces, no SCI Control Systems (and associated codewords) apply to the data.	40	Alphanumeric For ease of transliteration to NITF 2.1 security fields, only the first 11 characters of this field shall be populated. Therefore, abbreviations authorized for portion marking shall be used. Format Examples: AAA BB CC BB/CC/AAA BB-D/CC BB-D-EEE/CC	O

Table G-1. NITF 2.0 Security Fields Application Guidelines for EO 12958 (cont)

FIELD	NAME/DESCRIPTION	SIZE	VALUE RANGE	TYPE
xSCTLH	**Control and Handling** When applicable, this field shall contain a valid Dissemination Control Marking. Valid values are as listed in the Control Markings Register. When this field is all spaces, no dissemination control and handling instructions apply.	40	Alphanumeric For ease of transliteration to NITF 2.1 security fields, only the first 2 characters of this field shall be populated. Examples: DS LIMDIS FO For Official Use Only OC ORCON NF NOFORN PR PROPIN RS RSEN See Control Markings Register for currently applicable codes.	O
xSREL	**Releasing Instructions** This field shall contain a valid list of countries and/or groups of countries to which the data is authorized for release. Valid items in the list are one or more of the following separated by single spaces (ASCII 32, decimal) within the field: country codes and groupings that are digraphs in accordance with FIPS PUB 10-4. When this field is all spaces, no file release instructions apply.	40	Alphanumeric Digraph values indicating individual countries, or groupings of countries, (separated by space characters). See FIPS PUB 10-4	O
xSCAUT	**Classification Authority** This field shall contain a valid identifier (code) of the Classification Authority Type, the Classification Reason code, and shall identify the classification authority. The codes shall be in accordance with the regulations governing the appropriate security channel(s). When this field is all spaces, no file classification authority applies (i.e., xSCLAS = U or R).	20	Alphanumeric l_n_mmmmmmmmmmmmmm mm Where: l = Classification Authority Type Code (O, D, M) where: O = Original Class. Authority D = Derived, single source M = Derived, multiple sources n = Classification Reason, values A to G referencing appropriate classification reason from EO 12958. mmmmmmmmmmmmmmmm = Identification of the classification authority.	O

Table G-1. NITF 2.0 Security Fields Application Guidelines for EO 12958 (cont)

FIELD	NAME/DESCRIPTION	SIZE	VALUE RANGE	TYPE
xSCTLN	**Security Control Number** This field shall contain a valid security control number (alphanumeric) associated with the data. The format of the security control number shall be in accordance with the regulations governing the appropriate security channel(s). When this field is all spaces, no file security control number applies.	20	Alphanumeric	O
xSDWNG	**Security Downgrade** This field shall contain a valid indicator that designates the point in time at which a declassification or downgrading action is to take place. The valid values are (1) the code "999999" when the originating agency's determination is required (OADR), and (2) the code "999998" when a specific event determines at what point declassification or downgrading is to take place. When this field is all spaces, no security downgrade/declassification condition applies.	6	Alphanumeric Spaces (xSCLAS = U or R) 999999 (OADR) 999998 (Field xSDEVT contains security downgrade/declassification information.	O

Table G-1. NITF 2.0 Security Fields Application Guidelines for EO 12958 (cont)

FIELD	NAME/DESCRIPTION	SIZE	VALUE RANGE	TYPE
xSDEVT	**Downgrading Event** If the Security Downgrade field (xSDWNG) equals "999998," this field shall be present and shall contain a valid specification of the downgrade event. If this field is present and all spaces, it shall imply that an error exists. Valid values for the event specification depend on the type of event. (See value range field.)	40	Alphanumeric Six possible field structures: 1. DD_CCYYMMDD 2. DE_kkkkkkkkkkkkkkkkkkk kkkkkkkkkkkkkkkk 3. GD_jjjjjjjj_i 4. GE_i_kkkkkkkkkkkkkkkkk kkkkkkkkkkkk 5. O_OADR 6. X_hhhh Where: 1. DD = Declassify on the specified date (separated by a space). 2. DE = Declassify on the specified event description (separated by a space). 3. GD = Downgrade on the specified date followed by the downgrade classification code (S or C) (separated by spaces). 4. GE = Downgrade on the specified event description followed by the downgrade classification code (S or C) (separated by spaces). 5. O_OADR = Original classification authority determination required. 6. X = Exempt from automatic declassification followed by applicable exemption codes (X1 - X8, X251 - X259).	C

Table G-2. NITF 2.0 TO NITF 2.1 Security Field Transliteration/Mapping (Last updated 26 May 2000)								
FIELD (2.0)	**DESCRIPTION**	**SIZE**	**VALUE** **(generic "codes" used here to graphically show transliteration of data)**	**NITF 2.1**	**DESCRIPTION**	**SIZE**	**Value** **(generic "codes" used here to graphically show transliteration of data)**	**Remarks**
xSCLASS	Security Classification	1	a	xSCLASS	Security Classification	1	a	Direct Map
				xSCLSY	Security Classification System	2	US	Only US
xSCODE	Codewords	40	bbbbbbbbbbbbbbbbbbbb bbbbbbbbbbbbbbbbbbb	xSCODE	Codewords	11	bbbbbbbbbbb	Problem field (15 usually used by 2.0 producers) If 2.0 field has codewords convert to corresponding digraphs allowed in 2.1. If codewords do not translate to approved digraph or exceeds 11 characters then make a "no conversion" decision (or manual override if human decision needed.
XSCTLH	Control and Handling	40	cccccccccccccccccccc cccccccccccccccccccc	xSCTLH	Control and Handling	2	CH	Problem Field Propose overflowing into xCLTX If a single codeword used in 2.0 field then convert to valid digraph. If there is no valid digraph or multiple digraphs then place "CH" and overflow digraphs, or other control and handling to xCLTX field.
XSREL	Releasing Instructions	40	dddddddddddddddddddd dddddddddddddddddddd	xSREL	Releasing Instructions	20	dddddddddddddddddddd	2.0 producers usually populate with spaces however, potential data loss if NITF 2.1 file xREL field exceeds 20 characters. Converters may abbreviate where possible, if data is lost from NITF 2.1-field xREL then make a "no conversion decision" (or allow manual override if human decision needed.)

Table G-2. NITF 2.0 TO NITF 2.1 Security Field Transliteration/Mapping (Last updated 26 May 2000)

FIELD (2.0)	DESCRIPTION	SIZE	VALUE (generic "codes" used here to graphically show transliteration of data)	NITF 2.1	DESCRIPTION	SIZE	Value (generic "codes" used here to graphically show transliteration of data)	Remarks
xSCAUT	Classification Authority	20	eeeeeeeeeeeeeeeeeeee					Direct map to 2.1 xSCAUT
xSCTLN	Security Control Number	20	ffffffffffffffffffff					See xSCTLN below
xSDWNG	Security Downgrade	6	gggggg					No matter what value is in 2.0 field xSDWNG (or when data does not map cleanly) set the 2.1 field xSDG to O for OADR to force a manual review. Could also make declass in 10 years as a default. NOTE: this option allows for a cleaner conversion back to 2.0 if done later. Need to add "O" as code in NITF 2.1 (xSDG) N-105 for OADR
xSDEVT	Downgrading event	40	hhhhhhhhhhhhhhhhhhhh hhhhhhhhhhhhh					No mapping required (Usually not used) If used however data goes in to xCLTX preceded by GE_
				xSDCTP	Declassification Type	2	Default	Data usually not present in 2.0 (If a downgrade was indicated in the 2.0 file from C with no other restrictions then the declassification fields xSDCDT could be used rather then downgrade fields in the 2.1 file.
				XSDCDT	Declassification Date	8	Default	Data usually not present in 2.0
				xSDCXM	Declassification Exemption	4	Default	Data usually not present in 2.0

Table G-2. NITF 2.0 TO NITF 2.1 Security Field Transliteration/Mapping (Last updated 26 May 2000)

FIELD (2.0)	DESCRIPTION	SIZE	VALUE (generic "codes" used here to graphically show transliteration of data)	NITF 2.1	DESCRIPTION	SIZE	Value (generic "codes" used here to graphically show transliteration of data)	Remarks
				xSDG	Downgrade	1	Default	Map as one classification lower if a downgrade date or event in NITF 2.0. (In any case Downgrade action should be forced to a human decision)
				xSDGDT	Downgrade Date	8	Default	If date in 2.0 field xSDWNG then map to here converting 2 digit year to 4 digit year
				xCLTX	Classification Text	43	CH_ccccccccccccccc cGE_hhhhhhhhhhhhhh hhhhh	Propose transliterating with data from 2.0 fields xSCTLH using code CH, and for Downgrade/declass event use CODE GE or DE to start downgrade/declass event, if data does not fit then make a "no conversion decision" (or let requester override and allow conversion any way)
				xSCATP	Classification Authority Type	1	Default	Data usually not present in 2.0 (If info is operationally known then this field can be populated)
				xSCAUT	Classification Authority	40	eeeeeeeeeeeeeeeeeee	Mapped from 2.0 xSCAUT
				xSCRSN	Classification Reason	1	Default	Data usually not present in 2.0 (If info is operationally known then this field can be populated)
				xSSRDT	Security Source Date	8	Default	Data usually not present in 2.0 (If info is operationally known then this field can be populated)

Table G-2. NITF 2.0 TO NITF 2.1 Security Field Transliteration/Mapping (Last updated 26 May 2000)								
FIELD (2.0)	**DESCRIPTION**	**SIZE**	**VALUE** (generic "codes" used here to graphically show transliteration of data)	**NITF 2.1**	**DESCRIPTION**	**SIZE**	**Value** (generic "codes" used here to graphically show transliteration of data)	**Remarks**
				xSCTLN	Security Control Number	15	Default	First fifteen chars map, potential to lose 5 characters for NITF 2.1 file NOTE: The use and value of this field are questionable as Control numbers when dealing with data files are not usable in the same manner as with paper documents. Therefore, loss of data here may not be of any consequence.

NOTE: The example code words, digraphs and control and handling caveats listed in Mil-Std-2500B and referred to in Table G-2 above are for illustrative purposes only. Implementations should support security-marking requirements according to approved security policies and guidelines applicable to the site or facility using the system.

Table G-3. NITF 2.1 TO NITF 2.0 Security Field Transliteration/Mapping (Last updated 26 May 2000)

FIELD (2.1)	DESCRIPTION	SIZE	VALUE (generic "codes" used here to graphically show transliteration of data)	NITF 2.0	DESCRIPTION	SIZE	VALUE (generic "codes" used here to graphically show transliteration of data)	Remarks
xSCLASS	Security Classification	1	a	xSCLASS	Security Classification	1	A	Direct map across
xSCLSY	Security Classification System	2	bb					No map needed US system assumed
xSCODE	Codewords	11	cccccccccc	xSCODE	Codewords	40	cccccccccc	Direct map across
xSCTLH	Control and Handling	2	dd	xSCTLH	Control and Handling	40	dd	Direct map across
xSREL	Releasing Instructions	20	eeeeeeeeeeeeeeeeeeee	xSREL	Releasing Instructions	40	eeeeeeeeeeeeeeeeeeee	Direct map across
				xSCAUT	Classification Authority	20	l_n_mmmmmmmmmmmmmm	Data transliterated from 2.1 fields xSCATP, xSCRSN and xSCAUT
				xSCTLN	Security Control Number	20	ppppppppppppppp	Direct map across
				xSDWNG	Security Downgrade	6	999998	If any allowed code is in NITF 2.1 field xSDCTP this field always set to "999998"

Table G-3. NITF 2.1 TO NITF 2.0 Security Field Transliteration/Mapping (Last updated 26 May 2000)								
FIELD (2.1)	**DESCRIPTION**	**SIZE**	**VALUE** **(generic "codes" used here to graphically show transliteration of data)**	**NITF 2.0**	**DESCRIPTION**	**SIZE**	**VALUE** **(generic "codes" used here to graphically show transliteration of data)**	**Remarks**
				xSDEVT	Downgrading event	40	Examples 1. DD_gggggggg_i 2. DE_i_kkkkkkkkkkkkk kkkkkkkkkkkkkkkkkk kkk 3. GD_jjjjjjjj_i 4. GE_i_kkkkkkkkkkkkk kkkkkkkkkkkkkkkkk 5. O_OADR 6. X_hhhh	If xSDWNG set to 999998 _ = spaces unused portion of field is spaces also to fill out to length of 40 35 of a possible 43 alphanumeric from the NITF 2.1 field xCLTX are transliterated, should be sufficient for most data, if not possible solutions are abbreviations or truncation if intelligence is maintained. NOTE: If xSCATP and xSCRSN in 2.1 file are both spaces then this field is a direct map of the 2.1 downgrade event field xCLTX.
xSDCTP*	Declassification Type	2	ff	The code in this field determines the transliteration into the 2.0 field xSDEVT (as shown in examples 1-6 above in xSDEVT field)				
xSDCDT	Declassification Date	8	gggggggg	If code in 2.1 field xSDCTP is DD then this data is placed in 2.0 field xSDEVT (as shown in example 1 above in xSDEVT field)				
xSDCXM	Declassification Exemption	4	hhhh	If code in 2.1 field xSDCTP is X then this data is placed in 2.0 field xSDEVT (as shown in example 6 above in xSDEVT field)				
xSDG	Downgrade	1	i	If code in 2.1 field xSDCTP is DD or GD then this data is placed in 2.0 field xSDEVT (as shown in example 1 and 3 above in xSDEVT field)				
xSDGDT	Downgrade Date	8	jjjjjjjj	If code in 2.1 field xSDCTP is GD then this data is placed in 2.0 field xSDEVT (as shown in example 3 above in xSDEVT field)				
xCLTX	Classification Text	43	kkkkkkkkkkkkkkkkkkkkkkkkk kkkkkkkkkkkkkkkkkk	If code in 2.1 field xSDCTP is DE or GE then this data is placed in 2.0 field xSDEVT (as shown in examples 2 and 4 above in xSDEVT field)				

Table G-3. NITF 2.1 TO NITF 2.0 Security Field Transliteration/Mapping (Last updated 26 May 2000)								
FIELD (2.1)	**DESCRIPTION**	**SIZE**	**VALUE (generic "codes" used here to graphically show transliteration of data)**	**NITF 2.0**	**DESCRIPTION**	**SIZE**	**VALUE (generic "codes" used here to graphically show transliteration of data)**	**Remarks**
xSCATP	Classification Authority Type	1	l	Transliterated to NITF 2.0 xSCAUT				
xSCAUT	Classification Authority	40	mmmmmmmmmmmmmmmm mmmmmmmmmmmmmmmm mmmmmmmmm	Partially transliterated to NITF 2.0 xSCAUT, May be able to abbreviate or create transliteration table to keep at no more than length seven.				
xSCRSN	Classification Reason	1	n	Transliterated to NITF 2.0 xSCAUT				
xSSRDT	Security Source Date	8	oooooooo	Not transliterated to NITF 2.0 file assuming not carrying forward has no adverse impact				
xSCTLN	Security Control Number	15	ppppppppppppppp					Direct Map to 2.0 field xSCTLN

* Codes allowed in NITF 2.1 field xSDCTP DD (Declassify on date), DE (Declassify on event), GD (Downgrade on date), GE (Downgrade on event), O (OADR), X (exemption)

NOTE: The example code words, digraphs and control and handling caveats listed in Mil-Std-2500B and referred to in Table G-3 above are for illustrative purposes only. Implementations should support security-marking requirements according to approved security policies and guidelines applicable to the site or facility using the system.

Appendix H -- (TBD010)

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Appendix I -- (TBD011)

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Appendix J -- (TBD012)

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Appendix K -- (TBD013)

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Appendix L -- (TBD014)

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Appendix M – Product Summaries & Archetypes for NTM Producers

TFRD 1.3 to NITF

TFRD 2.3 to NITF

TFRD 4.3 to NITF

RRDS

EO/VIS

IR

SAR

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Appendix N – Product Summaries & Archetypes for Airborne Producers

N.1 INTRODUCTION

Product summaries for the following Airborne Producers are located at:

Producer System	Page
Block 1 TUAV GCS	N-2
ASARS	
AIP	
SYERS	
Joint STARS CGS	
CIP	
Screener	
Etc.	

Archetypes for the following types of Airborne Producers are located at:

Archetype (TBD015)	Page
EO/VIS	
IR	
SAR	
SARIQ	
VPH	
Screener Outputs	

NITFS APPLICATION SUMMARY **Common Imagery Processor (CIP) – APG-73**	
System Identifier:	
NITFS Services:	
NITF/NSIF Version(s):	
Reference Documents:	
NITFS Compliance Test Report:	
System Description	
Sensor Type(s)	
General Characteristics	
File Naming Convention	Uses an internal convention, not as defined by the AIMID ASDE
CLEVELs Supported	6 (full res); 3 (reduced res)
Origination Station Identifier Convention	CIP
File Title Convention	Uses the convention as defined by the AIMID ASDE
Security Marking Options Supported	All data is Secret; and files provide the following security information: FSCLAS – S FSCLSY – [spaces] FSCTLH – [spaces] FSDCTP – [spaces] FSDCXM – [spaces] FSCATP – [spaces] FSCAUT – [spaces] FSCRSN – [spaces] FSSRDT – [spaces]
Originator's Designated Background Color	Decimal 00 00 00
Originator's Name Field Convention	[spaces]
Originator's Phone Number Convention	[spaces]
Image Segments Supported	1 per file
Symbol Segments Supported	None
Text Segments Supported	None

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – APG-73	
Data Extension Segments Supported	None
Reserved Extension Segments Supported	None
File Header TREs (tags) Supported	None
File Size/Range	4,196,360 – 10,487,816 (full res) 66,376 – 459,032 (reduced res)
Image Segment Options Supported	
Image Identifier 1 (short ID)	Resolution and sequence number e.g. “FR_0_00005” (full res) “RR_0_00005” (reduced res)
Image Identifier 2 (long ID)	Identical to FTITLE in main header
Target Identifier Field	[spaces]
Image Source Field	[spaces]
Image Comment Fields	None
Image Characteristics	
Dimensions	Not sure
Pixel Value Types	INT
Image Representation Types	MONO
Image Categories	SAR
Bounding Rectangle Coordinates	Always present in degrees, minutes, seconds
Compression Options	NC
Pixel Interleave(s)	MONO – IMODE B
Blocking	Yes, always at 1024 x 1024 (full res) at 676 x 676, 64 x 1005, or 65 x 1005 (reduced res)
Location offset supported	No, always 0000000000
Attachment Level supported	Always 000
Reduced Resolutions	Unknown
Image Subheader TREs (tags) Supported	ACFTB, AIMIDB, BLOCKA, EXPLTB, MENSRB, MPDSRA, PATCHB, and SECTGA
Symbol Segment Options Supported	
CGM Supported	Not Supported
Degree of CGM Support	
Symbol Identifier Convention	

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – APG-73	
Symbol Name Convention	
Location offset supported	
Attachment Level supported	
Symbol Subheader TREs (tags) supported	
Text Segment Options Supported	
STA (Basic Character Set)	Not Supported
UT1 (Extended Character Set)	
U8S (UTF-8 Extended Characters)	
MTF (US Message Text Format)	
Text Identifier Convention	
Text Title Convention	
Attachment Level supported	
Text Subheader TREs (tags) supported	
Data Extension Segments Supported	
Controlled Extensions (NITF 2.0 only)	Not Supported
Registered Extensions (NITF 2.0 only)	
TRE_OVERFLOW	
STREAMING_FILE_HEADER	
Reserved Extension Segments Supported	
None yet defined.	Not Supported
Other Pertinent Information	
AIMIDA--Additional Image ID Extension Format	
MISSION_DATE	
MISSION_NO	
FLIGHT_NO	
OP_NUM	
START_SEGMENT	
REPRO_NUM	

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – APG-73	
REPLAY	
(reserved-001)	[1 space]
START_COLUMN	
START_ROW	
END_SEGMENT	
END_COLUMN	
END_ROW	
COUNTRY	
(reserved-002)	[4 spaces]
LOCATION	
TIME	
CREATION_DATE	
AIMIDB—Additional Image ID Extension Format	
ACQUISITION_DATE	
MISSION_NO	
MISSION_IDENTIFICATION	
FLIGHT_NO	
OP_NUM	
CURRENT_SEGMENT	
REPRO_NUM	
REPLAY	
(reserved-001)	[1 space]
START_TILE_COLUMN	
START_TILE_ROW	
END_SEGMENT	
END_TILE_COLUMN	
END_TILE_ROW	
COUNTRY	
(reserved-002)	[4 spaces]
LOCATION	
(reserved-003)	[13 spaces]

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – APG-73	
ACFTA—Aircraft Information Extension Format	
AC_MSN_ID	
SCTYPE	
SCNUM	
SENSOR_ID	
PATCH_TOT	
MTI_TOT	
PDATE	
IMHOSTNO	
IMREQID	
SCENE_SOURCE	
MPLAN	
ENTLOC	
ENTELV	
EXITLOC	
EXITELV	
TMAP	
RCS	
ROW_SPACING	
COL_SPACING	
SENSERIAL	
ABSWVER	
ACFTB—Aircraft Information Extension Format	
AC_MSN_ID	
AC_TAIL_NO	
AC_TO	
SENSOR_ID_TYPE	
SENSOR_ID	
SCENE_SOURCE	
SCNUM	
PDATE	

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – APG-73	
IMHOSTNO	
IMREQID	
MPLAN	
ENTLOC	
LOC_ACCY	
ENTELV	
ELV_UNIT	
EXITLOC	
EXITELV	
TMAP	
ROW_SPACING	
ROW_SPACING_UNITS	
COL_SPACING	
COL_SPACING_UNITS	
FOCAL_LENGTH	
SENSERIAL	
ABSWVER	
CAL_DATE	
PATCH_TOT	
MTI_TOT	
BANDSA—Multispectral/Hyperspectral Band Parameters Extension Format	
ROW_SPACING	
ROW_SPACING_UNITS	
COL_SPACING	
COL_SPACING_UNITS	
FOCAL_LENGTH	
BANDCOUNT	
BANDPEAKn	
BANDLBOUNDn	
BANDUBOUNDn	
BANDWIDTHn	

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – APG-73	
BANDCALDRKn	
BANDCALINCn	
BANDRESPn	
BANDASDn	
BANDGSDn	
BLOCKA—Image Block Information Extension Format	
BLOCK_INSTANCE	
N_GRAY	
L_LINES	
LAYOVER_ANGLE	
SHADOW_ANGLE	
(reserved-001)	[16 spaces]
FRLC_LOC	
LRLC_LOC	
LRFC_LOC	
FRFC_LOC	
(reserved-002)	010.0
EXOPTA—Exploitation Usability Optical Information Extension Format	
ANGLE_TO_NORTH	
MEAN_GSD	
(reserved-001)	[1]
DYNAMIC_RANGE	
(reserved-002)	[7 spaces]
OBL_ANG	
ROLL_ANG	
PEIME_ID	
PRIME_BE	
(reserved-003)	[5 spaces]
N_SEC	
(reserved-004)	[2 spaces]
(reserved-005)	0000001

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – APG-73	
N_SEG	
MAX_LP_SEG	
(reserved-006)	[12 spaces]
SUN_EL	
EXPLTA—Exploitation Related Information Extension Format	
ANGLE_TO_NORTH	
SQUINT_ANGLE	
MODE	
(reserved-001)	[16 spaces]
GRAZE_ANG	
SLOPE_ANG	
POLAR	
NSAMP	
(reserved-002)	[0]
SEQ_NUM	
PRIME_ID	
PRIME_BE	
(reserved-003)	[0]
N_SEC	
IPR	
(reserved-004)	[01]
(reserved-005)	[2 spaces]
(reserved-006)	[00000]
(reserved-007)	[8 spaces]
EXPLTB—Exploitation Related Information Extension Format	
ANGLE_TO_NORTH	
ANGLE_TO_NORTH_ACCY	
SQUINT_ANGLE	
SQUINT_ANGLE_ACCY	
MODE	
(reserved-001)	[16 spaces]

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – APG-73	
GRAZE_ANG	
GRAZE_ANG_ACCY	
SLOPE_ANG	
POLAR	
NSAMP	
(reserved-002)	[0]
SEQ_NUM	
PRIME_ID	
PRIME_BE	
(reserved-003)	[0]
N_SEC	
IPR	
MENSRA—Airborne SAR Mensuration Data Extension Format	
CCRP_LOC	
CCRP_ALT	
OF_PC_R	
OF_PC_A	
COSGRZ	
RGCCRP	
RLMAP	
CCRP_ROW	
CCRP_COL	
ACFT_LOC	
ACFT_ALT	
C_R_NC	
C_R_EC	
C_R_DC	
C_AZ_NC	
C_AZ_EC	
C_AZ_DC	
C_AL_NC	

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – APG-73	
C_AL_EC	
C_AL_DC	
MENSRB—Airborne SAR Mensuration Data Extension Format	
ACFT_LOC	
ACFT_LOC_ACCY	
ACFT_ALT	
RP_LOC	
RP_LOC_ACCY	
RP_ELV	
OF_PC_R	
OF_PC_A	
COSGRZ	
RGCRP	
RLMAP	
RP_ROW	
RP_COL	
C_R_NC	
C_R_EC	
C_R_DC	
C_AZ_NC	
C_AZ_EC	
C_AZ_DC	
C_AL_NC	
C_AL_EC	
C_AL_DC	
TOTAL_TILES_COLS	
TOTAL_TILES_ROWS	
MPDSRA—Mensuration Data Extension Format	
BLK_NUM	
IPR	
NBLKS_IN_WDG	

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – APG-73	
ROWS_IN_BLK	
COLS_IN_BLK	
ORP_X	
ORP_Y	
ORP_Z	
ORP_ROW	
ORP_COLUMN	
FOC_X	
FOC_Y	
FOC_Z	
ARP_TIME	
(reserved-001)	[14 spaces]
ARP_POS_N	
ARP_POS_E	
ARP_POS_D	
ARP_VEL_N	
ARP_VEL_E	
ARP_VEL_D	
ARP_ACC_N	
ARP_ACC_E	
ARP_ACC_D	
(reserved-002)	000.0000001.0
MSTGTA—Mission Target Information Extension Format	
TGT_NUM	
TGT_ID	
TGT_BE	
TGT_PRI	
TGT_REQ	
TGT_LTIOV	
TGT_TYPE	
TGT_COLL	

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – APG-73	
TGT_CAT	
TGT_UTC	
TGT_ELEV	
TGT_ELEV_UNIT	
TGT_LOC	
MTIRPA—Moving Target Report Extension Format	
MTI_DP	
MTI_PACKET_ID	
PATCH_NO	
WAMTI_FRAME_NO	
WAMTI_BAR_NO	
UTC	
SQUINT_ANGLE	
COSGRZ	
NO_VALID_TGTS	
TGT_n_LOC	
TGT_n_VEL_R	
TGT_n_SPEED	
TGT_n_HEADING	
TGT_n_AMPLITUDE	
TGT_n_CAT	
MTIRPB—Moving Target Report Extension Format	
MTI_DP	
MTI_PACKET_ID	
PATCH_NO	
WAMTI_FRAME_NO	
WAMTI_BAR_NO	
DATIME	
ACFT_LOC	
ACFT_ALT	
ACFT_ALT_UNIT	

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – APG-73	
ACFT_HEADING	
MTI_LR	
SQUINT_ANGLE	
COSGRZ	
NO_VALID_TGTS	
TGT_n_LOC	
TGT_n_LOC_ACCY	
TGT_n_VEL_R	
TGT_n_SPEED	
TGT_n_HEADING	
TGT_n_AMPLITUDE	
TGT_n_CAT	
PATCHA—Patch Information Extension Format	
PAT_NO	
LAST_PAT_FLAG	
LNSTRT	
LNSTOP	
AZL	
NVL	
FVL	
NPIXEL	
FVPIX	
FRAME	
UTC	
SHEAD	
GRAVITY	
INS_V_NC	
INS_V_EC	
INS_V_DC	
OFFLAT	
OFFLONG	

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – APG-73	
TRACK	
GSWEEP	
SHEAR	
PATCHB—Patch Information Extension Format	
PAT_NO	
LAST_PAT_FLAG	
LNSTRT	
LNSTOP	
AZL	
NVL	
FVL	
NPIXEL	
FVPIX	
FRAME	
UTC	
SHEAD	
GRAVITY	
INS_V_NC	
INS_V_EC	
INS_V_DC	
OFFLAT	
OFFLONG	
TRACK	
GSWEEP	
SHEAR	
BATCH_NO	
RPC00B—Rapid Positioning Capability Extension Format	
SUCCESS	
ERR_BIAS	
ERR_RAND	
LINE_OFF	

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – APG-73	
SAMP_OFF	
LAT_OFF	
LONG_OFF	
HEIGHT_OFF	
LINE_SCALE	
SAMP_SCALE	
LAT_SCALE	
LONG_SCALE	
HEIGHT_SCALE	
LINE_NUM_COEFF_1 (through) LINE_NUM_COEFF_20	
LINE_DEN_COEFF_1 (through) LINE_DEN_COEFF_20	
SAMP_NUM_COEFF_1 (through) SAMP_NUM_COEFF_20	
SAMP_DEN_COEFF_1 (through) SAMP_DEN_COEFF_20	
SECTGA—Secondary Targeting Information Extension Format	
SEC_ID	
SEC_BE	
(reserved-001)	[0]
SENSRA—EO-IR Sensor Parameters Extension Format	
REF_ROW	
REF_COL	
SENSOR_MODEL	
SENSOR_MOUNT	
SENSOR_LOC	
SENSOR_ALT_SOURCE	
SENSOR_ALT	
SENSOR_ALT_UNIT	

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – APG-73	
SENSOR_AGL	
SENSOR_PITCH	
SENSOR_ROLL	
SENSOR_YAW	
PLATFORM_PITCH	
PLATFORM_ROLL	
PLATFORM_HDG	
GROUND_SPD_SOURCE	
GROUND_SPD	
GROUND_SPD_UNIT	
GROUND_TRACK	
VERT_VEL	
VERT_VEL_UNIT	
SWATH_FRAMES	
N_SWATHS	
SPOT_NUM	
STEREOB—Stereo Information Extension Format	
ST_ID	
N_MATES	
MATE_INSTANCE	
B_CONV	
E_CONV	
B_ASYM	
E_ASYM	
B_BIE	
E_BIE	

NITFS APPLICATION SUMMARY **ASARS-2 Improvement Program**	
System Identifier:	ASARS-2 Improvement Program (AIP)
NITFS Services:	Airborne Synthetic Aperture Radar Image Data Producer
NITF/NSIF Version(s):	NITF 2.1
Reference Documents:	Interface Control Document for the AIP Airborne Radar Set to Ground ICD40042-166
NITFS Compliance Test Report:	Dated November 2001

System Description

The ASARS-2A sensor is the Advanced Synthetic Aperture Radar System (ASARS) designed for the high altitude U.S. Air Force U-2 aircraft. It is near real-time, high-resolution reconnaissance system with all-weather, day night, long-range mapping capabilities. ASARS-2A sensor detects and accurately locates fixed and moving ground targets. It gathers detailed information, formats the data, and transmits high-resolution images. The ASARS-2 Improvement Program (AIP) was designed to bring the latest commercial-off-the shelf (COTS) technology to the warfighter. The AIP brings operational capabilities, including near real-time, precision targeting; broad area synoptic coverage; on-board processing; ground moving target indications; and complex imagery for measurement intelligence applications.

The AIP Image Processing Assemblies provide the capability to export Synthetic Aperture Radar (SAR) to the National Imagery Transmission Format Standard (NITFS). There are two platforms that make up the Image Processing Assemblies, the On-Board Processor (OBP) and the Ground Station (GS). The OBP generates complex SAR, compressed or uncompressed detected SAR and Ground Moving Target Indicator (GMTI) hit data. The GS has the same NITF file generation capabilities as the OBP except it does not generate complex image or GMTI files. The OBP receives raw radar data in the form of Video Phase History (VPH) and breaks it up into numerous tiles as shown in Figure 17-3 and 17-4 of STDI-0002, Version 2.1, CMETAA TRE (section 17). Sponsored by the Air Force Aeronautical System Center, Raytheon Company of El Segundo developed both the OBP and GS.

The ASARS-2A sensor collects SAR data in several different modes; Search, Canted Search, Point, Repetitive Point Imaging, and GMTI. When the sensor is in either of the search modes, it collects its data in one of the three sub-modes: High, Medium or Coarse. If the sensor is in Point Imaging mode, it collects in either Point Imaging or Repetitive Point Imaging sub-mode. If the sensor is in GMTI mode, it collects in either Swath MTI (SMTI) or Wide Area MTI (WAMTI) sub-mode.

Sensor Type(s)

ASARS-2A

NITFS APPLICATION SUMMARY ASARS-2 Improvement Program	
General Characteristics	
File Naming Convention	*For Search and Point Imaging Modes*: m(followed by Mission Name)_s(followed by Scene #)_seg(followed by Segment#)_f(followed by Frame#)_row(followed by Row #)_col(followed by Col #)_c(followed by Copy #)_r(followed by Reduction # - For Minification use only 1= Full Resolution - Not Minified, 14 ,15, 36).ntf_detected or .ntf_complex or .ntf_detected_compressed *For example*: maa39_s11_seg1_f1_row12_col5_c1_r1.ntf_detected (for detected uncompressed data) maa39_s11_seg1_f1_row12_col5_c1_r1.ntf_complex (for complex uncompressed data) maa39_s11_seg1_f1_row12_col5_c1_r1.ntf_detected_compressed (for detected compressed data) *For GMTI Modes*: The filename format is as follows: m(followed by Mission Name)_s(followed by Scene #)_(Year in 4 digits)(Months in 2 digits)(Day in 2 digits)(Hours in 2 digits)(Minutes in 2 digits)(Seconds in 2 digits)_c(followed by copy #). ntf_mti *For example*: maa39_s11_20011225123001_c1.ntf_mti
CLEVELs Supported	Complex - CLEVEL 06; Detected and MTI - CLEVEL 03
Origination Station Identifier Convention	ARS (Airborne Radar System)
File Title Convention	Uses AIMIDB mapping of fields Acquisition_Date through END_TILE_ROW
Security Marking Options Supported	The following Security fields are populated in all AIP files: FSCLAS - S, FSCLSY - US, FSCTLH - UO, FSREL - country codes per FIPS PUB 10-4, all other Security fields are defaulted according to MIL-STD-2500B
Originator's Designated Background Color	0x303030
Originator's Name Field Convention	Spaces
Originator's Phone Number Convention	Spaces
Image Segments Supported	SAR - 001; MTI - 000
Symbol Segments Supported	000

NITFS APPLICATION SUMMARY ASARS-2 Improvement Program	
Text Segments Supported	000
Data Extension Segments Supported	000
Reserved Extension Segments Supported	000
File Header TREs (tags) Supported	Complex and Detected SAR - no TREs supported; GMTI - ACFTB, MTIRPB and MTXFIL
File Size/Range	Typical file sizes demonstrated during testing were: Complex ≈ 4-6 MB Search (Detected) ≈ 2-4 MB Point (Detected) ≈ 2-3 MB Search (Detected) JPEG < 1 MB Point (Detected) JPEG < 1/2 MB SMTI/WAMTI ≈ 20k
Image Segment Options Supported	
Image Identifier 1 (short ID)	AIP
Image Identifier 2 (long ID)	Same as FTITLE
Target Identifier Field	Spaces
Image Source Field	AIP
Image Comment Fields	No image comments used
Image Characteristics	
Dimensions	Complex - columns usually less than 20000, rows usually less than 400; Detected - slightly ≤ 2048 x 2048 and usually not square
Pixel Value Types	INT
Image Representation Types	Complex - POLAR, Detected - MONO
Image Categories	SAR
Bounding Rectangle Coordinates	Decimal Degrees
Compression Options	NC or C3 (Complex data are always NC)
Pixel Interleave(s)	Complex - IMODE S; Detected - IMODE B
Blocking	Complex - single pixel blocks in row dimension, and generally one to four blocks in column dimension; Detected - single block
Location offset supported	0000000000
Attachment Level supported	000
Reduced Resolutions	IMAG is always 1.0

NITFS APPLICATION SUMMARY ASARS-2 Improvement Program	
Image Subheader TREs (tags) Supported	Complex - AIMIDB, ACFTB, AIPBCA, BLOCKA, CMETAA, EXPLTB, MENSRB, MTXFIL; Detected - AIMIDB, ACFTB, BLOCKA, EXPLTB, MENSRB, MTXFIL
Symbol Segment Options Supported	
CGM Supported	NOT SUPPORTED
Degree of CGM Support	
Symbol Identifier Convention	
Symbol Name Convention	
Location offset supported	
Attachment Level supported	
Symbol Subheader TREs (tags) supported	
Text Segment Options Supported	
STA (Basic Character Set)	NOT SUPPORTED
UT1 (Extended Character Set)	
U8S (UTF-8 Extended Characters)	
MTF (US Message Text Format)	
Text Identifier Convention	
Text Title Convention	
Attachment Level supported	
Text Subheader TREs (tags) supported	
Data Extension Segments Supported	
Controlled Extensions (NITF 2.0 only)	N/A
Registered Extensions (NITF 2.0 only)	
TRE_OVERFLOW	NOT SUPPORTED
STREAMING_FILE_HEADER	
Reserved Extension Segments Supported	
None yet defined.	N/A
Other Pertinent Information	
AIMIDB—Additional Image ID Extension Format	
ACQUISITION_DATE	populated

NITFS APPLICATION SUMMARY ASARS-2 Improvement Program	
MISSION_NO	‘UNKN’
MISSION_IDENTIFICATION	alphanumeric string, convention unknown
FLIGHT_NO	‘00’
OP_NUM	same as ACFTB: SCNUM
CURRENT_SEGMENT	‘00’
REPRO_NUM	‘00’
REPLAY	‘000’
(reserved-001)	[1 space]
START_TILE_COLUMN	these fields provide the row/col of the data in each file relative to the full image operation.
START_TILE_ROW	
END_SEGMENT	‘00’
END_TILE_COLUMN	populated identically to START_TILE_COLUMN and ROW
END_TILE_ROW	
COUNTRY	spaces
(reserved-002)	[4 spaces]
LOCATION	populated
(reserved-003)	[13 spaces]
ACFTB—Aircraft Information Extension Format	
AC_MSN_ID	alphanumeric string, unknown convention
AC_TAIL_NO	spaces
AC_TO	spaces
SENSOR_ID_TYPE	‘SAR’
SENSOR_ID	‘AIP’
SCENE_SOURCE	‘1’
SCNUM	populated
PDATE	populated
IMHOSTNO	spaces
IMREQID	spaces
MPLAN	populated
ENTLOC	populated
LOC_ACCY	spaces
ENTELV	populated
ELV_UNIT	‘m’
EXITLOC	Point – spaces; Search – populated

NITFS APPLICATION SUMMARY ASARS-2 Improvement Program	
EXITELV	populated
TMAP	populated
ROW_SPACING	populated
ROW_SPACING_UNITS	‘f’
COL_SPACING	populated
COL_SPACING_UNITS	‘f’
FOCAL_LENGTH	‘999.99’
SENSERIAL	spaces
ABSWVER	spaces
CAL_DATE	spaces
PATCH_TOT	‘0000’
MTI_TOT	‘000’
BLOCKA—Image Block Information Extension Format	
BLOCK_INSTANCE	‘01’
N_GRAY	spaces
L_LINES	same as NROWS
LAYOVER_ANGLE	populated
SHADOW_ANGLE	populated
(reserved-001)	[16 spaces]
FRLC_LOC	same as IGEOLO 2 (w/more precision)
LRLC_LOC	same as IGEOLO 3 (w/more precision)
LRFC_LOC	same as IGEOLO 4 (w/more precision)
FRFC_LOC	same as IGEOLO 1 (w/more precision)
(reserved-002)	010.0
EXPLTB—Exploitation Related Information Extension Format	
ANGLE_TO_NORTH	populated
ANGLE_TO_NORTH_ACCY	‘00.000’
SQUINT_ANGLE	populated
SQUINT_ANGLE_ACCY	’00.000’
MODE	populated
(reserved-001)	[16 spaces]
GRAZE_ANG	populated
GRAZE_ANG_ACCY	’00.00’

NITFS APPLICATION SUMMARY ASARS-2 Improvement Program	
SLOPE_ANG	populated
POLAR	'HH'
NSAMP	populated same as NCOLS
(reserved-002)	[0]
SEQ_NUM	spaces
PRIME_ID	spaces
PRIME_BE	spaces
(reserved-003)	[0]
N_SEC	'00'
IPR	spaces
MENSRB—Airborne SAR Mensuration Data Extension Format	
ACFT_LOC	populated
ACFT_LOC_ACCY	populated
ACFT_ALT	populated
RP_LOC	populated
RP_LOC_ACCY	populated
RP_ELV	populated
OF_PC_R	'+0000.0'
OF_PC_A	'+0000.0'
COSGRZ	populated
RGCRP	populated
RLMAP	populated
RP_ROW	populated
RP_COL	populated
C_R_NC	populated
C_R_EC	populated
C_R_DC	populated
C_AZ_NC	populated
C_AZ_EC	populated
C_AZ_DC	populated
C_AL_NC	populated
C_AL_EC	populated
C_AL_DC	populated
TOTAL_TILES_COLS	provides the total number of files in the full image operation.

NITFS APPLICATION SUMMARY ASARS-2 Improvement Program	
TOTAL_TILES_ROWS	
CMETAA	
100 – RELATED_TRES	2 or 3
200 – ADDITIONAL_TRES	AIMIDB, AIPBCE and / or MTXFIL
300 – RD_PRC_NO	populated
400 – IF_PROCESS	‘RM’
500 – RD_CEN_FREQ	‘X’
600 – RD_MODE	populated
700 – RD_PATCH_NO	populated
800 – CMPLX_DOMAIN	‘MP’
900 – CMPLX_MAG_REMAP_TYPE	‘LLM’
1000 – CMPLX_LIN_SCALE	‘1.00000’
1100 – CMPLX_AVG_POWER	‘0000000’
1200 – CMPLX_LINLOG_TP	‘00117’
1300 – CMPLX_PHASE_QUANT_FLAG	‘NS’
1400 – CMPLX_PHASE_QUANT_BIT_DEPTH	‘00’
1500 – CMPLX_SIZE_1	‘08’
1600 – CMPLX_IC_1	‘NC’
1700 – CMPLX_SIZE_2	‘08’
1800 – CMPLX_IC_2	‘NC’
1900 – CMPLX_IC_BPP	‘00000’
2000 – CMPLX_WEIGHT	‘UWT’
2100 – CMPLX_AZ_SLL	‘00’
2200 – CMPLX_RNG_SLL	‘00’
2300 – CMPLX_AZ_TAY_NBAR	‘00’
2400 – CMPLX_RNG_TAY_NBAR	‘00’
2500 – CMPLX_WEIGHT_NORM	SPACES
2600 – CMPLX_SIGNAL_PLANE	‘S’
2700 – IF_DC_SF_ROW	POPULATED
2800 – IF_DC_SF_COL	POPULATED
2900 – IF_PATCH_1_ROW	POPULATED
3000 – IF_PATCH_1_COL	POPULATED
3100 – IF_PATCH_2_ROW	POPULATED
3200 – IF_PATCH_2_COL	POPULATED

NITFS APPLICATION SUMMARY ASARS-2 Improvement Program	
3300 – IF_PATCH_3_ROW	POPULATED
3400 – IF_PATCH_3_COL	POPULATED
3500 – IF_PATCH_4_ROW	POPULATED
3600 – IF_PATCH_4_COL	POPULATED
3700 – IF_DC_IS_ROW	POPULATED
3800 – IF_DC_IS_COL	POPULATED
3900 – IF_IMG_ROW_DC	PROVIDES LOCATION OF FILE RELATIVE TO FULL IMAGE OPERATION
4000 – IF_IMG_COL_DC	
4100 – IF_TILE_1_ROW	INDICATES WHAT DATA IS VALID IN THIS FILE – FOUR CORNERS
4200 – IF_TILE_1_COL	
4300 – IF_TILE_2_ROW	
4400 – IF_TILE_2_COL	
4500 – IF_TILE_3_ROW	
4600 – IF_TILE_3_COL	
4700 – IF_TILE_4_ROW	
4800 – IF_TILE_4_COL	
4900 – IF_RD	SEARCH – ‘O’; POINT – ‘Y’
5000 – IF_RGWLK	‘O’
5100 – IF_KEYSTN	‘O’
5200 – IF_LINSFT	‘Y’
5300 – IF_SUBPATCH	SPACE
5400 – IF_GEODIST	‘O’
5500 – IF_RGFO	‘Y’
5600 – IF_BEAM_COMP	‘Y’
5700 – IF_RGRES	POPULATED
5800 – IF_AZRES	POPULATED
5900 – IF_RSS	POPULATED
6000 – IF_AZSS	POPULATED
6100 – IF_RSR	POPULATED
6200 – IF_AZSR	POPULATED
6300 – IF_RFFT_SAMP	POPULATED
6400 – IF_AZFFT_SAMP	POPULATED
6500 – IF_RFFT_TOT	POPULATED
6600 – IF_AZFFT_TOT	POPULATED

NITFS APPLICATION SUMMARY ASARS-2 Improvement Program	
6700 – IF_SUBP_ROW	POPULATED
6800 – IF_SUBP_COL	POPULATED
6900 – IF_SUB_RG	‘0001’
7000 – IF_SUB_AZ	USED TO COUNT PATCHES NOT SUBPATCHES
7100 – IF_RFFTS	SEARCH – ‘+’; POINT – ‘-‘
7200 – IF_AFFTS	SEARCH – ‘+’; POINT – ‘-‘
7300 – IF_RANGE_DATA	‘ROW_DEC’ OR ‘ROW_INC’
7400 – IF_INCPH	POPULATED
7500 – IF_SR_NAME1	SPACES
7600 – IF_SR_AMOUNT1	’01.00000’
7700 – IF_SR_NAME2	SPACES
7800 – IF_SR_AMOUNT2	’01.00000’
7900 – IF_SR_NAME3	SPACES
8000 – IF_SR_AMOUNT3	’01.00000’
8100 – AF_TYPE1	‘PHDIF’
8200 – AF_TYPE2	‘N’
8300 – AF_TYPE3	‘N’
8400 – POL_TR	‘H’
8500 – POL_RE	‘H’
8600 – POL_REFERENCE	‘ANT’
8700 – POL	‘N’
8800 – POL_REG	SPACE
8900 – POL_ISO_1	‘00000’
9000 – POL_BAL	SPACE
9100 – POL_BAL_MAG	‘00000000’
9200 – POL_BAL_PHS	‘00000000’
9300 – POL_HCOMP	SPACE
9400 – POL_HCOMP_BASIS	‘0000000000’
9500 – POL_HCOMP_COEF_1	‘0000000000’
9600 – POL_HCOMP_COEF_2	SPACES
9700 – POL_HCOMP_COEF_3	SPACES
9800 – POL_AFCOMP	SPACE
9900 – POL_SPARE_A	SPACES
10000 – POL_SPARE_N	‘000000000’

NITFS APPLICATION SUMMARY ASARS-2 Improvement Program	
10100 – T_UTC_YYYYMMMDD	MATCHES IDATIM
10200 – T_HHMMSSUTC	MATCHES IDATIM
10300 – T_HHMMSSLOCAL	SPACES
10400 – CG_SRAC	POPULATED
10500 – CG_SLANT_CONFIDENCE	‘0000000’
10600 – CG_CROSS	POPULATED
10700 – CG_CROSS_CONFIDENCE	‘0000000’
10800 – CG_CAAC	POPULATED
10900 – CG_CONE_CONFIDENCE	‘000000’
11000 – CG_GPSAC	POPULATED
11100 – CG_GPSAC_CONFIDENCE	‘000000’
11200 – CG_SQUINT	POPULATED
11300 – CG_GAAC	POPULATED
11400 – CG_GAAC_CONFIDENCE	‘000000’
11500 – CG_INCIDENT	POPULATED
11600 – CG_SLOPE	POPULATED
11700 – CG_TILT	POPULATED
11800 – CG_LD	POPULATED
11900 – CG_NORTH	POPULATED
12000 – CG_NORTH_CONFIDENCE	‘000000’
12100 – CG_EAST	POPULATED
12200 – CG_RLOS	POPULATED
12300 – CG_LOS_CONFIDENCE	‘000000’
12400 – CG_LAYOVER	POPULATED
12500 – CG_SHADOW	POPULATED
12600 – CG_OPM	‘0000000’
12700 – CG_MODEL	‘ECEF’
12800 – CG_AMPT_X	POPULATED
12900 – CG_AMPT_Y	POPULATED
13000 – CG_AMPT_Z	POPULATED
13100 – CG_AP_CONF_XY	‘000000’
13200 – CG_AP_CONF_Z	‘000000’
13300 – CG_APCEN_X	POPULATED
13400 – CG_APCEN_Y	POPULATED

NITFS APPLICATION SUMMARY ASARS-2 Improvement Program	
13500 – CG_APCEN_Z	POPULATED
13600 – CG_APER_CONF_XY	POPULATED
13700 – CG_APER_CONF_Z	POPULATED
13800 – CG_FPNUV_X	POPULATED
13900 – CG_FPNUV_Y	POPULATED
14000 – CG_FPNUV_Z	POPULATED
14100 – CG_IDPNUVX	POPULATED
14200 – CG_IDPNUVY	POPULATED
14300 – CG_IDPNUVZ	POPULATED
14400 – CG_SCECN_X	POPULATED
14500 – CG_SCECN_Y	POPULATED
14600 – CG_SCECN_Z	POPULATED
14700 – CG_SC_CONF_XY	POPULATED
14800 – CG_SC_CONF_Z	POPULATED
14900 – CG_SWWD	POPULATED
15000 – CG_SNVEL_X	POPULATED
15100 – CG_SNVEL_Y	POPULATED
15200 – CG_SNVEL_Z	POPULATED
15300 – CG_SNACC_X	POPULATED
15400 – CG_SNACC_Y	POPULATED
15500 – CG_SNACC_Z	POPULATED
15600 – CG_SNATT_ROLL	POPULATED
15700 – CG_SNATT_PITCH	POPULATED
15800 – CG_SNATT_YAW	POPULATED
15900 – CG_GTP_X	POPULATED
16000 – CG_GTP_Y	POPULATED
16100 – CG_GTP_Z	POPULATED
16200 – CG_MAP_TYPE	‘GEOD’
16300 – CG_PATCH_LAT_CEN	POPULATED
16400 – CG_PATCH_LNG_CEN	POPULATED
16500 – CG_PATCH_LTC_ORUL	POPULATED
16600 – CG_PATCH_LGC_ORUL	POPULATED
16700 – CG_PATCH_LTC_ORUR	POPULATED
16800 – CG_PATCH_LGC_ORUR	POPULATED

NITFS APPLICATION SUMMARY ASARS-2 Improvement Program	
16900 – CG_PATCH_LTC_ORLR	POPULATED
17000 – CG_PATCH_LGC_ORLR	POPULATED
17100 – CG_PATCH_LTC_ORLL	POPULATED
17200 – CG_PATCH_LNGCOLL	POPULATED
17300 – CG_PATCH_LAT_CONFIDENCE	POPULATED
17400 – CG_PATCH_LONG_CONFIDENCE	POPULATED
17500 – CG_MGRS_CENT	NOT PRESENT
17600 – CG_MGRSCORUL	NOT PRESENT
17700 – CG_MGRSCORUR	NOT PRESENT
17800 – CG_MGRSCORLR	NOT PRESENT
17900 – CG_MGRCORLL	NOT PRESENT
18000 – CG_MGRS_CONFIDENCE	NOT PRESENT
18100 – CG_MGRS_PAD	NOT PRESENT
18150 – CG_MAP_TYPE_BLANK	NOT PRESENT
18200 – CG_SPARE_A	SPACES
18300 – CA_CALPA	‘0000000’
18400 – WF_SRTFR	POPULATED
18500 – WF_ENDFR	POPULATED
18600 – WF_CHRPRT	POPULATED
18700 – WF_WIDTH	POPULATED
18800 – WF_CENFRQ	POPULATED
18900 – WF_BW	POPULATED
19000 – WF_PRF	POPULATED
19100 – WF_PRI	POPULATED
19200 – WF_CDP	POPULATED
19300 – WF_NUMBER_OF_PULSES	POPULATED
19400 – VPH_COND	‘N’

NITFS APPLICATION SUMMARY

Common Imagery Processor (CIP) – Low Altitude Electro Optical (LAEO)/ Medium Altitude Electro Optical (MAEO) Advanced Tactical Air Reconnaissance System (ATARS)

System Identifier:	LAEO/MAEO ATARS
NITFS Services:	Tactical NITFS File Producer
NITF/NSIF Version(s):	NITF 2.10
Reference Documents:	Common Imagery Processor (CIP) to Common Imagery Ground Surface System (CIGSS) Interface Control Document (ICD), 5A28773, Revision H, Draft, 19 November 2001. STDI-0002 version 2.0, Section 8.0, 4 March 1999, Airborne Support Data Extension (ASDE).
NITFS Compliance Test Report:	None.

System Description

The Common Imagery Ground/Surface System (CIGSS) consists of a Common Imagery Processor (CIP), an Image Product Library (IPL), an Imagery Exploitation Support System (IESS), Exploitation Workstations, a Screener Workstation, a CIGSS System Manager, and other CIGSS-compliant elements. The CIP accepts imagery and support data and processes it into an exploitable image and outputs it to other CIGSS elements. CIP imagery (full and reduced resolution data sets) and support data can be output to a Screening Workstation. The Screener Workstation provides an image selection capability that allows for the designation of targets within the imagery. Selected image target areas are either transmitted to the IPL or an exploitation workstation in NITF 2.0 or 2.1 format with the appropriate Support Data Extensions (SDEs).

The CIP receives data from the electro optical (EO) sensor via Advanced Tactical Air Reconnaissance System (ATARS) EO mission tapes or common data link and processes it into either a standard image array with supporting metadata (internal product A) or an image array with supporting metadata mosaiced together from up to 8 internal standard image array products (internal product B). Then the CIP product formatting software processes the CIP internal product, by applying options such as NITF blocking and formatting to create final “output products." CIP produces three ATARS EO NITF 2.1 output products: full resolution images, reduced resolution images, and exploitation images.

Sensor Type(s)

Low Altitude Electro Optical (LAEO) ATARS

Medium Altitude Electro Optical (MAEO) ATARS

General Characteristics

File Naming Convention	Uses an internal convention.
CLEVELs Supported	06 (full resolution) 03 (reduced resolution)
Origination Station Identifier Convention	CIP

NITFS APPLICATION SUMMARY

Common Imagery Processor (CIP) – Low Altitude Electro Optical (LAEO)/ Medium Altitude Electro Optical (MAEO) Advanced Tactical Air Reconnaissance System (ATARS)

File Title Convention	Same as IID2.
Security Marking Options Supported	All data is Unclassified; and files provide the following security information: FSCLAS – U FSCLSY – [spaces] FSCTLH – [spaces] FSDCTP – [spaces] FSDCXM – [spaces] FSCATP – [spaces] FSCAUT – [spaces] FSCRSN – [spaces] FSSRDT – [spaces]
Originator's Designated Background Color	Decimal 00 00 00
Originator's Name Field Convention	[spaces]
Originator's Phone Number Convention	[spaces]
Image Segments Supported	1 per file
Symbol Segments Supported	None
Text Segments Supported	None
Data Extension Segments Supported	None
Reserved Extension Segments Supported	None
File Header TREs (tags) Supported	None
File Size/Range	3,081,739 – 18,876,087 (full resolution) 4,547 – 129,719 (reduced resolution)
Image Segment Options Supported	
Image Identifier 1 (short ID)	Resolution and sequence number e.g. “FR_1_00022” (full resolution) “RR_1_00013” (reduced resolution)
Image Identifier 2 (long ID)	40-characters mapped from AIMIDB.
Target Identifier Field	[spaces]
Image Source Field	[spaces]
Image Comment Fields	None
Image Characteristics	
Dimensions	1536 rows x 12002 cols (full resolution) 128 rows x 1000 cols (reduced resolution)
Pixel Value Types	INT
Image Representation Types	MONO

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – Low Altitude Electro Optical (LAEO)/ Medium Altitude Electro Optical (MAEO) Advanced Tactical Air Reconnaissance System (ATARS)	
Image Categories	VIS
Bounding Rectangle Coordinates	ddmmssXdddmmssY (except for cvsf.ntf – dcsf.ntf, bvsf.ntf) (full resolution) ddmmssXdddmmssY (except for cxsr.ntf – desr.ntf, bxsr.ntf) (reduced resolution)
Compression Options	NC
Pixel Interleave(s)	MONO – IMODE B
Blocking	Yes, 256 x 256, 512 x 512, or 1024 x1024 (full resolution) Not always (reduced resolution)
Location offset supported	None. Image always placed at CCS origin.
Attachment Level supported	Always unattached (IALVL = 000).
Reduced Resolutions	Unknown
Image Subheader TREs (tags) Supported	ACFTB, AIMIDB, BANDSA, EXOPTA, SENSRA, SECTGA, and sometimes MSTGTA
Symbol Segment Options Supported	
CGM Supported	Not Supported
Degree of CGM Support	
Symbol Identifier Convention	
Symbol Name Convention	
Location offset supported	
Attachment Level supported	
Symbol Subheader TREs (tags) supported	
Text Segment Options Supported	
STA (Basic Character Set)	Not Supported
UT1 (Extended Character Set)	
U8S (UTF-8 Extended Characters)	
MTF (US Message Text Format)	
Text Identifier Convention	
Text Title Convention	
Attachment Level supported	
Text Subheader TREs (tags) supported	

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – Low Altitude Electro Optical (LAEO)/ Medium Altitude Electro Optical (MAEO) Advanced Tactical Air Reconnaissance System (ATARS)	
Data Extension Segments Supported	
Controlled Extensions (NITF 2.0 only)	Not Supported
Registered Extensions (NITF 2.0 only)	
TRE_OVERFLOW	
STREAMING_FILE_HEADER	
Reserved Extension Segments Supported	
None yet defined.	Not Supported
Other Pertinent Information	
MSTGTA included when ACFTB SCENE_SOURCE = 0 (pre-planned)	
When there are no IGEOLOs in image subheader, there will be no entry/exit locations in ACFTB.	
AIMIDB--Additional Image ID Extension Format	
ACQUISITION_DATE	CCYYMMDDhhmmss. (Same as IDATIM in image subheader.)
MISSION_NO	UNKN
MISSION_IDENTIFICATION	Populated
FLIGHT_NO	00 (unavailable)
OP_NUM	Populated (same as ACFTB SCNUM)
CURRENT_SEGMENT	Populated
REPRO_NUM	00
REPLAY	000
(reserved-001)	[1 space]
START_TILE_COLUMN	001
START_TILE_ROW	00001
END_SEGMENT	00 (unknown)
END_TILE_COLUMN	001
END_TILE_ROW	00001
COUNTRY	2 spaces
(reserved-002)	[4 spaces]
LOCATION	DdmmXdddmmY

NITFS APPLICATION SUMMARY

Common Imagery Processor (CIP) – Low Altitude Electro Optical (LAEO)/ Medium Altitude Electro Optical (MAEO) Advanced Tactical Air Reconnaissance System (ATARS)

(reserved-003)	[13 spaces]
ACFTB—Aircraft Information Extension Format	
AC_MSN_ID	Same as AIMIDB MISSION_IDENTIFICATION.
AC_TAIL_NO	10 spaces
AC_TO	CCYYMMDDhhmm
SENSOR_ID_TYPE	VLPB (LAEO), VMPB (MAEO)
SENSOR_ID	LAEO, MAEO
SCENE_SOURCE	0 = preplanned, 2 =
SCNUM	Populated (same as AIMIDB OP_NUM)
PDATE	CCYYMMDD
IMHOSTNO	6 spaces
IMREQID	5 spaces
MPLAN	Populated per STDI-0002
ENTLOC	ddmmss.ssssXdddmmss.ssssY
LOC_ACCY	6 spaces
ENTELV	Populated
ELV_UNIT	f
EXITLOC	ddmmss.ssssXdddmmss.ssssY
EXITELV	Populated
TMAP	Populated
ROW_SPACING	Populated
ROW_SPACING_UNITS	f
COL_SPACING	Populated
COL_SPACING_UNITS	f
FOCAL_LENGTH	999.99
SENSERIAL	6 spaces
ABSWVER	7 spaces
CAL_DATE	8 spaces
PATCH_TOT	0001
MTI_TOT	000

NITFS APPLICATION SUMMARY

Common Imagery Processor (CIP) – Low Altitude Electro Optical (LAEO)/ Medium Altitude Electro Optical (MAEO) Advanced Tactical Air Reconnaissance System (ATARS)

BANDSA—Multispectral/Hyperspectral Band Parameters Extension Format	
ROW_SPACING	Same as in ACFTB.
ROW_SPACING_UNITS	Same as in ACFTB.
COL_SPACING	Same as in ACFTB.
COL_SPACING_UNITS	Same as in ACFTB.
FOCAL_LENGTH	Same as in ACFTB.
BANDCOUNT	0001
BANDPEAKn	5 spaces
BANDLBOUNDn	00.55
BANDUBOUNDn	00.95
BANDWIDTHn	00.40
BANDCALDRKn	6 spaces
BANDCALINCn	5 spaces
BANDRESPn	006.2
BANDASDn	006.2
BANDGSDn	Populated
EXOPTA—Exploitation Usability Optical Information Extension Format	
ANGLE_TO_NORTH	Populated
MEAN_GSD	Populated
(reserved-001)	[1]
DYNAMIC_RANGE	00255
(reserved-002)	[7 spaces]
OBL_ANG	Populated
ROLL_ANG	Populated
PRIME_ID	Populated
PRIME_BE	15 spaces
(reserved-003)	[5 spaces]
N_SEC	001
(reserved-004)	[2 spaces]
(reserved-005)	[0000001]
N_SEG	001
MAX_LP_SEG	Populated

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – Low Altitude Electro Optical (LAEO)/ Medium Altitude Electro Optical (MAEO) Advanced Tactical Air Reconnaissance System (ATARS)	
(reserved-006)	[12 spaces]
SUN_EL	Populated
SUN_AZ	Populated
MSTGTA—Mission Target Information Extension Format	
TGT_NUM	Populated
TGT_ID	12 spaces
TGT_BE	15 spaces
TGT_PRI	3 spaces
TGT_REQ	12 spaces
TGT_LTIOV	12 spaces
TGT_TYPE	1 = strip
TGT_COLL	0 = vertical, 4 = best possible
TGT_CAT	5 spaces
TGT_UTC	7 spaces
TGT_ELEV	6 spaces
TGT_ELEV_UNIT	f
TGT_LOC	Xddmmss.ssYdddmmss.ss
SECTGA—Secondary Targeting Information Extension Format	
SEC_ID	12 spaces
SEC_BE	15 spaces
(reserved-001)	[0]
SENSRA—EO-IR Sensor Parameters Extension Format	
REF_ROW	00000000
REF_COL	00000000
SENSOR_MODEL	ATARS
SENSOR_MOUNT	Populated
SENSOR_LOC	ddmmss.ssXdddmmss.ssY
SENSOR_ALT_SOURCE	B (barometric altimeter)
SENSOR_ALT	Populated
SENSOR_ALT_UNIT	f
SENSOR_AGL	Populated

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – Low Altitude Electro Optical (LAEO)/ Medium Altitude Electro Optical (MAEO) Advanced Tactical Air Reconnaissance System (ATARS)	
SENSOR_PITCH	Populated
SENSOR_ROLL	populated
SENSOR_YAW	Populated
PLATFORM_PITCH	Populated
PLATFORM_ROLL	Populated
PLATFORM_HDG	Populated
GROUND_SPD_SOURCE	N (Navigation System)
GROUND_SPD	Populated
GROUND_SPD_UNIT	k
GROUND_TRACK	Populated
VERT_VEL	Populated
VERT_VEL_UNIT	f
SWATH_FRAMES	4 spaces
N_SWATHS	4 spaces
SPOT_NUM	3 spaces

NITFS APPLICATION SUMMARY
Common Imagery Processor (CIP) – ASARS2

System Identifier:	ASARS2 Spot and Strip
NITFS Services:	Tactical NITFS File Producer
NITF/NSIF Version(s):	NITF 2.0 and 2.1
Reference Documents:	Common Imagery Processor (CIP) to Common Imagery Ground Surface System (CIGSS) Interface Control Document (ICD), 5A28773, Revision H, Draft, 19 November 2001. STDI-0002 version 2.0, Section 8.0, 4 March 1999, Airborne Support Data Extension (ASDE).
NITFS Compliance Test Report:	None

System Description

The Common Imagery Ground/Surface System (CIGSS) consists of a Common Imagery Processor (CIP), an Image Product Library (IPL), an Imagery Exploitation Support System (IESS), Exploitation Workstations, a Screener Workstation, a CIGSS System Manager, and other CIGSS-compliant elements. The CIP accepts imagery and support data and processes it into an exploitable image and outputs it to other CIGSS elements. CIP imagery (full and reduced resolution data sets) and support data can be output to a Screening Workstation. The Screener Workstation provides an image selection capability that allows for the designation of targets within the imagery. Selected image target areas are either transmitted to the IPL or an exploitation workstation in NITF 2.0 or 2.1 format with the appropriate Support Data Extensions (SDEs).

ASARS-2 produces 3 output NITF products: the full resolution SAR image, a reduced resolution SAR image and an exploitation SAR image. These products are all detected imagery with supporting metadata, produced from raw ASARS-2 video phase history data.

Sensor Type(s)

Synthetic Aperture Radar (SAR)

General Characteristics

File Naming Convention	Alphanumeric – no apparent convention
CLEVELs Supported	Up to CL05
Origination Station Identifier Convention	CIP
File Title Convention	Alphanumeric string. <u>NITF 2.0 example:</u> “ASARS-2 MSN:NoMsn IID: IL_1_00003 121230252SEP00” <u>NITF 2.1</u> maps from IID2 and AIMIDB
Security Marking Options Supported	unclassified
Originator's Designated Background Color	<u>NITF 2.0:</u> Hexadecimal 20, 20, 20

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – ASARS2	
	NITF 2.1: Hexadecimal 0, 0, 0
Originator's Name Field Convention	spaces
Originator's Phone Number Convention	spaces
Image Segments Supported	1
Symbol Segments Supported	0
Text Segments Supported	0
Data Extension Segments Supported	0
Reserved Extension Segments Supported	0
File Header TREs (tags) Supported	None
File Size/Range	< 11MB
Image Segment Options Supported	
Image Identifier 1 (short ID)	alpha string w/unknown numbering scheme, e.g. IL_1_00001
Image Identifier 2 (long ID)	both NITF 2.0 and 2.1 are the same as FTITLE
Target Identifier Field	spaces
Image Source Field	spaces
Image Comment Fields	none
Image Characteristics	
Dimensions	Spot – approximately square strip – approximate ratio of 8:1 rows to columns
Pixel Value Types	INT
Image Representation Types	MONO
Image Categories	SAR
Bounding Rectangle Coordinates	always present
Compression Options	NC
Pixel Interleave(s)	B
Blocking	256 blocks
Location offset supported	always at 0,0
Attachment Level supported	always attached to 000
Reduced Resolutions	yes /8
Image Subheader TREs (tags) Supported	ACFTB, AIMIDB, EXPLTB, BLOCKA, MPDSRA, MENSRB, PATCHB, SECTGA

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – ASARS2	
Symbol Segment Options Supported	
CGM Supported	N/A
Degree of CGM Support	
Symbol Identifier Convention	
Symbol Name Convention	
Location offset supported	
Attachment Level supported	
Symbol Subheader TREs (tags) supported	
Text Segment Options Supported	
STA (Basic Character Set)	
UT1 (Extended Character Set)	N/A
U8S (UTF-8 Extended Characters)	
MTF (US Message Text Format)	
Text Identifier Convention	
Text Title Convention	
Attachment Level supported	
Text Subheader TREs (tags) supported	
Data Extension Segments Supported	
Controlled Extensions (NITF 2.0 only)	N/A
Registered Extensions (NITF 2.0 only)	
TRE_OVERFLOW	
STREAMING_FILE_HEADER	
Reserved Extension Segments Supported	
None yet defined.	N/A
Other Pertinent Information	
AIMIDB—Additional Image ID Extension Format	
ACQUISITION_DATE	populated
MISSION_NO	‘UNKN’
MISSION_IDENTIFICATION	‘NOT AVAIL.’
FLIGHT_NO	‘00’

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – ASARS2	
OP_NUM	populated – same as ACFTB SCNUM
CURRENT_SEGMENT	Spot – 00 Strip – AA, AB, AC,…
REPRO_NUM	‘00’
REPLAY	‘000’
(reserved-001)	[1 space]
START_TILE_COLUMN	‘001’
START_TILE_ROW	‘00001’
END_SEGMENT	‘00’
END_TILE_COLUMN	‘001’
END_TILE_ROW	‘00001’
COUNTRY	spaces
(reserved-002)	[4 spaces]
LOCATION	populated
(reserved-003)	[13 spaces]
ACFTB—Aircraft Information Extension Format	
AC_MSN_ID	‘NOT AVAILABLE’
AC_TAIL_NO	spaces
AC_TO	populated
SENSOR_ID_TYPE	‘SAR’
SENSOR_ID	‘ASARS2’
SCENE_SOURCE	1, 2, 3, 5, or 6 (see ASDE 1.0 for description)
SCNUM	populated – same as AIMIDB OP_NUM
PDATE	populated
IMHOSTNO	spaces
IMREQID	spaces
MPLAN	according to ASDE 1.0
ENTLOC	populated
LOC_ACCY	spaces
ENTELV	populated
ELV_UNIT	‘f’
EXITLOC	strip – populated spot – spaces
EXITELV	populated

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – ASARS2	
TMAP	populated
ROW_SPACING	populated
ROW_SPACING_UNITS	‘f’
COL_SPACING	populated
COL_SPACING_UNITS	‘f’
FOCAL_LENGTH	‘999.99’
SENSERIAL	data tested was ‘000016’
ABSWVER	data tested was ‘119.5’
CAL_DATE	spaces
PATCH_TOT	‘0001’
MTI_TOT	‘000’
BLOCKA—Image Block Information Extension Format	
BLOCK_INSTANCE	‘01’
N_GRAY	‘00000’
L_LINES	populated same as NROWS
LAYOVER_ANGLE	populated
SHADOW_ANGLE	‘000’
(reserved-001)	[16 spaces]
FRLC_LOC	same as IGEOLO 2
LRLC_LOC	same as IGEOLO 3
LRFC_LOC	same as IGEOLO 4
FRFC_LOC	same as IGEOLO 1
(reserved-002)	010.0
EXPLTB—Exploitation Related Information Extension Format	
ANGLE_TO_NORTH	populated
ANGLE_TO_NORTH_ACCY	’00.000’
SQUINT_ANGLE	populated
SQUINT_ANGLE_ACCY	’00.000’
MODE	according to ASDE 1.0
(reserved-001)	[16 spaces]
GRAZE_ANG	populated
GRAZE_ANG_ACCY	‘0.000’
SLOPE_ANG	populated

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – ASARS2	
POLAR	‘HH’
NSAMP	same as NCOLS
(reserved-002)	[0]
SEQ_NUM	spaces
PRIME_ID	spaces
PRIME_BE	spaces
(reserved-003)	[0]
N_SEC	‘01’
IPR	0 - 99
MENSRB—Airborne SAR Mensuration Data Extension Format	
ACFT_LOC	populated
ACFT_LOC_ACCY	‘000.00’
ACFT_ALT	populated
RP_LOC	populated
RP_LOC_ACCY	‘000.00’
RP_ELV	populated
OF_PC_R	+0000.0
OF_PC_A	+0000.0
COSGRZ	populated
RGCRP	populated
RLMAP	populated
RP_ROW	populated
RP_COL	populated
C_R_NC	populated
C_R_EC	populated
C_R_DC	populated
C_AZ_NC	populated
C_AZ_EC	populated
C_AZ_DC	populated
C_AL_NC	populated
C_AL_EC	populated
C_AL_DC	populated
TOTAL_TILES_COLS	spaces
TOTAL_TILES_ROWS	spaces

NITFS APPLICATION SUMMARY
Common Imagery Processor (CIP) – ASARS2

MPDSRA—Mensuration Data Extension Format	
BLK_NUM	‘01’
IPR	same as EXPLTB IPR
NBLKS_IN_WDG	‘01’
ROWS_IN_BLK	same as NROWS
COLS_IN_BLK	same as NCOLS
ORP_X	populated
ORP_Y	populated
ORP_Z	populated
ORP_ROW	populated
ORP_COLUMN	populated
FOC_X	populated
FOC_Y	populated
FOC_Z	populated
ARP_TIME	populated
(reserved-001)	[14 spaces]
ARP_POS_N	populated
ARP_POS_E	populated
ARP_POS_D	populated
ARP_VEL_N	populated
ARP_VEL_E	populated
ARP_VEL_D	populated
ARP_ACC_N	populated
ARP_ACC_E	populated
ARP_ACC_D	populated
(reserved-002)	000.0000001.0
PATCHB—Patch Information Extension Format	
PAT_NO	‘01’
LAST_PAT_FLAG	Strip -- 0 or 1 Spot – 1
LNSTRT	populated
LNSTOP	populated
AZL	populated

NITFS APPLICATION SUMMARY Common Imagery Processor (CIP) – ASARS2	
NVL	populated
FVL	populated
NPIXEL	populated
FVPIX	populated
FRAME	populated
UTC	populated
SHEAD	populated
GRAVITY	populated
INS_V_NC	populated
INS_V_EC	populated
INS_V_DC	populated
OFFLAT	+00.0000
OFFLONG	+00.0000
TRACK	populated
GSWEEP	populated
SHEAR	populated
BATCH_NO	populated
SECTGA—Secondary Targeting Information Extension Format	
SEC_ID	spaces
SEC_BE	spaces
(reserved-001)	[0]

NITFS APPLICATION SUMMARY SYERS	
System Identifier:	
NITFS Services:	
NITF/NSIF Version(s):	
Reference Documents:	
NITFS Compliance Test Report:	
System Description	
Sensor Type(s)	
General Characteristics	
File Naming Convention	Uses an internal convention, not as defined by the AIMID ASDE
CLEVELs Supported	6
Origination Station Identifier Convention	SYERS2-FEP
File Title Convention	Same as file name
Security Marking Options Supported	All data is Secret; and files provide the following security information: FSCLAS – S FSCLSY – US FSCTLH – US FSDCTP – X FSDCXM – X1 FSCATP – D FSCAUT – SENIOR YEAR PROGRAM CLASSIFICATION GUIDE FSCRSN – C FSSRDT – 19990303
Originator's Designated Background Color	Decimal 127 127 127
Originator's Name Field Convention	Spaces
Originator's Phone Number Convention	Spaces
Image Segments Supported	1 per file
Symbol Segments Supported	None
Text Segments Supported	None
Data Extension Segments Supported	None
Reserved Extension Segments Supported	None

NITFS APPLICATION SUMMARY SYERS	
File Header TREs (tags) Supported	MTXFIL
File Size/Range	
Image Segment Options Supported	
Image Identifier 1 (short ID)	Description of Location of data e.g. “MIRAMAR”
Image Identifier 2 (long ID)	Spaces
Target Identifier Field	Spaces
Image Source Field	SYERS2
Image Comment Fields	None
Image Characteristics	
Dimensions	Half FOV 5120 x 15360 Full FOV 10240 x 15360 IR 2560 x 7680
Pixel Value Types	12/16 INT, 24 (3x8) INT
Image Representation Types	MONO, RGB
Image Categories	VIS, MS
Bounding Rectangle Coordinates	Always present in degrees, minutes, seconds
Compression Options	NC
Pixel Interleave(s)	MONO – IMODE B RGB – IMODE S
Blocking	Yes, always at 256 x 256
Location offset supported	No, always 0000000000
Attachment Level supported	Always 000
Reduced Resolutions	Unknown
Image Subheader TREs (tags) Supported	ACFTA, ACFTB, AIMIDB, BANDSA, numerous SENSRA, EXOPTA and BLOCKA
Symbol Segment Options Supported	
CGM Supported	Not Supported
Degree of CGM Support	
Symbol Identifier Convention	
Symbol Name Convention	
Location offset supported	
Attachment Level supported	

NITFS APPLICATION SUMMARY SYERS	
Symbol Subheader TREs (tags) supported	
Text Segment Options Supported	
STA (Basic Character Set)	Not Supported
UT1 (Extended Character Set)	
U8S (UTF-8 Extended Characters)	
MTF (US Message Text Format)	
Text Identifier Convention	
Text Title Convention	
Attachment Level supported	
Text Subheader TREs (tags) supported	
Data Extension Segments Supported	
Controlled Extensions (NITF 2.0 only)	Not Supported
Registered Extensions (NITF 2.0 only)	
TRE_OVERFLOW	
STREAMING_FILE_HEADER	
Reserved Extension Segments Supported	
None yet defined.	Not Supported
Other Pertinent Information	

NITFS APPLICATION SUMMARY Tactical Exploitation System (TES)	
System Identifier:	Tactical Exploitation System (TES)
NITFS Services:	Airborne Synthetic Aperture Radar Image Data Producer
NITF/NSIF Version(s):	NITF 02.00
Reference Documents:	Based on files from CIGSS CL testing, Aug 02.
NITFS Compliance Test Report:	None. Pending Compliance Testing.
System Description	
Tactical Exploitation System (TES) is the Army's objective Tactical Exploitation of National Capabilities (TENCAP) system for the 21st century. TES replaces the Advanced Electronic Processing and Dissemination System (APEDS), Enhanced Tactical Radar Correlator (ETRAC), and Modernized Imagery Exploitation System (MIES). TES combines all TENCAP functionality into a single, integrated, scaleable system specifically designed for split based operations as Forward or Main elements. TES serves as an interface between national systems and in-theater tactical forces, and directly receives data from theater and tactical assets. TES receives, processes, exploits, and disseminates imagery data from direct downlinks and from ground stations for national and theater platforms. TES serves as the preprocessor of the All Source Analysis System (ASAS), Common Ground Station (CGS), and the Digital Topographic Support System (DTSS).	
Sensor Type(s)	
ASARS-2	
General Characteristics	
File Naming Convention	E.g. "182832090.01.01"
CLEVELs Supported	CLEVEL = 04
Origination Station Identifier Convention	RemoteView
File Title Convention	80 spaces
Security Marking Options Supported	The "FSCLAS – S" Security field is populated in all TES files all other Security fields are defaulted according to MIL-STD-2500B.
Originator's Designated Background Color	Not implementing background color.
Originator's Name Field Convention	"testop2"
Originator's Phone Number Convention	18 spaces
Image Segments Supported	1 per file
Symbol Segments Supported	000
Text Segments Supported	000

NITFS APPLICATION SUMMARY Tactical Exploitation System (TES)	
Data Extension Segments Supported	000
Reserved Extension Segments Supported	000
File Header TREs (tags) Supported	00000
File Size/Range	- 6,291,456
Image Segment Options Supported	
Image Identifier (short ID)	Resolution and ?? E.g. “FR_00_0291."
Image Title (long ID)	“NITF 2.0 Image #0”
Target Identifier Field	17 spaces
Image Source Field	43 spaces
Image Comment Fields	0
Image Characteristics	
Dimensions	1521 rows x 2612 cols
Pixel Value Types	INT
Image Representation Types	MONO
Image Categories	SAR
Bounding Rectangle Coordinates	ddmmssXdddmmssY (four times)
Compression Options	NC (not compressed)
Pixel Interleave(s)	IMODE = B (band interleaved by block)
Blocking	1024 x 1024
Location offset supported	None. Always at origin.
Attachment Level supported	000
Reduced Resolutions	IMAG is always 1.0
Image Subheader TREs (tags) Supported	ACFTB, AIMIDB, BLOCKA, EXPLTB, ICHIPB, MENSRB, MPDSRA, and PATCHB
Symbol Segment Options Supported	
CGM Supported	NOT SUPPORTED
Degree of CGM Support	
Symbol Identifier Convention	
Symbol Name Convention	
Location offset supported	
Attachment Level supported	

NITFS APPLICATION SUMMARY Tactical Exploitation System (TES)	
Symbol Subheader TREs (tags) supported	
Text Segment Options Supported	
STA (Basic Character Set)	NOT SUPPORTED
UT1 (Extended Character Set)	
U8S (UTF-8 Extended Characters)	
MTF (US Message Text Format)	
Text Identifier Convention	
Text Title Convention	
Attachment Level supported	
Text Subheader TREs (tags) supported	
Data Extension Segments Supported	
Controlled Extensions (NITF 2.0 only)	NOT SUPPORTED
Registered Extensions (NITF 2.0 only)	
TRE_OVERFLOW	
STREAMING_FILE_HEADER	
Reserved Extension Segments Supported	
None yet defined.	N/A
Other Pertinent Information	
AIMIDB—Additional Image ID Extension Format	
ACQUISITION_DATE	CCYYMMDDhhmmss
MISSION_NO	UNKN
MISSION_IDENTIFICATION	AS21281
FLIGHT_NO	01
OP_NUM	105
CURRENT_SEGMENT	00 (not segmented)
REPRO_NUM	00
REPLAY	000
(reserved-001)	[1 space]
START_TILE_COLUMN	001

NITFS APPLICATION SUMMARY Tactical Exploitation System (TES)	
START_TILE_ROW	00001
END_SEGMENT	00
END_TILE_COLUMN	001
END_TILE_ROW	00001
COUNTRY	2 spaces
(reserved-002)	[4 spaces]
LOCATION	ddmmXdddmmY
(reserved-003)	[13 spaces]
ACFTB—Aircraft Information Extension Format	
AC_MSN_ID	same as MISSION_ID in AIMIDB
AC_TAIL_NO	10 spaces
AC_TO	YYYYMMDDhhmm
SENSOR_ID_TYPE	SAR
SENSOR_ID	ASARS2
SCENE_SOURCE	1 (scene update (uplink))
SCNUM	Same as OP_NUM in AIMIDB
PDATE	YYYYMMDD
IMHOSTNO	6 spaces
IMREQID	5 spaces
MPLAN	002 (Spot 3)
ENTLOC	ddmmss.ssssXdddmmss.ssssY
LOC_ACCY	6 spaces
ENTELV	+#####
ELV_UNIT	f
EXITLOC	25 spaces
EXITELV	6 spaces
TMAP	058.000
ROW_SPACING	02.2500
ROW_SPACING_UNITS	f
COL_SPACING	02.2500
COL_SPACING_UNITS	f

NITFS APPLICATION SUMMARY Tactical Exploitation System (TES)	
FOCAL_LENGTH	999.99
SENSERIAL	000021
ABSWVER	120.0 (space in the beginning and end)
CAL_DATE	8 spaces
PATCH_TOT	0001
MTI_TOT	000
BLOCKA—Image Block Information Extension Format	
BLOCK_INSTANCE	01
N_GRAY	00000
L_LINES	02720
LAYOVER_ANGLE	215
SHADOW_ANGLE	003
(reserved-001)	[16 spaces]
FRLC_LOC	Xddmmss.ssYddmmss.ss
LRLC_LOC	Xddmmss.ssYddmmss.ss
LRFC_LOC	Xddmmss.ssYddmmss.ss
FRFC_LOC	Xddmmss.ssYddmmss.ss
(reserved-002)	010.0
EXPLTB—Exploitation Related Information Extension Format	
ANGLE_TO_NORTH	020.300
ANGLE_TO_NORTH_ACCY	00.000
SQUINT_ANGLE	+10.001
SQUINT_ANGLE_ACCY	+0.000
MODE	yyS
(reserved-001)	[16 spaces]
GRAZE_ANG	10.00
GRAZE_ANG_ACCY	00.00
SLOPE_ANG	10.56
POLAR	HH
NSAMP	00472
(reserved-002)	[0]

NITFS APPLICATION SUMMARY Tactical Exploitation System (TES)	
SEQ_NUM	spaces
PRIME_ID	spaces
PRIME_BE	spaces
(reserved-003)	[0]
N_SEC	00
IPR	yy
MENSRB—Airborne SAR Mensuration Data Extension Format	
ACFT_LOC	ddmmss.ssssXdddmmss.ssssY
ACFT_LOC_ACCY	000.00
ACFT_ALT	+67730
RP_LOC	ddmmss.ssssXdddmmss.ssssY
RP_LOC_ACCY	000.00
RP_ALT	+00000
OF_PC_R	+0000.0
OF_PC_A	+0000.0
COSGRZ	0.98050
RGCRP	0357749
RLMAP	L
RP_ROW	04080
RP_COL	00236
C_R_NC	+0.0356420
C_R_EC	+0.4932567
C_R_DC	+0.1812530
C_AZ_NC	-0.4700526
C_AZ_EC	-0.80451230
C_AZ_DC	+0.0526431
C_AL_NC	+0.2843951
C_AL_EC	+0.2854747
C_AL_DC	+0.0254681
TOTAL_TILES_COLS	000
TOTAL_TILES_ROWS	00000

NITFS APPLICATION SUMMARY Tactical Exploitation System (TES)	
MPDSRA—Mensuration Data Extension Format	
BLK_NUM	01
IPR	yy
NBLKS_IN_WDG	01
ROWS_IN_BLK	08160
COLS_IN_BLK	00472
ORP_X	-08606016
ORP_Y	-15261893
ORP_Z	+11402523
ORP_ROW	04080
ORP_COLUMN	00236
FOC_X	-0.4109
FOC_Y	-0.7286
FOC_Z	+0.5480
ARP_TIME	69540.000
(reserved-001)	[14 spaces]
ARP_POS_N	+00308257
ARP_POS_E	+00169554
ARP_POS_D	-00064782
ARP_VEL_N	+00119.39
ARP_VEL_E	-00681.88
ARP_VEL_D	-00004.12
ARP_ACC_N	-000.551
ARP_ACC_E	-000.244
ARP_ACC_D	-000.822
(reserved-002)	000.0000001.0
PATCHB—Patch Information Extension Format	
PAT_NO	0001
LAST_PAT_FLAG	0
LNSTRT	0000001
LNSTOP	0000160

NITFS APPLICATION SUMMARY Tactical Exploitation System (TES)	
AZL	00160
NVL	00160
FVL	001
NPIXEL	00472
FVPIX	00001
FRAME	001
UTC	69540.00
SHEAD	205.607
GRAVITY	31.9331
INS_V_NC	+0123
INS_V_EC	-0681
INS_V_DC	+0001
OFFLAT	000.0000
OFFLONG	000.0000
TRACK	200
GSWEEP	000.42
SHEAR	0.985214
BATCH_NO	002495

NITFS APPLICATION SUMMARY
Block 1 TUAV GCS

System Identifier:	Tactical Unmanned Aerial Vehicle (TUAV) Ground Control System (GCS) Block 1
NITFS Services:	Tactical NITFS File Producer
NITF/NSIF Version(s):	NITF02.10
Reference Documents:	Block 1 National Imagery Transmission Format (NITF) Data Production Specification (DPS) for the Tactical Unmanned Aerial Vehicle (TUAV) Ground Control System (GCS), Document Number TUAV-203, 01/18/01 TUAV System Operational Requirements Document (ORD)
NITFS Compliance Test Report:	Test is pending.

System Description

The TUAV system provides intelligence collection and targeting capability as a direct support asset to the Brigade Commander and his staff. The TUAV GCS provides for two-operator control of a single TUAV Shadow 200 air vehicle, including flight management, mission management, sensor/payload control, and C4I interface management. Defined by the TUAV system Operational Requirements Document (ORD), the TUAV system integrates with typical Brigade TOC C4I systems, specifically the Advanced Field Artillery Tactical Data System (AFATDS), the All-Source Analysis System Remote Workstation (ASAS-RWS), and the Joint STARS CGS.

The TUAV GCS receives an NTSC analog motion imagery signal and associated air vehicle and payload telemetry from the Shadow 200 air vehicle. The telemetry information includes situation awareness parameters defining the air vehicle status, position, and attitude, as well as including sensor setting and pointing parameters. The TUAV GCS combines the video and telemetry data producing an NTSC closed caption analog video product that is disseminated into the Joint STARS CGS and to other mission-appropriate C4I systems. TUAV GCS operators can create still imagery products directly from the analog motion imagery feed. These still imagery products are captured in data files conforming to MIL-STD-2500B, National Imagery Transmission Format (Version 2.1). Following capture, these NITF files can be transferred into other connected C4I systems per the TUAV system ORD.

The TUAV GCS operator can request NITF 2.1 still imagery files to be generated while viewing the video imagery down-linked from the Shadow 200. On request, the NITF files are built and displayed to the requesting operator using the Paragon ELT software component of the TUAV GCS, which can be used to annotate the image for feature-of-interest (FOI) identification.

Selected air vehicle and sensor parameters are collected into the File Header and a single Text Data Segment as defined in Section 5.6 of MIL-STD-2500B. No Support Data Extensions (SDE) or Tagged Record Extensions (TRE) are defined within the Block 1 implementation of the TUAV GCS NITF file interface although implementation of SDE is reserved for a future TUAV GCS Block definition.

NITFS APPLICATION SUMMARY Block 1 TUAV GCS	
Sensor Type(s)	
EO/IR Payload Sensor Camera: IAI / TAMAM POP-200 (NTSC closed caption video and frame captured digital still imagery)	
General Characteristics	
File Naming Convention	MMDDYYYY_HHMMSS.ntf
CLEVELs Supported	03
Origination Station Identifier Convention	TUAV CGS A
File Title Convention	File name and directory path; e.g., /h/data/local/TUAV/MMDDYYYY_HHMMSS.ntf
Security Marking Options Supported	All files marked as Unclassified with no additional security control or handling codes.
Originator's Designated Background Color	All files marked OxFFFFFF (white)
Originator's Name Field Convention	Unknown (followed by 17 spaces)
Originator's Phone Number Convention	Field left blank (18 spaces)
Image Segments Supported	001
Symbol Segments Supported	000
Text Segments Supported	001
Data Extension Segments Supported	000
Reserved Extension Segments Supported	000
File Header TREs (tags) Supported	None
File Size/Range	All files are approximately 1Mb
Image Segment Options Supported	
Image Identifier 1 (short ID)	PIO0000000 (fixed value for all files)
Image Identifier 2 (long ID)	Shadow 200 Image (followed by 64 spaces)
Target Identifier Field	Not used. Filled with 17 spaces.
Image Source Field	Shadow 200 (followed by 32 spaces)
Image Comment Fields	One image comment field populated with 80 spaces.
Image Characteristics	
Dimensions	480 rows x 704 cols x 3 bands
Pixel Value Types	8-bit Integer in each of 3 bands
Image Representation Types	RGB (24-bit color)

NITFS APPLICATION SUMMARY Block 1 TUAV GCS	
Image Categories	VIS and IR
Bounding Rectangle Coordinates	Present, using geographic coordinates expressed as ddmmssXdddmmssY
Compression Options	No Compression (NC)
Pixel Interleave(s)	IMODE B (Band interleaved by block)
Blocking	Single block per image only; 720h X 480v
Location offset supported	None. Image always placed at CCS origin.
Attachment Level supported	Always unattached (AL=000)
Reduced Resolutions	None. IMAG = 1.0
Image Subheader TREs (tags) Supported	None. Plan to support ASDEs in future.
Symbol Segment Options Supported	
CGM Supported	Not supported.
Degree of CGM Support	N/A
Symbol Identifier Convention	N/A
Symbol Name Convention	N/A
Location offset supported	N/A
Attachment Level supported	N/A
Symbol Subheader TREs (tags) supported	N/A
Text Segment Options Supported	
STA (Basic Character Set)	Supported. The text segment contains telemetry data from the aircraft pending future system releases that will use the Airborne SDEs to contain this type of data. See the pertinent information section below for a sample of the telemetry data.
UT1 (Extended Character Set)	Not supported.
U8S (UTF-8 Extended Characters)	Not supported.
MTF (US Message Text Format)	Not supported.
Text Identifier Convention	TEXT000 (fixed value for all files)
Text Title Convention	Untitled (followed by 72 spaces)
Attachment Level supported	Always unattached (AL = 000)
Text Subheader TREs (tags) supported.	None.

NITFS APPLICATION SUMMARY Block 1 TUAV GCS	
Data Extension Segments Supported	
Controlled Extensions (NITF 2.0 only)	N/A
Registered Extensions (NITF 2.0 only)	N/A
TRE_OVERFLOW	Not supported.
STREAMING_FILE_HEADER	Not supported.
Reserved Extension Segments Supported	
None yet defined.	N/A
Other Pertinent Information	
Sample contents of the 'Metadata.dat' text file content placed in the Text Segment. AV Time: 20010115225408 Target Location Error: 80 meters AV Latitude: 0 radians AV Longitude: 0 radians AV Barometric Altitude: 118 meters AV True Heading: 0 radians AV Airspeed: 0 meters/sec AV Roll: 0 radians AV Pitch: 0 radians Payload Azimuth: 0 radians Payload Field of View: 0.4 radians Payload Depression Angle: 1.5708 radians Payload LOS Range to Target: 118 meters Payload CFOV Latitude: -8.29404e-13 radians Payload CFOV Longitude: 1.01573e-28 radians AV Current Navigation Position Source: B Payload Pointing Mode: B NOTE: The data will be variable in length since the values are not space filled or zero filled.	

Appendix O – Product Summaries & Archetypes for GI Producers

O.1 INTRODUCTION

Product summaries for the following Geospatial Information Producers are located at:

O.2 CIB and CADRG

O.2.1 CIB

NITFS APPLICATION SUMMARY Controlled Image Base	
System Identifier:	Controlled Image Base (CIB)
NITFS Services:	Geospatial Information Product
NITF/NSIF Version(s):	NITF02.00
Reference Documents:	MIL-STD-2411 Raster Product Format (RPF) MIL-STD-2411-1 Registered Data Values for RPF MIL-STD-2411-2 Integration of RPF Files into the NITF MIL-C-89041 CIB Product Specification
NITFS Compliance Test Report:	NITFS compliance testing conducted on a periodic basis as production system updates or modifications are made. Contact JITC.
System Description	
Controlled Image Base (CIB) is a data set of orthophotos made from rectified grayscale aerial images. CIB supports various weapons, C3I theater battle management, mission planning, digital moving map, terrain analysis, simulation, and intelligence systems. CIB data are produced from digital source images that can be converted to meet the requirements of the CIB Specification (MIL-C-89041) at one of the registered resolutions defined in the Registered Data Values For Raster Product Format (RPF) (MIL-STD-2411-1). CIB data are derived directly from digital images and are compressed and reformatted to conform to the Raster Product Format Military Standard (MIL-STD-2411). CIB files are physically formatted within a National Imagery Transmission Format (NITF) file format.	
Sensor Type(s)	
Electro-Optical, Grayscale	
General Characteristics	
File Naming Convention	Table of Contents files: Frame files:
CLEVELs Supported	03
Origination Station Identifier Convention	
File Title Convention	
Security Marking Options Supported	Unclassified with LIMDIS control.
Originator's Designated Background Color	Not used.
Originator's Name Field Convention	

NITFS APPLICATION SUMMARY Controlled Image Base	
Originator's Phone Number Convention	
Image Segments Supported	001
Symbol Segments Supported	000
Text Segments Supported	000
Data Extension Segments Supported	001
Reserved Extension Segments Supported	000
File Header TREs (tags) Supported	RPFHDR
File Size/Range	
Image Segment Options Supported	
Image Identifier 1 (short ID)	
Image Identifier 2 (long ID)	
Target Identifier Field	
Image Source Field	
Image Comment Fields	
Image Characteristics	
Dimensions	1536 rows x 1536 cols x 1 band
Pixel Value Types	8-bit Integer, single band
Image Representation Types	Monochrome
Image Categories	VIS
Bounding Rectangle Coordinates	
Compression Options	Vector Quantization
Pixel Interleave(s)	IMODE B (Interleave by block)
Blocking	Multiple blocks, all blocks 256 x 256
Location offset supported	None. Image always placed at CCS origin.
Attachment Level supported	Always unattached (AL=000)
Reduced Resolutions	None. IMAG = 1.0
Image Subheader TREs (tags) Supported	RPFIMG RPFDES (located in Registered Extensions DES)
Symbol Segment Options Supported	
CGM Supported	Not Supported.

NITFS APPLICATION SUMMARY Controlled Image Base	
Degree of CGM Support	N/A
Symbol Identifier Convention	N/A
Symbol Name Convention	N/A
Location offset supported	N/A
Attachment Level supported	N/A
Symbol Subheader TREs (tags) supported	N/A
Text Segment Options Supported	
STA (Basic Character Set)	N/A
UT1 (Extended Character Set)	N/A
U8S (UTF-8 Extended Characters)	N/A
MTF (US Message Text Format)	N/A
Text Identifier Convention	N/A
Text Title Convention	N/A
Attachment Level supported	N/A
Text Subheader TREs (tags) supported	N/A
Data Extension Segments Supported	
Controlled Extensions (NITF 2.0 only)	Not supported.
Registered Extensions (NITF 2.0 only)	Supported. Contains RPFDES TRE.
TRE_OVERFLOW	N/A
STREAMING_FILE_HEADER	Not supported.
Reserved Extension Segments Supported	
None yet defined.	N/A
Other Pertinent Information	

O-2.2 CADRG

NITFS APPLICATION SUMMARY Compressed ARC Digital Raster Graphic	
System Identifier:	Compressed ARC Digital Raster Graphic (CADRG)
NITFS Services:	Geospatial Information Product
NITF/NSIF Version(s):	NITF02.00
Reference Documents:	MIL-STD-2411 Raster Product Format (RPF) MIL-STD-2411-1 Registered Data Values for RPF MIL-STD-2411-2 Integration of RPF Files into the NITF MIL-C- CADRG Product Specification
NITFS Compliance Test Report:	NITFS compliance testing conducted on a periodic basis as production system updates or modifications are made. Contact JITC.
System Description	
CADRG is a general-purpose product, comprising computer-readable digital map and chart images. It supports various weapons, C3I theater battle management, mission planning, and digital moving map systems. CADRG data is derived directly from ADRG and other digital sources through downsampling filtering, compression, and reformatting to the RPF Standard. CADRG files are physically formatted within National Imagery Transmission Format (NITF) files.	
Sensor Type(s)	
Electro-Optical, Grayscale and Color	
General Characteristics	
File Naming Convention	Table of Contents files: Frame files:
CLEVELs Supported	03
Origination Station Identifier Convention	
File Title Convention	
Security Marking Options Supported	Unclassified with LIMDIS control.
Originator's Designated Background Color	Not used.
Originator's Name Field Convention	
Originator's Phone Number Convention	
Image Segments Supported	001
Symbol Segments Supported	000

NITFS APPLICATION SUMMARY
Compressed ARC Digital Raster Graphic

Text Segments Supported	000
Data Extension Segments Supported	001
Reserved Extension Segments Supported	000
File Header TREs (tags) Supported	RPFHDR
File Size/Range	
Image Segment Options Supported	
Image Identifier 1 (short ID)	
Image Identifier 2 (long ID)	
Target Identifier Field	
Image Source Field	
Image Comment Fields	
Image Characteristics	
Dimensions	1536 rows x 1536 cols x 1 band
Pixel Value Types	8-bit Integer, single band
Image Representation Types	Monochrome and RGB/LUT
Image Categories	VIS
Bounding Rectangle Coordinates	
Compression Options	Vector Quantization
Pixel Interleave(s)	IMODE B (Interleave by block)
Blocking	Multiple blocks, all blocks 256 x 256
Location offset supported	None. Image always placed at CCS origin.
Attachment Level supported	Always unattached (AL=000)
Reduced Resolutions	None. IMAG = 1.0
Image Subheader TREs (tags) Supported	RPFIMG RPFDES (located in Registered Extensions DES)
Symbol Segment Options Supported	
CGM Supported	Not Supported.
Degree of CGM Support	N/A
Symbol Identifier Convention	N/A
Symbol Name Convention	N/A

NITFS APPLICATION SUMMARY Compressed ARC Digital Raster Graphic	
Location offset supported	N/A
Attachment Level supported	N/A
Symbol Subheader TREs (tags) supported	N/A
Text Segment Options Supported	
STA (Basic Character Set)	N/A
UT1 (Extended Character Set)	N/A
U8S (UTF-8 Extended Characters)	N/A
MTF (US Message Text Format)	N/A
Text Identifier Convention	N/A
Text Title Convention	N/A
Attachment Level supported	N/A
Text Subheader TREs (tags) supported	N/A
Data Extension Segments Supported	
Controlled Extensions (NITF 2.0 only)	Not supported.
Registered Extensions (NITF 2.0 only)	Supported. Contains RPFDES TRE.
TRE_OVERFLOW	N/A
STREAMING_FILE_HEADER	Not supported.
Reserved Extension Segments Supported	
None yet defined.	N/A
Other Pertinent Information	

O.3 DPPDB Format Structure

Figure O-2 depicts the sequential arrangement of a DPPDB. The first file is the Master Product File, with numerous subheader files that provide information about the DPPDB and the reference graphic. Following the Master Product File (MPF) are the files that comprise the reference graphic frames. The rest of the files contained on the DPPDB are image files.

a. The MPF contains a directory of the image files on that tape, the reference graphic directory, and the exploitation product support data that applies to the entire product. Figure O-3 shows the file structure of the MPF, showing only the primary components of the file.

b. The reference graphic files are unmodified CADRG frame files. They are extracted from the CADRG media and recorded to the DPPDB product tape without further processing.

c. The files following the reference graphic files contain single compressed images and the associated support data for each of the overview and full resolution data set images comprising the DPPDB. The image files are arranged in groups of four (left and right overview image segments, followed by the full resolution left and right image segments), with each group pertaining to a single DPPDB model. Figures O-4 and O-5 shows the file structure for the overview and full resolution image segments.

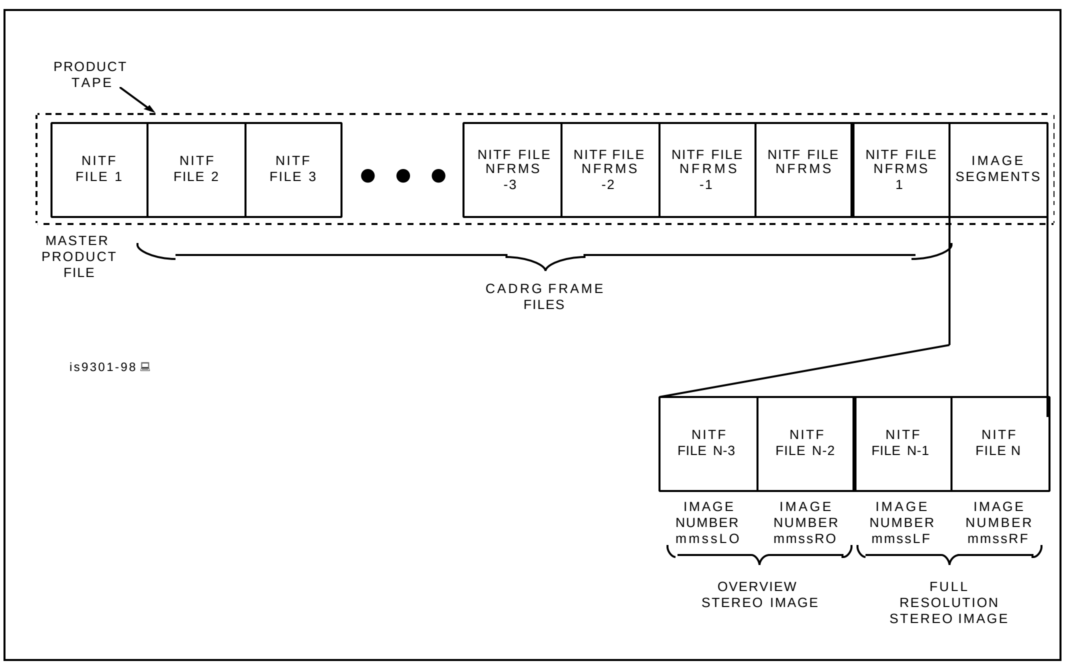

Figure O-2. DPPDB File Organization

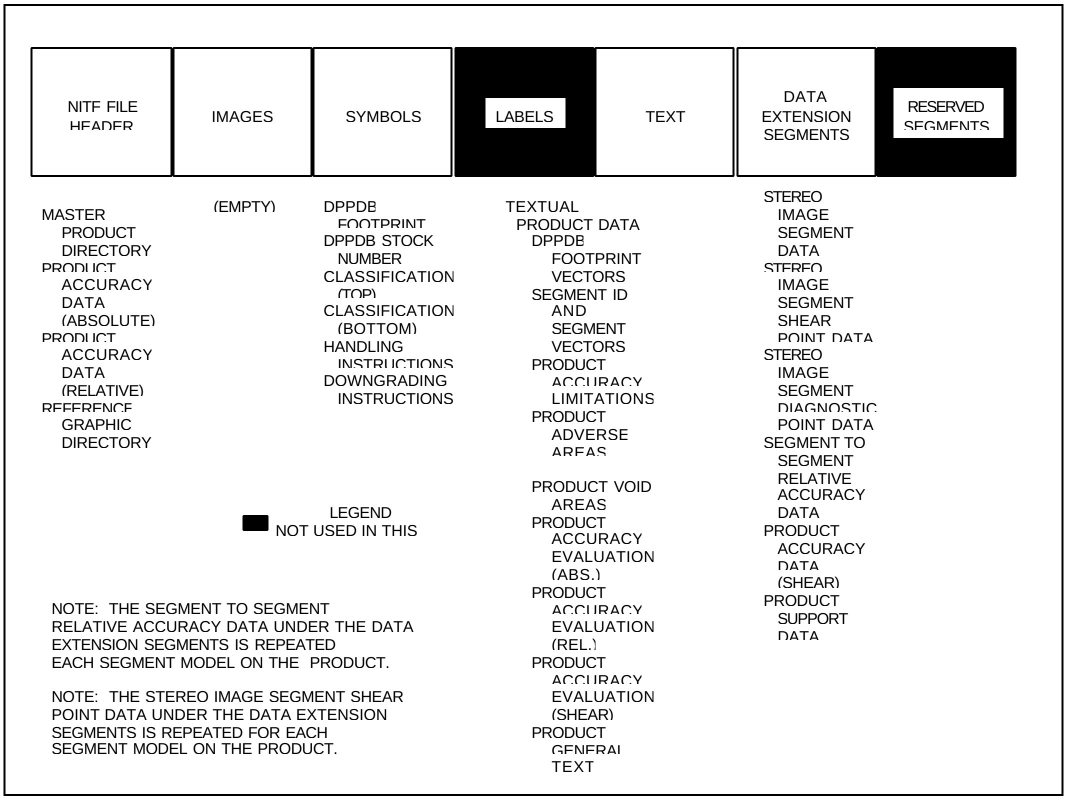

Figure O-3. Master Product File Structure

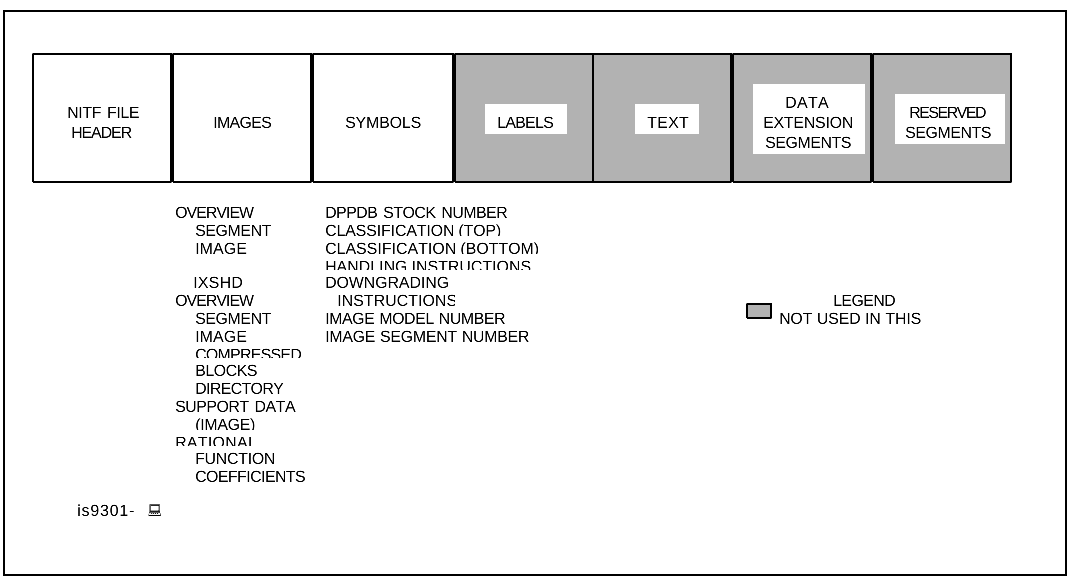

Figure O-4. DPPDB Overview Segment Image File

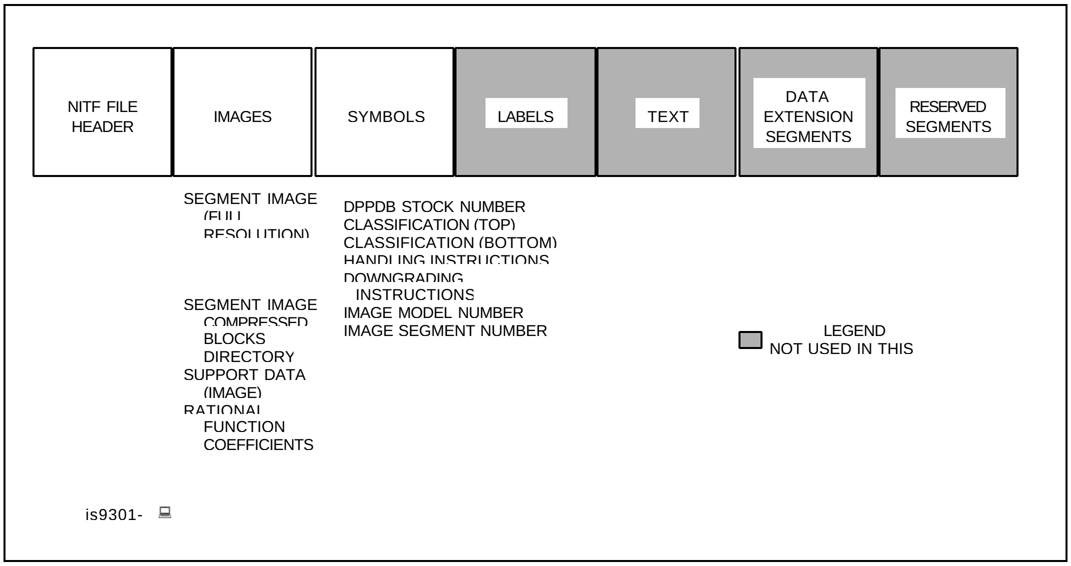

Figure O-5. DPPDB Full Resolution Image File

Appendix P – Product Summaries & Archetypes for Commercial Producers

EO/VIS

IR

SAR

Etc.

Commercial SDEs

GeoSDEs

NITFS APPLICATION SUMMARY Digital Globe QuickBird 02	
System Identifier:	DigitalGlobe QuickBird (QB) 02
NITFS Services:	Commercial NITFS File Producer
NITF/NSIF Version(s):	NITF02.00 and 02.10
Reference Documents:	To obtain information on a DigitalGlobe product, log onto their web site (www.digitalglobe.com).
NITFS Compliance Test Report:	Test is pending.

System Description

The QuickBird is a collection and production system that produces high-resolution earth images in a variety of processing levels. The lowest available processing level above raw data, Level 1, is divided into two sub-levels termed 1A considered Raw and 1B that is called Basic. 1A imagery is delivered in individual Detector Chip Array (DCA) files that can be ordered with or without radiometric correction and with or without non-responsive detector fill. 1B images are virtual linear arrays that have been generated from the DCA strips and are radiometrically and geometrically corrected. 1B images have been resampled to a map grid but not projected onto the Earth. 1A data is geometrically raw, whereas 1B data will include "sensor corrections," accounting for image artifacts due to optical distortion and detector geometry. The level 2A or Rectified product is rectified product to a customer selectable map projection and datum.

The QuickBird sensor is a pushbroom imager and therefore acquires image data one line at a time by sweeping across the earth's surface. The QuickBird platform supports 12 detector chip assemblies (DCAs) or detector arrays. There are 6 DCAs for the panchromatic (PAN) band, and 6 DCAs for the multispectral (MS) bands. Each PAN DCA contains 1 linear detector array. Each MS DCA contains 4 linear arrays representing the colors blue, green, red, and near infrared.

To obtain further information log onto the DigitalGlobe web site (www.digitalglobe.com).

Sensor Type(s)

Pushbroom = Panchromatic (single band) and Multispectral (4 band)

General Characteristics

File Naming Convention	YYMONDDHHMMSS-b-id-t-nnnnnnnnnnnn_nn_nnnn.NTF YYMONDDHHMMSS = acquisition time b <band> = P for panchromatic, M for multispectral, S for pan sharpened, and X for non-images. id <image identifier> = 1A, 1B or 2A t <tile identifier> = S for Scene and M for Mosaic nnnnnnnnnnnn_nn_nnnn = Product Order # **NOTE:** The dash("-") delimits the file name components. The components themselves will not include a dash. YYMONDDHHMMSS = acquisition time
CLEVELs Supported	For NITF 2.0: up to CLEVEL06 For NITF 2.1: up to CLEVEL07

NITFS APPLICATION SUMMARY Digital Globe QuickBird 02	
Origination Station Identifier Convention	DG (meaning Digital Globe)
File Title Convention	Collector Identification = QB02 Applied Corrections = Name of particular product line such as Raw, Basic or Rectified acquisition date = YYYY-MM-DD acquisition time = Thh:mm.ssddddZ
Security Marking Options Supported	All files marked as Unclassified with no additional security control or handling codes.
Originator's Designated Background Color	**For NITF 2.0**—CN2 option for FBKGC not used. ONAME is not split into two fields (3-bytes for FBKGC and 24-bytes for ONAME). **For NITF 2.1**—All files are marked with a FBKGC of Ox000000 (black)
Originator's Name Field Convention	DigitalGlobe (followed by 12 spaces)
Originator's Phone Number Convention	+1(800)496-1225 (followed by 3 spaces)
Image Segments Supported	Single Image Segment per file Products **Panchromatic =** single band (1A, 1B and 2A) **Multispectral =** four band (1B, 2A) **Pan-sharpened =** three band, Natural Color (2A) three band, Color Infrared Composite (2A) Four Image Segment per file Products **Multispectral** = one band in each of four image segments (1A)
Symbol Segments Supported	000
Text Segments Supported	000
Data Extension Segments Supported	000
Reserved Extension Segments Supported	000
File Header TREs (tags) Supported	None
File Size/Range	1A, Panchromatic = 233 Mb each DCA file Multispectral = 67 Mb each DCA file 1B, Panchromatic = 1.2 Gb Multispectral = 650 Mb 2A, Panchromatic = up to 1.2 Gbytes Multispectral = up to 650 MB Pan sharpened = up to 4 Gbytes

NITFS APPLICATION SUMMARY Digital Globe QuickBird 02	
Image Segment Options Supported	
Image Identifier 1 (short ID)	An 8 digit numeric value (catalog record number)
Image Identifier 2 (long ID)	Same as File Title Convention (FTITLE)
Target Identifier Field	Not used. Filled with 17 spaces.
Image Source Field	QB02
Image Comment Fields	5 image comment fields populated with image data ownership, licensing and purchasing information
Image Characteristics	
Dimensions	**Panchromatic** = 27,552 x 27,424 pixels, 1 band and 6 DCAs **Multispectral** = 6,892 x 6,856 pixels, 4 bands and 6 DCAs
Pixel Value Types	**Panchromatic** = 8 or 16-bit integer (8/8 and 11/16) **Multispectral** = 8 or 16-bit Integer (8/8 and 11/16) **Pan-sharpened** = 8 bit Integer (8/8)
Image Representation Types	**Panchromatic:** IREP=MONO, IREPBANDn = M (1A, 1B and 2A) **Multispectral:** IREP=MONO, IREPBANDn = M (1A) IREP=MULTI, IREPBANDn = M, B, G, R, N (1B, 2A) **Pan-sharpened:** IREP = RGB, IREPBANDn = R, G, B and N, R, G (2A)
Image Categories	**Panchromatic:** ICAT = Visual (VIS) for single band MONO **Multispectral:** ICAT = Multispectral (MS) **Pan-sharpened:** ICAT = VIS for Natural Color and Color Infrared Composite
Bounding Rectangle Coordinates	Present, using geographic coordinates expressed as ddmmssXdddmmssY
Compression Options	No Compression (NC)
Pixel Interleave(s)	**Panchromatic** = IMODE B (1A, 1B and 2A) **Multispectral** = IMODE B (1A) for the single band per image segment file and IMODE S (1B and 2A) for 4-band per image segment file **Pan-sharpened** = IMODE P (2A), 3-band per image segment file B (Band interleaved by block) P (Band interleaved by Pixel) S (Band Sequential)
Blocking	Multi blocked (1024x1024)
Location offset supported	None. Image always placed at CCS origin.

NITFS APPLICATION SUMMARY Digital Globe QuickBird 02	
Attachment Level supported	Always unattached (AL=000)
Reduced Resolutions	None. IMAG = 1.0
Image Subheader TREs (tags) Supported	RPC00B, STDIDC, and USE00A Future products will support ICHIPB
Symbol Segment Options Supported	
CGM Supported	Not supported.
Degree of CGM Support	N/A
Symbol Identifier Convention	N/A
Symbol Name Convention	N/A
Location offset supported	N/A
Attachment Level supported	N/A
Symbol Subheader TREs (tags) supported	N/A
Text Segment Options Supported	
STA (Basic Character Set)	Not supported.
UT1 (Extended Character Set)	Not supported.
U8S (UTF-8 Extended Characters)	Not supported.
MTF (US Message Text Format)	Not supported.
Text Identifier Convention	N/A
Text Title Convention	N/A
Attachment Level supported	N/A
Text Subheader TREs (tags) supported.	N/A
Data Extension Segments Supported	
Controlled Extensions (NITF 2.0 only)	None
Registered Extensions (NITF 2.0 only)	None
TRE_OVERFLOW	None
STREAMING_FILE_HEADER	None
Reserved Extension Segments Supported	
None yet defined.	N/A

NITFS APPLICATION SUMMARY Digital Globe QuickBird 02	
Other Pertinent Information	

The DigitalGlobe product list is included in tables P-1 through P-3. The table provides the NITF products produced by DigitalGlobe, to include critical NITF field values.

Table P-1. Multispectral

PROCESSING LEVEL	1B	2A	1A	2A
NITF 2.0	X		X	X
NITF 2.1		X		
NITF FIELDS				
NUMI	1	1	4	1
IREP	MULTI	MULTI	MONO	MULTI
ICAT	MS	MS	MS	MS
IREPBANDn	B, G, R, N	B, G, R, N	M	B, G, R, N
ISUBCATn	485, 560, 660, 830	485, 560, 660, 830	485, 560, 660, 830	485, 560, 660, 830
IMODE	S	S	B	S
NBPP	16	16	16	8
ABPP	11	11	11	8
ICORDS	G	G	G	G
NICOM	5	5	5	5
TREs				
STDIDC	X	X	X	X
RPC00B	X	X	X	X
USE00A	X	X	X	X

Table P-2. Monochrome, Panchromatic

PROCESSING LEVEL	1B	1B	2A	1A
NITF 2.0	X		X	
NITF 2.1		X		X
NITF FIELDS				
NUMI	1	1	1	1
IREP	MONO	MONO	MONO	MONO
ICAT	VIS	VIS	VIS	VIS
IREPBANDn	M	M	M	M
ISUBCATn	675	675	675	675
IMODE	B	B	B	B
NBPP	8	16	16	16
ABPP	8	11	11	11
ICORDS	G	G	G	G
NICOM	5	5	5	5
TREs				
STDIDC	X	X	X	X
RPC00B	X	X	X	X
USE00A	X	X	X	X

Table P-3. Color, Pan-Sharpened

PROCESSING LEVEL	2A (RGB)	2A (NRG)	2A (RGB)	
NITF 2.0		X	X	
NITF 2.1	X			
NITF FIELDS				
NUMI	1	1	1	
IREP	RGB	RGB	RGB	
ICAT	MS	MS	MS	
IREPBANDn	R, G, B	R, G, B	R, G, B	
ISUBCATn	660, 560, 485	830, 660, 560	660, 560, 485	
IMODE	S	S	S	
NBPP	8	8	16	
ABPP	8	8	11	
ICORDS	G	G	G	
NICOM	5	5	5	
TREs				
STDIDC	X	X	X	
RPC00B	X	X	X	
USE00A	X	X	X	

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Appendix Q – Product Summaries & Archetypes for Tactical Products

Target Material Folders

Briefing Boards

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