NAVY WARFARE DEVELOPMENT COMMAND TACMEMO 2-01.1-02

NAVAL FIRES NETWORK

PROMULGATION DATE 1 SEP 02
REVIEW DATE 1 SEP 04

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ADMINISTRATIVE COVER

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Purpose:

This Tactical Memorandum (TACMEMO) is intended for intelligence (N2), operations (N3) and communications (N6) personnel assigned to a flag, ship or airwing staff who have, or soon will have, NFN available for their use. It will provide descriptions of individual systems currently associated with NFN, the various configurations that will be deployed, and relate those systems to the targeting processes providing fleet users the documentation to understand how NFN can be used to task sensors then process, exploit and disseminate the targeting information. Manning and training requirements and other issues affecting operational employment will be presented as well.

This TACMEMO should be employed and referenced at every opportunity in the planning and execution of Fleet exercises and during real-world operations. Recommended changes, additions, or deletions are encouraged and should be sent via the chain of command to:

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LIST OF CHANGES

CHANGE 1

Front Matter – Corrected acronym definitions

Chapter 2 – Added text to paragraphs 2.5.1.5, 2.5.3, and 2.6.5

Appendix D – Corrected format on Figure D-1

Naval Fires Network

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LIST OF ACRONYMS/ABBREVIATIONS

A

ACC	air combat commander
ACE	analysis and control element
ACO	airspace control order
ACTD	advanced concept technology demonstration
ADOCS	automated deep operations combat system
ADRG	arc digitized raster graphic
ADSI	air defense system integrator
AFATDS	advanced field artillery tactical data system
AFRL	Air Force research laboratory
AIP	avionic improvement program
AO	area of operations
AOB	air order of battle
AOC	air operations center
AOI	area of operational interest
AOR	area of responsibility
APS	afloat planning system
APTS	afloat personal telephone service
ARG	amphibious readiness group
ASARS	advanced synthetic aperture radar system
ASAS	all source analysis system
ASPO	Army space program office
ATARS	advanced tactical airborne reconnaissance system
ATF	automated target folder
ATO	air tasking order

ATWCS	advanced Tomahawk weapon control system
AUTODIN	automatic digital network

B

BDA	bomb damage assessment
BG	battle group

C

C2	command and control
C3	command, control and communications
C4I	command, control, communications, computers and intelligence
C4ISR	command, control, communications, computers, intelligence, surveillance, and reconnaissance
CA-III	Challenge Athena III
CAM	central access memory
CCIR	commanders critical information requirements
CDL-N	common datalink-Navy
CFFC	Commander, Fleet Forces Command
CIC	combat information center
CIGSS	common imagery ground/surface system
CINC	commander in chief
CIP	common imagery processor
CJTF	commander joint task force
COMINT	communications intelligence
COMIREX	Committee on Imagery Requirements and Exploitation
CONOPS	concept of operations
COP	common operational picture
COPS	concentrator open primary server
COTS	commercial off-the-shelf
CRD	capstone requirements document

CROSSINT	cross intelligence
CST	COP Synch Tool
CT	cryptologic technician
CTL	candidate target list
CUB	cryptologic unified build
CVBG	carrier battle group
CVIC	aircraft carrier intelligence center
CWSP	Commercial Wideband SATCOM Program

D

DB	database
DBO	database organizer
DCGS	distributed common ground station
DCRS	digital camera receiving station
DCS	digital communication system
DDL	direct down link
DE	dissemination element
DIA	Defense Intelligence Agency
DIICOE	defense information infrastructure common operating environment
DIOP	data input/output port
DIRLAUTH	direct liaison authorized
DIWS	digital imagery workstation
DIWS-A	digital imagery workstation-afloat
DLRP	datalink reference point
DMOB	defensive missile order of battle
DMPI	desired mean point of impact
DMS	defense message system
DOD	Department of Defense
DP	data package

DPPDB	digital point positioning database
DSCS	Defense Satellite Communications Service
DSMAC	digital scene-matching area correlation
DSS	data storage system
DTED	digital terrain elevation data
DTM	digital terrain matrix

E

ECM	enlisted community manager
EEI	equipment-to-equipment interfaces
EHF	extremely high frequency
ELINT	electronic intelligence
ELT	electronic light table
EMPS	enhanced mission planning subsystem
EO	electro-optical
EOB	electronic order of battle
ERGM	extended range guided munition
ESM	electronic support measures
ETF	electronic target folder
EW	electronic warfare

F

F2T2EA	find, fix, track, target, engage and assess
FAF	fast access format
FBE	fleet battle experiment
FITCPAC	Fleet Intelligence Training Center, Pacific
FLTCINC	fleet commander in chief
FoS	family of systems
FOTC	force OTH track coordinator
FSET	fleet service engineering team

FSR	field service representative
FTI	fast tactical imagery
FTP	file transfer protocol

G

GALE	graphic area limitation environment
GBS	Global Broadcast System
GCCS	Global Command and Control System
GCCS-M	Global Command and Control System — Maritime
GCN	ground communication node
GENSER	general service
GLIS	GALE lite interface segment
GMI	general military intelligence
GMTI	ground moving target indicator
GOTS	government off-the-shelf
GPS	global positioning system
GRAPHREP	graphic representation
GSD	graphic situation display
GUI	graphics unit interface

H

HDR	high data rate
HFDF	high frequency direction finding
HSI	hyperspectral imagery
HTTP	hypertext transfer protocol

I

IA	imagery analyst
IAS	intelligence analysis system
ID	identification
IDI	image data input

IDM	improved data modem
IDS	image data storage
IDTC	interdeployment training cycle
IESS	imagery exploitation support-system
IIR	imagery interpretation reports
IKA	information and knowledge advantage
ILS	integrated logistics team
IMINT	imagery intelligence
INCONUS	in continental United States
INT	intelligence
IOC	initial operational capability
IP	Internet protocol
IPB	intelligence preparation of the battlespace
IPIR	initial photo interpretation report
IPL	image products library
IR	infrared
IRC	internet relay chat
IS	intelligence specialist
ISDS	intelligence shared data server
ISNS	integrated shipboard network system
ISR	intelligence, surveillance, and reconnaissance
ISR-M	intelligence, surveillance and reconnaissance-manager
ISSO	information system security officer
IT-21	information technology for the 21st century
ITD	integrated tactical display
ITS	imagery transformation server
IUW	inshore undersea warfare
I&W	indications and warning

J

J2T	Joint Staff Intelligence Directorate, Target Support
JAC	joint analysis center
JCA	JSIPS-N concentration architecture
JCE	joint collaborative environment
JFACC	joint force air component commander
JFC	joint force commander
JFLCC	joint force land component commander
JFMCC	joint force maritime component commander
JIC	joint intelligence center
JIVE	java imagery viewer and exploitation
JNC	jet navigation chart
JOG	joint operations graphic
JOTS	Joint Operational Tactical System
JPITL	joint prioritized integrated target list
JSIPS-N	Joint Service Imagery Processing System-Navy
JSTARS	Joint Surveillance Target Attack Radar System
JSWS	joint Service workstation
JTF	joint task force
JTFEX	joint task force exercise
JTIM	JSIPS-N TAMPS interface module
JTT	joint targeting toolbox
JWICS	Joint Worldwide Intelligence Communications System

K

KAT	kinematic auto tracking

L

LAN	local area network
LANTIRN	low altitude navigation and targeting infrared for night

LAWS	land attack warfare system
LNO	liaison officer
LOC	lines of communication
LOE	limited objective experiments
LOS	line of sight
LPI	low probability of intercept
LRG	local requirements generation
LSS	littoral surveillance system

M

MAGIS	Marine air-ground intelligence system
MASINT	measurement and signature intelligence
MAST	mobile ashore support terminal
MATT	multi-mission advanced tactical terminal
MDR	medium data rate
MEDAL	MIW and Environmental Decision Aids Library
MET	multi-image exploitation tool
MFWS	multi-function workstation
MICFAC	mobile integrated command facility
MIDAS	miniaturized data acquisition system
MIDB	modernized integrated database
MIG	multi-image geopositioning
MIUW	mobile inshore undersea warfare
MIW	mine warfare
MOA	military operations area; memorandum of agreement
MOCC	mobile operation control center
MOE	measure of effectiveness
MOP	measures of performance
MPEG	moving picture experts group

MPET	mission planning evaluation team
MPM	mission planning module
MPUS	military proper use statement
MTC	multi-TADIL capability
MTES	moving target exploitation system
MTI	moving target indicator
MTT	mobile team trainers
MUST	multi-service UHF SATCOM transceiver

N

N2	staff intelligence officer
N3	staff operations officer
N6	staff communications officer
NATO EX	North Atlantic Treaty Organization Exercise
NAVICP	naval inventory control point
NCC	national communications coordinator
NCW	network centric warfare
NDI	non-developmental item
NEC	Navy enlisted classification
NETPREC	net precedence
NFCS	naval fire control system
NFN	naval fires network
NIIRS	national imagery interpretability rating schedule
NIMA	National Imagery and Mapping Agency
NIS	national input segment
NITF	national imagery transmission format
NITFS	national imagery transmission format standard
NIU	network interface unit
NJI	naval JSTARS interface

NMITC	Navy and Marine Corps Intelligence Training Center
NRT	near real time
NSAWC	Naval Strike Air Warfare Center
NTCS	Navy Tactical Command System
NTDS	naval tactical data system
NTM	national technical means
NTSP	navy training system plan
NWDC	Navy Warfare Development Command
NWP	naval warfare publication

O

OAF	operation allied force
OBRP	on-board repair parts
OJT	on-the-job training
ONC	operational navigation chart
OOB	order of battle
OPEG	operational planning evaluation group
OPNOTES	operator notes
OTCIXS	officer in tactical command information exchange system
OTG	operational tactical group
OTH	over the horizon
OTHT	over-the-horizon targeting

P

PAO	public affairs officer
PAR	processing/analysis/reporting
PBL	performance based logistics
Pd	probability of damage
PFPS	portable flight planning system
PGM	precision-guided munition

PIR	priority information request
PRISM	photo reconnaissance intelligence strike module
PTM	precision targeting module
PTW	precision targeting workstation

Q

Q2	quick query

R

R&D	research and development
RAID	redundant array of independent disks
REQUPD	requirements update
RF	radio frequency
RFI	request for information
RIC	requirements-to-image correlation
RITA	rapid imagery transmission assembly
RMS	requirements management system
RMTS	record management transaction system
ROE	rules of engagement
RRDS	reduced resolution data set
RTC	remote terminal component
RTC-Lite	remote terminal component-lite
RTIC	real-time information into the cockpit
RVT	remote video terminal

S

SAMA	semi-automatic movement analysis
SAP	situational awareness processor
SAR	synthetic aperture radar
SATCOM	satellite communications
SCI	sensitive compartmented information

SCU	system communication unit
SEF	shape error forecasting
SHARP	shared airborne reconnaissance pod
SHF	super high frequency
SID	satellite identifier
SIDS	secondary imagery dissemination system
SIGINT	signals intelligence
SIMM	single in-line memory module
SIPRNET	SECRET Internet Protocol Router Network
SITA	single imagery target area
SITANM	single imagery area target nomination
SMTI	small moving target indicator
SOP	standard operating procedure
SoS	system of systems
SOSUS	sound operated underwater surveillance system
SPA	strike planning archive
SPAWAR	Space and Naval Warfare Systems Command
SPE	screen processor element
SPF	strike planning folder
SR	shared resources
SRQ	SID review queue
SS	system server
SYERS	SENIOR YEAR Electro-Optical Reconnaissance System

T

TACAIR	tactical air
TACMEMO	tactical memorandum
TACRECCE	tactical reconnaissance
TADIL	tactical digital information link

TADIXS	tactical data information exchange subsystem
TAG	technical assist group
TAMPS	tactical aircraft mission planning system
TARPS	tactical air reconnaissance pod system
TBM	theater ballistic missile
TBMCS	theater battle management core system
TBMWD	theater ballistic missile warning and display
TCDL	tactical common datalink
TCMS	tactical communications message subsystem
TCP	transmission control protocol; tactical computer processor
TCSO	time critical strike officer
TDBM	track database manager
TDDS	tactical related applications (TRAP) data dissemination system
TDFA	top down functional analysis
TDM	tactical dissemination module
TDW	tactical dissemination workstation
TEG	tactical exploitation group
TENCAP	tactical exploitation of national capabilities
TERCOM	terrain contour matching
TES	tactical exploitation system
TES-A	tactical exploitation system-Army
TES-C	tactical exploitation system-CENTCOM
TES-F	tactical exploitation system-Forward
TES-N	tactical exploitation system-Navy
TFRD	transmission format requirements document
TIBS	tactical information broadcast system
TIC	target to image correlation
TIS	tactical input segment

TLAM	Tomahawk land attack missile
TLM	topographic line map
TMPC	theater mission planning center
TNL	target nomination list
TO	tasking order
TPED	tasking, processing, exploitation, and dissemination
TPG	target package generator
TQCP	training, qualification, certification, and proficiency
TRAP	tactical related applications
TRD	training requirements document
TRE	tactical receive equipment
TRF	target reference files
TRPPM	training planning process methodology
TSC	tactical support center
TSO	time sensitive operations
TSS	time sensitive strike; target selection standards
TST	time sensitive target
TTP	tactics, techniques, and procedures
TTS	TES track service
TTWCS	Tactical Tomahawk Weapon Control System
TYCOM	type commander

U

UAV	unmanned aerial vehicle
UHF	ultrahigh frequency
USMTF	United States message text format

V

VPO	virtual program office
VTC	video teleconferencing

W

WAC	world aeronautical chart
WAMTI	wide area moving target indicator
WAN	wide-area network
WAS	wide area search
WFM	workflow manager
WPC	Washington Planning Center
WS	work station

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EXECUTIVE SUMMARY

INTRODUCTION

Desert Storm, Operation Allied Force (OAF), and other operations throughout the past decade highlighted the traditional difficulty that military services have had in sharing real time to near-real time tactical and national information among individual units and with each other. Network Centric Warfare (NCW) is an evolving concept that strives to address this challenge. The vision of NCW is that by using high-bandwidth communications systems, advanced processing capabilities, and interoperable information systems, information is shared seamlessly and in near-real-time among joint "sensor grids," "information grids," and "weapons grids" to form a coherent, recognizable operating picture in support of strike operations. The overall goal is to collect, process, fuse and disseminate data from a variety of disparate, geographically-separated, dissimilar sensors (including space-based sensors) and to provide that data to the warfighting community in a timely enough manner to identify, target, engage, evaluate, and if required, re-engage and destroy enemy targets.

Naval Fires Network (NFN) is a sea-based architecture that is moving towards realizing NCW. NFN seeks to integrate the capabilities of three systems: Joint Service Imagery Processing System – Navy (JSIPS-N), Global Command and Control System – Maritime (GCCS-M), and Tactical Exploitation System – Navy (TES-N). These systems currently perform various tasking, processing, exploitation, and dissemination (TPED) functions that give decision makers access to multi-source sensor data, thereby connecting the sensor and information grids. JSIPS-N and GCCS-M also give decision makers some limited access to the weapons grid by providing planning support and/or targeting information for precision guided munitions (PGMs), to include Tomahawk Land Attack Missile (TLAM) and connection to various mission planning and tactical digital information link (TADIL) systems. Future versions of NFN will address redundant functionality among these systems and will have additional links to the weapons grid. NFN can be employed by afloat command nodes while participating as either a supporting or supported commander in joint operations, providing "scaleable" utility for various combat scenarios and rules of engagement (ROE). NFN is able to support deliberate intelligence functions as well as time sensitive targeting (TST) and time sensitive strike (TSS) operations.

PURPOSE

This Tactical Memorandum (TACMEMO) is intended for intelligence (N2), operations (N3) and communications (N6) personnel assigned to a flag, ship or airwing staff who have, or soon will have, NFN available for their use. It will provide descriptions of individual systems currently associated with NFN, the various configurations that will be deployed, and relate those systems to the targeting processes providing fleet users the documentation to understand how NFN can be used to task sensors then process, exploit and disseminate the targeting information. Manning and training requirements and other issues affecting operational employment will be presented as well.

SCOPE

Although this TACMEMO will focus on overall operational and tactical employment of component systems in land strike scenarios, NFN enhances the complete spectrum of maritime surveillance and strike capabilities. The scope is also limited to describing the architecture and component systems that are currently fielded or are planned to be fielded within the next twelve months (through September 2003). Routine updates to this TACMEMO will be made to incorporate changes as NFN moves toward a final converged architecture[1] and as there are changes to the operational employment of NFN. Detailed descriptions of specific software functionality and operating procedures can be found in the appropriate system's Users Manual. This TACMEMO is not an operational requirements or a manpower requirements document.

[1] Discussed in Chapter 3 (NFN Roadmap).

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CHAPTER 1

NFN ARCHITECTURE DESCRIPTION

1.1 INTRODUCTION

The Naval Fires Network (NFN) is a family of systems (FoS) that includes several Navy programs: Joint Service Imagery Processing System – Navy (JSIPS-N), Global Command and Control System – Maritime (GCCS-M), and Tactical Exploitation System – Navy (TES-N). These systems currently perform various tasking, processing, exploitation, and dissemination (TPED) functions in support of naval operations. By bringing them together into a single FoS with increased interoperability and collaboration among component systems, NFN seeks to improve the flow of information and intelligence while enhancing joint and combined warfighter capabilities. In particular, the collection of capabilities provided by NFN include the following:

1. Real-time receipt, display and screening of tactical imagery and video sensors

2. Near real-time (NRT) receipt and display of national imagery

3. Precision mensuration for precision-guided munitions (PGMs)

4. Geo-registration, warping and annotation of imagery

5. Multi-Source information management, data correlation and display at multiple security levels

6. Association of tracks with dynamic intelligence database entities

7. Dissemination of situational awareness data and targeting information across platforms and joint systems through extensive communications interfaces.

This chapter provides a brief description of each component system (GCCS-M, JSIPS-N and TES-N) of the NFN architecture (detailed system descriptions, to include specific hardware/software, are provided in Appendix A). Considerations for connecting systems and sharing data among them are also presented. Finally, various supporting systems that facilitate NFN operations are described. The processes whereby NFN systems support specific intelligence and targeting operations are described in Chapter 2.

1.2 NFN COMPONENT SYSTEMS

The following paragraphs provide an overview of the capabilities of each NFN component system. Each system operates at both the Secret General Service (GENSER) and Sensitive Compartmented Information (SCI) security levels. Several areas of functional overlap are evident in the system descriptions in this chapter and in Appendix B and will be addressed in greater detail in Chapter 3 (NFN Roadmap).[2] Detailed operating procedures for GCCS-M, JSIPS-N, and TES-N can be found in each system's respective operations manual.

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[2] NFN is in a similar situation faced by Microsoft in the early 1990s when it decided to combine its various desktop applications into a single "Office Suite." Multiple applications, each with different strengths and weaknesses, existed to address various business requirements. These applications did not share information easily and often had functionally similar components (e.g., simple spreadsheet and graphing features) that were different in each system. Microsoft has distributed successive versions of Office, each of which more closely integrates the various component programs. Similarly, NFN can unofficially be described as an intelligence targeting support "suite" of systems designed to work in a distributed environment. The spiral development plan, long term goals and "converged architecture" of NFN are presented in Chapter 3 of this document.

1.2.1 GCCS-M

1.2.1.1 System Description

The purpose of GCCS-M is to provide naval commanders a timely Common Operational Picture (COP) containing geo-locational track information on friendly, hostile, and neutral land, sea, and air forces integrated with intelligence, imagery, and environmental information. The COP provides fused situational awareness that supports decision-makers at every operational level, from unit-level to Fleet Commander, during every phase of operations, from peacetime through general war. Track information enters the GCCS-M system via various Command, Control, Communications, Computers and Intelligence (C4I) systems, and the timeliness of that data depends on the system supplying the information. For example, tracks supplied via tactical digital information link (TADIL) systems are usually near real-time, while contacts originating from the Modernized Integrated Database (MIDB, described in section 1.3.3) or entered manually will be considerably time late.

Interoperability with other service/joint C4I systems (e.g., Theater Battle Management Core System (TBMCS), Joint Global Command and Control System (GCCS), and Intelligence Analysis System (IAS)) and Naval combat systems (e.g., Advanced Tomahawk Weapon Control System (ATWCS), Tactical Tomahawk Weapon Control System (TTWCS), MIW (Mine Warfare) and Environmental Decision Aids Library (MEDAL)) is achieved through compliance with the Defense Information Infrastructure Common Operating Environment (DIICOE) or via numerous interfaces.

GCCS-M is operational on most surface combatants in the U.S. Navy, including numbered fleet flagships, aircraft carriers, amphibious ships, cruisers, destroyers, frigates, minesweepers, and supply ships. GCCS-M versions are also fielded at each of the Fleet Commander in Chief command headquarters (FLTCINCs), and Type Commands (TYCOMs), located principally within the command centers. GCCS-M operates at Tactical Support Centers (TSCs), and has several mobile configurations, including the Mobile Operations Control Centers (MOCCs), Mobile Ashore Support Terminals (MASTs), and Mobile Integrated Command Facilities (MICFACs). In total, GCCS-M is operational aboard over 300 ships, 72 shore sites, and 32 tactical/mobile sites.

1.2.1.2 GCCS-M Key Contributions to NFN

Following are the key contributions of GCCS-M to NFN. If a contribution is associated with a particular component of the system, that component is listed in parenthesis after the contribution. Specific component descriptions may be found in Appendix A.

1. Multi-source information management, data correlation, and display.

2. Dissemination of the COP across platforms and with joint systems through extensive communications interfaces (Track DataBase Manager (TDBM).

3. Association of tracks with relational database (DB) entities (imagery and intelligence DB records) (Intel Shared Data Server (ISDS)).

4. MIDB replication, update, and analysis tools (ISDS).

5. Electronic intelligence (ELINT) and communications intelligence (COMINT) reports accepted, included in visualization, and where appropriate translated into tracks (Graphic Area Limitation Environment-Lite (GALE-Lite), Cryptologic Unified Build (CUB)).

6. Request, receipt, storage, and visualization of secondary imagery (Imagery Transformation Server (ITS)).

7. NRT receipt, display, and screening of unmanned aerial vehicle (UAV) video (Java Imagery Viewer and Exploitation (JIVE)[3].

8. Two-way interface with TADIL networks (Multi-TADIL Capability (MTC))[3].

1.2.2 JSIPS-N

1.2.2.1 System Description

JSIPS-N is a cornerstone system for intelligence support to targeting on carriers, large deck amphibious assault ships, command ships, and shore sites supporting operational, training and test activities. JSIPS-N provides the capability to receive imagery from national and tactical sources in a variety of formats and to create precise and accurate imagery information products (such as Target Aimpoint Graphics, Electronic Target Folders (ETFs), and Desired Mean Points of Impact (DMPIs)), which are tactically and operationally significant. It provides imagery exploitation and targeting for PGMs in support of tactical aircraft strike. In addition, JSIPS-N imagery exploitation and target folder services support TLAM strike planning.

Shipboard interfaces include GCCS-M, Tactical Aircraft Mission Planning System (TAMPS), and the Afloat Planning System (APS). JSIPS-N also interfaces with external intelligence databases/data sources and joint mission planning systems via various communications channels.

JSIPS-N is fielded on twelve carriers, twelve large deck amphibious ships, four command ships, four operational shore facilities (AOSDLANT, AOSDPAC, COM5THFLT, NSAWC), two training sites (Navy and Marine Corps Intelligence Training Center (NMITC) and Fleet Intelligence Training Center Pacific (FITCPAC)), one test and evaluation site (Washington Planning Center (WPC)) and one Research and Development (R&D) site (Space and Naval Warfare Systems Command (SPAWAR) Philadelphia, PA). Additionally, JSIPS-N comprises the operational targeting system supporting imagery exploitation, precision geopositioning, and target folder services at three Theater Mission Planning Centers (TMPC) (CMSALANT, CMSAPAC, and CMSAUK).

1.2.2.2 JSIPS-N Key Contributions to NFN

Following are the key contributions of JSIPS-N to NFN. If a contribution is associated with a particular component of the system, that component is listed in parenthesis after the contribution. Specific component descriptions may be found in Appendix A.

1. NRT ingest and processing of national imagery (National Input Segment (NIS), JSIPS-N Concentration Architecture (JCA))[4].

2. Real-time to NRT ingest and processing of Common Datalink-Navy (CDL-N) supported tactical sensor imagery, to include FA-18 Shared Reconnaissance Pod (SHARP) data (Tactical Input Segment (TIS)[5]).

3. Imagery exploitation, geo-registration, archival and secondary dissemination services (Precision Targeting Workstation (PTW), Digital Imagery Workstation (DIWS), Image Products Library (IPL)).

4. Mensuration and precision geopositioning services supporting all PGM weapons employment (including Tomahawk) (PTW 4.x[4], DIWS).

5. Aimpoint and imagery product output to combat/weapons/mission planning systems (PTW, DIWS).

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[3] Being fielded with GCCS-M version 3.1.2.1 patch 1, scheduled for FY03 release.

[4] Being fielded with JSIPS-N version 3.2.

[5] Fielding scheduled for Q4FY02.

1.2.3 TES-N

1.2.3.1 System Description

TES-N is the Navy shipboard implementation of the Army Tactical Exploitation System (TES-A). It is an integrated, scalable, multi-intelligence system specifically designed for rapid correlation of national and theater Intelligence, Surveillance, Reconnaissance (ISR) information to support network centric operations. TES-N provides the warfighting commander with access to near real time (NRT), multi-source, and continuously updated day/night battlespace ISR information. TES-N supports strike operations using numerous ISR collection planning, data correlation, geolocation, data dissemination, and storage functions. It is interoperable with other service derivatives of the TES system: TES-A, the Marine Corp's Tactical Exploitation Group (TEG) and the Air Force's ISR Manager (ISR-M).

Four primary configurations of TES-N are deploying to enable distributed network operations among naval units: Full System, Remote Terminal Component (RTC), Littoral Surveillance System (LSS) and Remote Terminal Component - Lite (RTC-Lite). A full TES-N system contains all the components necessary to conduct operations with various sensor platforms. A full TES-N can be employed as a stand-alone system or as a server supporting multiple RTCs. An RTC is a smaller version of the full system that does not have the workflow management features or the equipment (antennas, processors, etc.) necessary to interface directly with various ISR platforms. However, when connected as a client to a full TES-N system (or to other service TES systems), the RTC is able to remotely control the full system's antennas and processors in order to receive sensor data for local exploitation. The RTC can operate over a wide range of bandwidths to support rapid icon visualization (lower bandwidth) through real time display of imagery products (higher bandwidth). The LSS integrates the major functions of the Naval Reserve Mobile Inshore Undersea Warfare (MIUW) system with that of the TES-N system. The RTC-Lite is a lightweight, man portable unit that provides a limited Tactical Exploitation of National Capabilities (TENCAP) communications and processing/analysis/reporting (PAR) capability where deployed. RTC-Lite is primarily used as a situational awareness tool that allows TES preprocessed data to be shared in a distributed environment.

1.2.3.2 TES-N Key Contributions to NFN

Following are the key contributions of TES-N to NFN. If a contribution is associated with a particular component of the system, that component is listed in parenthesis after the contribution. Specific component descriptions may be found in Appendix A.

1. Real-time to NRT ingest and processing of CDL-N supported tactical sensor imagery (excluding FA-18 SHARP data) (Common Imagery Processor (CIP), SS1).

2. U2 sensor control, flight track/collection plan visualization and modification (Enhanced Mission Planning System (EMPS)).

3. NRT receipt, display, and screening of UAV video.

4. NRT receipt and processing of synthetic aperture radar (SAR) and moving target indicator (MTI) data from Joint Surveillance Target Attack Radar System (JSTARS) (Moving Target Exploitation System (MTES)).

5. ELINT reports accepted and included in visualization.

6. Direct access to selected classified sensors.

7. Multi-intelligence correlated, geo-registered/overlayable displays.

8. Interoperability with other service TES-based systems (TES-A, TEG, ISR-M, etc.).

1.3 SUPPORTING SYSTEMS/PRODUCTS

Figure 1-1 displays the major components of GCCS-M, JSIPS-N, and TES-N. It will be used throughout Chapter 2 to explain the flow of information through the NFN component systems in support of targeting operations. The diagram also displays various systems that are not components of NFN, but are necessary for various NFN operations (the JSIPS-N Concentrator Architecture (JCA) is a component of NFN but is shown as an external system due to its remote location ashore). These supporting systems are briefly described below.

1.3.1 Local Network Connections

The mere existence of NFN component systems does not guarantee that they will be able to communicate with each other. Users should ensure that all three systems are connected via common Secret GENSER and SCI networks to allow the passage of data from one system to another. A common misperception is that a TES-N RTC can only communicate with and receive data from another TES unit. In fact, a unit with an RTC can connect it to local JSIPS-N and GCCS-M systems so that imagery and other data can be passed among all three systems.[6]

The primary means of passing imagery among all three systems is via File Transfer Protocol (FTP). FTP is a client-server protocol that allows a user on one computer to manually transfer files to and from another computer over a Transmission Control Protocol/Internet Protocol (TCP/IP) network. In order to use FTP to pass imagery between JSIPS-N, TES-N, and GCCS-M, users will need to know the IP addresses for the various imagery servers located in each system. If imagery will be passed directly to other units, the IP addresses for their systems will also need to be determined. Individual systems may allow users to assign common names (e.g., "Local IPL") to an IP address to facilitate the FTP process. Designated web browsers (e.g., the JSIPS-N Quick Query (Q2) program) can also be used to facilitate the imagery transfer process.

Non-imagery data transfer among NFN component systems requires the use of special system interfaces (e.g., TES-N/GCCS-M track interface). These interfaces will be discussed in greater detail in Chapter 2.

1.3.2 Communication Systems

The boxes at the top of Figure 1-1 represent various antennas and communications paths used by data entering NFN.[7] The MacUHF Satellite Terminal (MUST) antenna receives JSTARS data and sends it to the MTES located in TES-N. The CDL-N antenna is a Department of Defense (DOD) mandated interoperable, high bandwidth, secure line-of-sight (LOS) data link for the receipt of ISR data from U-2, Global Hawk, RC-12 Guard Rail, F/A-18 ATARS/SHARP, S-3B SSU, SH-60 LAMPS (Hawklink), and P-3C/AIP/Special Project platforms. "Local proprietary antenna and processing" systems are colocated with the local unit and are designed to receive and process data for a single system (e.g., Pioneer UAV video or the Digital Camera Receiving Station (DCRS) that transmits, receives and processes F-14 Fast Tactical Imagery (FTI) data). They are often directly linked to the local unit's data network. This is in contrast with "remote antenna and processing" systems, which also receive and process data for a single system, but are not located with the local unit (e.g., land based UAV ground control stations). These systems receive raw signals remotely and then send preprocessed data to the local customer via designated communication channels such as the Secret Internet Protocol Router Network (SIPRNET), the Joint Worldwide Intelligence Communications System (JWICS), or the Global Broadcast System (GBS). The Tactical Related Applications (TRAP) Data Dissemination System (TDDS) provides worldwide dissemination of high-interest ELINT, contact reports, and parametric information at the SECRET level. Various TADILs, specifically Link-11 and Link-16, provide track data that is processed by the GCCS-M system.

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[6] Current plans have most RTC installations in a dual server configuration. In other words, both a Secret GENSER server and an SCI server will be installed. It is possible, however, that some units may deploy with a single server configuration. In this instance, units will need to decide whether to install their RTC on the GENSER or SCI network. The security level of other TES units deployed in theater may affect this decision. See Appendix B for additional considerations for configuration of a single server RTC.

[7] Detailed descriptions of various communication systems and considerations for NFN employment (e.g., bandwidth issues) are provided in Appendix C.

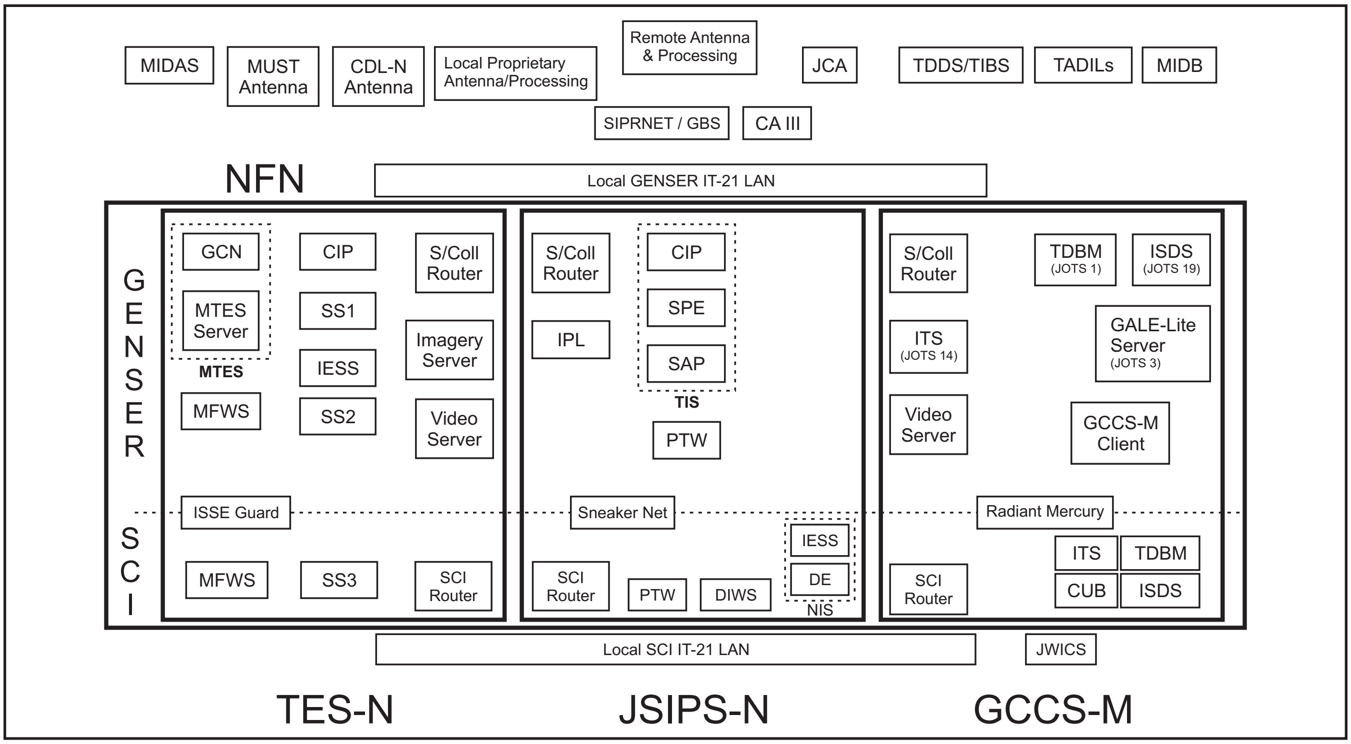

Figure 1-1. NFN Architecture

1.3.3 Modernized Integrated Database (MIDB)

The MIDB is a relational database that contains the bulk of global Order of Battle (OOB) information produced by the Defense Intelligence Agency (DIA) and the joint theater intelligence centers. Replication is used by these Tier I intelligence producers to keep each site's locally stored national database updated. Replication is also used to update these national records directly aboard each force-level afloat platform. Currently this is generally implemented on the GENSER networks, but will be available across the SCI network to/from afloat platforms within the next year.

1.3.4 Joint Targeting Toolbox (JTT)

The Joint Targeting Toolbox (JTT) is a software package created under the guidance of Joint Staff Intelligence Directorate, Target Support (J2T), and the Air Force Research Laboratory (AFRL). JTT is a suite of software modules that support the targeting cycle from objectives and guidance to combat assessment through management of critical intelligence data. JTT provides the functionality to perform target development and analysis, weaponeering, and the nomination of relevant targets for attack based upon the strategy and objectives of the national command authority.

JTT provides targeteers and target specialists at all planning levels and nodes the following capabilities: an automated linkage between Commanders Guidance/Objectives and Candidate/Priority Target Lists; a COP of the deep battle (air, land, and surface situations); call-up of imagery for selected targets; retrieval and manipulation of Tasking Orders (TOs) and master attack plans; linkages to MIDB targeting databases; and execution of on-line target management and combat assessment.

JTT is an Air Force initiative that, from a programmatic standpoint, operates autonomously from NFN. All three NFN component systems, however, will soon be fielded with JTT integrated into their baseline programs. GCCS-M incorporates JTT into version 3.1.2.1 patch 1 (FY03 release); JSIPS-N incorporates JTT into the PTW version 4.1, and TES-N incorporates JTT in version 5 (Q1FY03 release).

CHAPTER 2

NFN Operations

2.1 INTRODUCTION

US Naval Forces are by their very nature expeditionary forces, and as such, may operate in forward areas without host nation support. They must arrive on scene ready to operate with a minimum of rear-echelon or shore-based support. Naval Forces must be capable of providing fires, as well as the command and control, targeting and ISR in support of fires. Additionally, when operating in a joint environment, Naval Forces must be capable of integration with other forces and providing support to achieve Joint Force Commander's objectives. The objective of the NFN architecture is to provide intelligence and targeting support in a distributed operating environment (see Chapter 3 for a more detailed description of the long term goals/vision for NFN). This chapter provides descriptions of the current processes that are used by the NFN component systems in support of this objective.

2.2 NFN CONTRIBUTIONS TO THE TARGETING PROCESS

Any discussion of NFN contributions to the targeting process should begin by a quick analysis of the targeting process itself.[8] To the casual observer, this can be a confusing prospect, for there are various ways of describing the targeting process and the various intelligence functions that occur within it. Joint Publication 2-01.1 defines the Intelligence Cycle (Figure 2-1) and the various steps that occur within: planning and direction, collection, processing

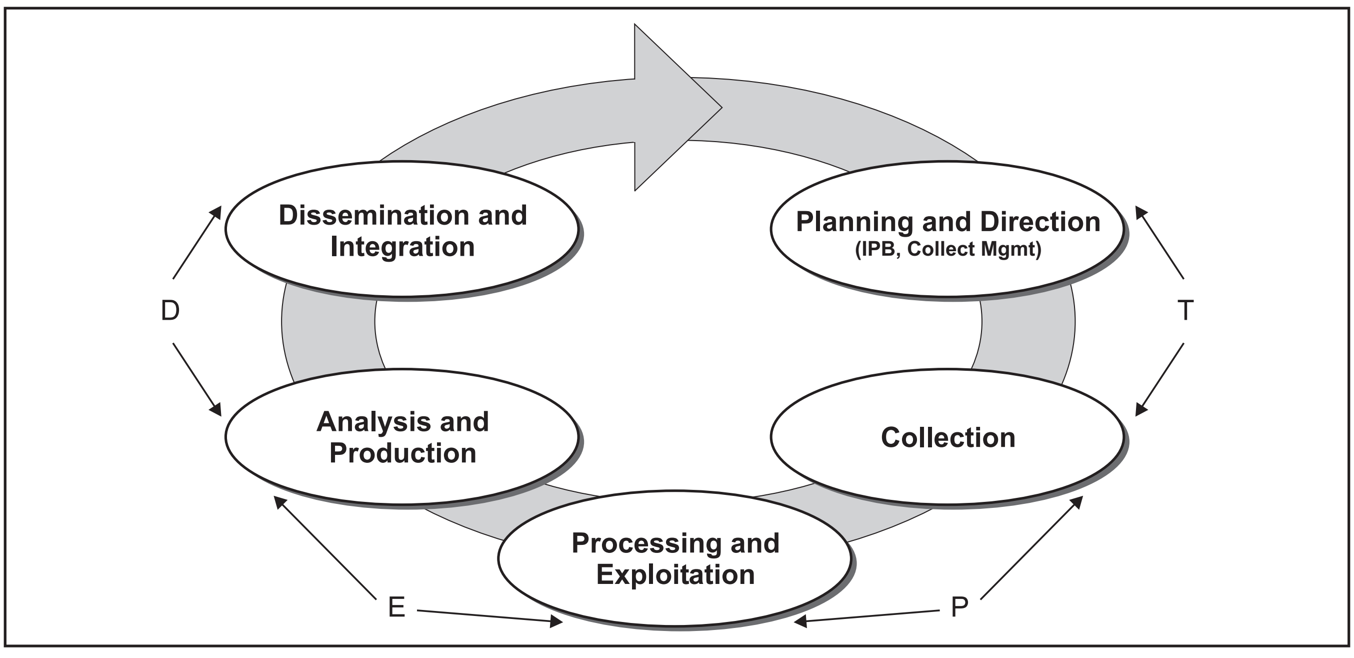

Figure 2-1. Intelligence Cycle

[8] Although there are many joint documents that explain the various targeting and intelligence cycles, this brief analysis is presented to explain/justify the organization to be taken by the remainder of this chapter.

and exploitation, analysis and production, dissemination and integration. TPED (tasking, processing, exploitation and dissemination) is another term used to describe the intelligence cycle.

Joint Publication 3-60 defines the Targeting Cycle (Figure 2-2) and the steps that occur within the targeting process. This is widely accepted as the targeting cycle for the deliberate planning process and each step is clearly observed during operations where an Air Tasking Order (ATO) is generated and executed. The Joint Force Commander's objectives and guidance define the priorities by which a target set is developed. Detailed target to weapon pairing analysis occurs during the weaponeering phase to determine the appropriate means available to destroy those targets. The ATO is generated during the force application phase, where assets are assigned to strike (or support the strike of) designated targets. After detailed mission planning and execution of the task at hand, combat assessment occurs to determine the success or failure of the mission.

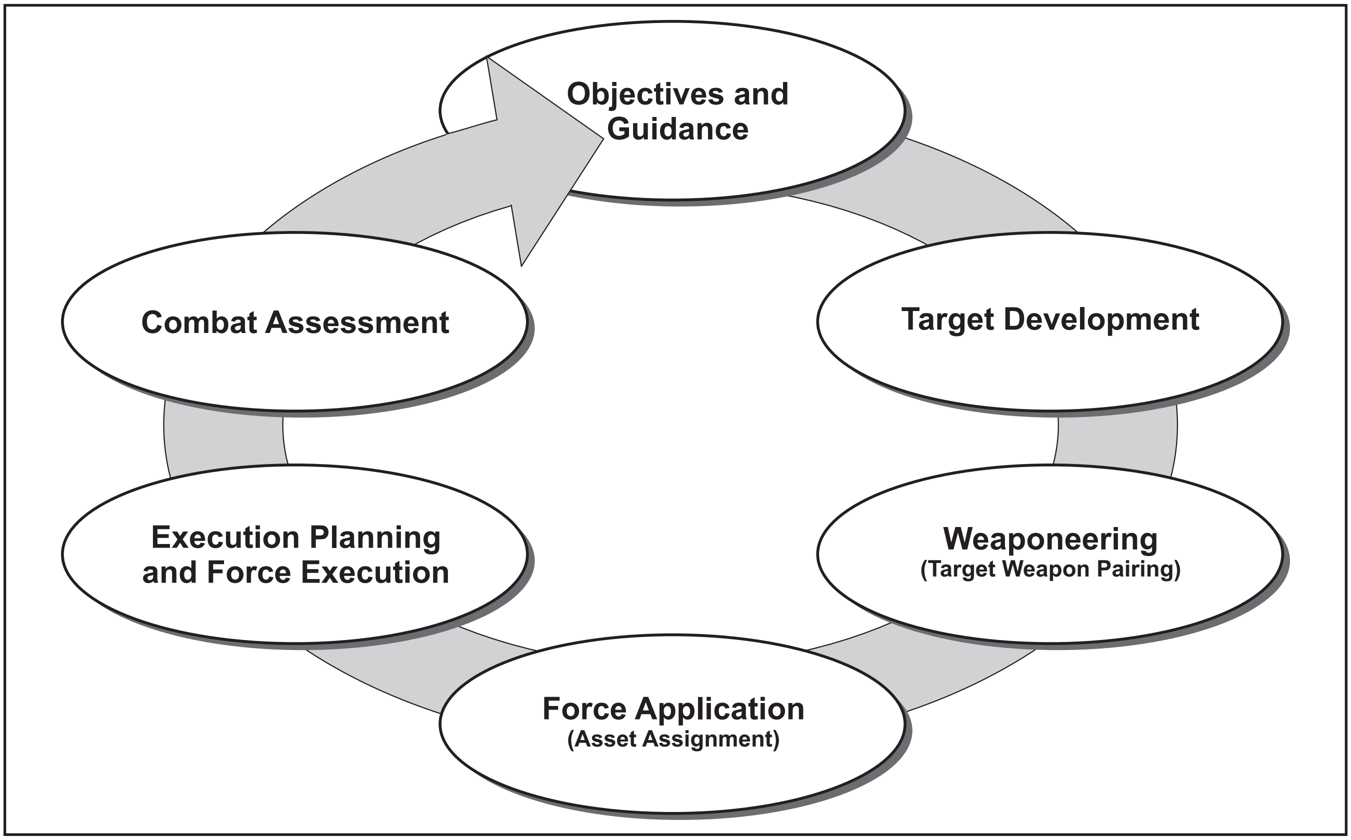

Figure 2-2. Targeting Cycle

The intelligence cycle described earlier closely resembles the individual steps that occur within the target development phase. Modification of the targeting cycle diagram by insertion of the intelligence cycle (Figure 2-3) provides greater insight into the role of intelligence in support of the targeting process.[9] Numbering individual steps on the diagram allows easy recognition of the process, although in real world operations many of these steps often occur in parallel with each other.

[9] The intelligence cycle could also be used to amplify and describe the combat assessment phase, but for the sake of clarity it will only be used in place of target development in this analysis.

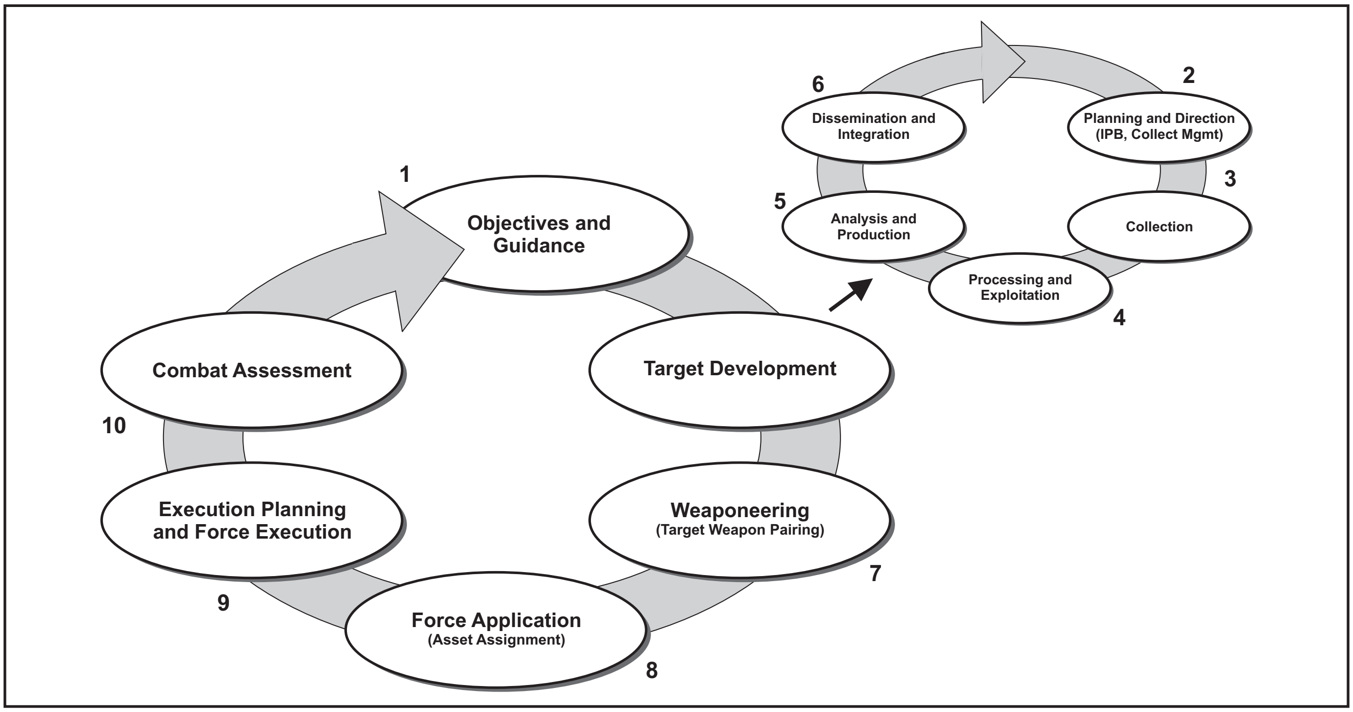

Figure 2-3. Intelligence Support to the Targeting Cycle

When discussing Time Sensitive Strike (TSS) operations, the Find, Fix, Track, Target, Engage and Assess (F2T2EA) cycle (Figure 2-4) is also used to describe the targeting process.[10]

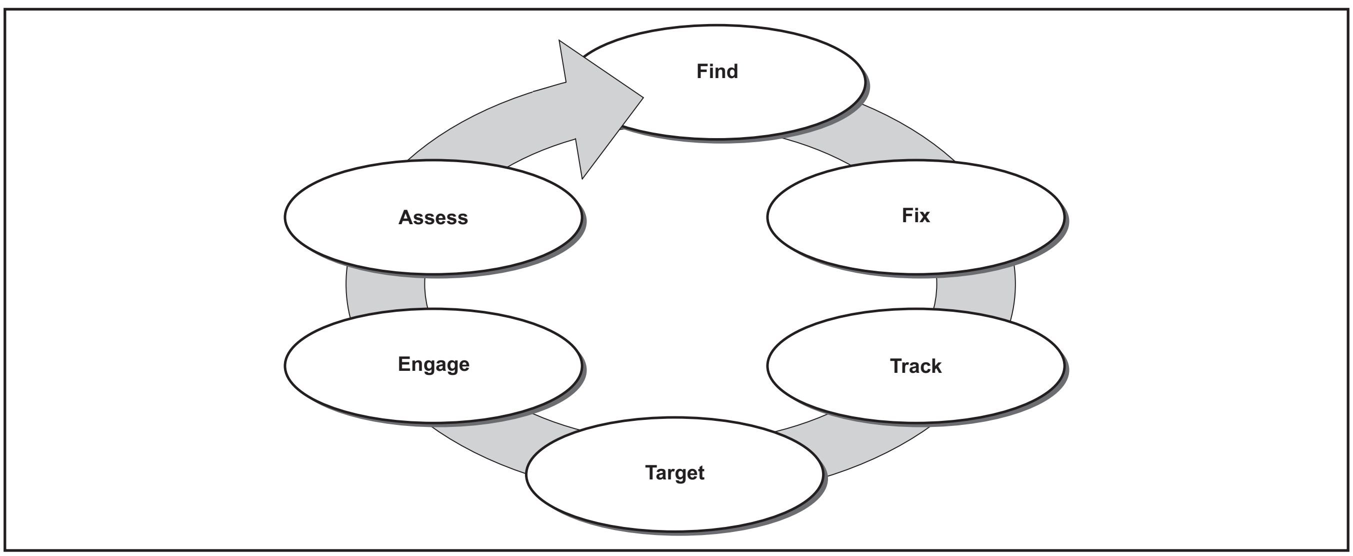

Figure 2-4. TSS Targeting Cycle

[10] These processes are defined in existing service and joint publications and are developed in some depth by documents (e.g. the draft ACC/CFFC/C3F/C2F *Joint Time-Sensitive Targeting CONOPS* dated 15 July 2002 and the draft NSAWC NTTP 3-03.4.3 *Strike Warfare Commander's Watch* dated October 2001) devoted to the tactics, techniques, and procedures for joint time sensitive targeting. These documents discuss the TST functional interactions with specific elements of the targeting process and the supporting intelligence cycle.

If these TST steps are superimposed upon the intelligence support to the targeting process diagram, Figure 2-5 results.

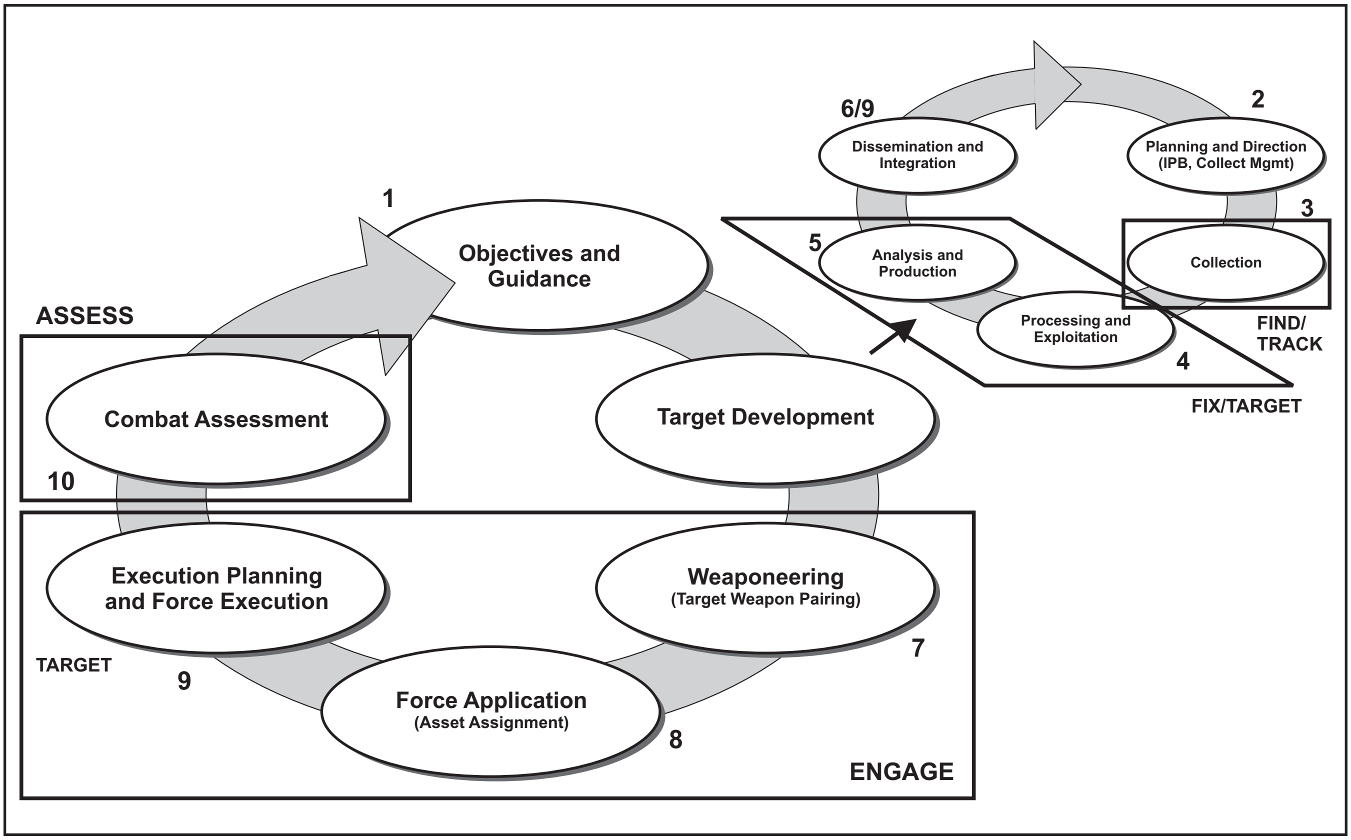

Figure 2-5. TSS Cycle Overlayed onto the Targeting Process

Several observations should be made when studying the diagram above. First, the JP 3-60 targeting cycle can be viewed within the context of time sensitive targeting. For example, when a commander decides to **engage** a time sensitive target, several subtasks still must be performed: target weapon pairing, asset assignment and mission planning/execution. Second, several steps still need to be addressed when discussing time sensitive targeting that are not readily apparent when reciting the F2T2EA acronym. Specifically, commander's objectives/guidance, planning/direction and dissemination/integration issues need to be addressed for TSS to succeed. Third, the quick dissemination and integration of intelligence data must occur at two different stages (steps 6 and 9): to the operations officer who must make engagement decisions and to the strike asset once the engagement decision has been made.

Using the steps from Figure 2–5, Table 2–1 summarizes the current contributions that NFN component systems make to the targeting process. The rest of this chapter is similarly organized and expands upon the data presented in Table 2–1. Operational processes that vary due to differing NFN configurations (e.g., full TES-N vs. RTC) will be highlighted in the text.[11]

[11] The NFN system architecture integrates multiple system components to accomplish the intelligence cycle. Many of these components are Government Off-the-Shelf (GOTS) or Commercial Off-the-Shelf (COTS) subsystems that provide detailed operations manuals and technical documentation as part of their delivery. It is not the intent of this TACMEMO to reiterate existing operational information for these components, but rather to identify how such components fit into the NFN architecture and address any NFN specific operational procedures that may not be addressed in existing documentation. Where appropriate, reference is made to existing component documentation.

	TES-N	JSIPS-N	GCCS-M
CDR's Objectives and Guidance	Yes[1]	Yes[1]	Yes[1]
Planning and Direction			
Intel Prep of Battlespace	Yes	Yes	Yes
Collection Planning	Yes[2,3]	Yes[3]	Yes[3]
Find/Track (Direct Sensor Receipt[4])			
Tactical Imagery (CDL-N)	Yes[5]	Yes[6]	No
Tactical Imagery (Video)	Yes	No	Yes
National Imagery[7]	No	Yes	No
JSTARS	Yes[8]	No	Yes[9]
ELINT	Yes[10]	No	Yes[10]
COMINT	No	No	Yes
Other SIGINT	Yes	No	No
Fix/Target			
Imagery Exploitation	Yes	Yes	No[11]
PGM Quality Mensuration	No	Yes	No
Non-PGM Quality Geolocation	Yes	Yes	No
Target Validation	Yes[1]	Yes[1]	Yes[1]
Target Nomination/Dissemination to C2	Yes	Yes	Yes
Engage			
Target Weapon Pairing	**No**	**No**	**No**
Force Application (Asset assignment)	**No**	**No**	**No**
Execution Planning	No	Yes[12]	No
Force Execution/Targeting			
Target Dissemination to Strike Asset	No	Yes[13]	Yes[14]
Assess	Yes	Yes	Yes

Notes:

1. If configured with JTT.
2. Builds collection plans for U-2 sensors (ROE and inter-service military operating area (MOA) permitting). Predator and Global Hawk collection planning included in TES version 5.x.
3. National imagery request via web requirements management system (RMS).
4. System is a primary data path for the respective imagery/data. Once received, secondary imagery/data can be passed to other component systems for processing/analysis.
5. Full TES-N within LOS of sensor or RTC connected with sufficient bandwidth to Full TES node. Includes U-2 sensor control (ROE and inter-service MOA permitting).
6. If configured with TIS component and within LOS of sensor.
7. Not suitable for TST dynamic retasking.
8. If configured with MTES components.
9. If loaded with Naval JSTARS Interface (NJI).
10. If TDDS present.
11. Imagery/video display only. Does not include ELT exploitation tools.
12. Direct TLAM planning. Connection to external strike planning programs (TAMPS, etc.). Strike Planning Folder for air tasking order (ATO) missions only.
13. All PGMs (to include TLAM).
14. Via Multi-TADIL Capability.

Table 2-1. NFN Component System Support to TST

2.3 COMMANDER'S OBJECTIVES AND GUIDANCE

The first step in the joint targeting process is to identify the Joint Force Commanders (JFC's) guidance and objectives. Based on initial and updated intelligence and other assessments, and direction provided by the President, SECDEF and higher headquarters, the JFC refines national guidance and provides timely and current intent, guidance and clear, measurable, attainable objectives that become specific plans of action. With the advice of component commanders, the JFC sets priorities, provides targeting guidance, determines the weight of effort for various operations, and issues guidance messages to his joint task force (JTF) components (JFACC, JFMCC, etc). This is the point where the importance and general prioritization of TSTs begins to take shape. The priority of TSTs can change throughout an operation, and clearly-articulated and current JFC's guidance and objectives assist commanders at all echelons to make timely decisions on which targets to strike and what resources they can use. **Pre-establishing joint TST communications, coordination, and deconfliction procedures are key to TST command and control nodes and supporting ISR and strike assets.**[12]

The Joint Targeting Toolbox (JTT) is a jointly developed application that will soon be resident within GCCS-M, JSIPS-N, and TES-N. It can be used to create a set of objectives and to organize and display hierarchies of national, theater, component, and tactical objectives. The JTT also decomposes each objective into more specific sub-objectives and tasks and orders each objective, sub-objective, and task by priority. Additionally, the JTT allows users to enter targeting guidance in the form of free-text remarks for each objective, sub-objective, and task. Deployed naval forces can use these objectives and tasks delineated by higher authority to develop target nomination lists (TNLs) and candidate target lists (CTLs). Once the TNL is approved by the combatant commander JTT permits the sharing of the TNL to all the components for early access to assigned missions for strike planning.

2.4 PLANNING AND DIRECTION

2.4.1 Planning Overview

The extent of planned procedures for attacking TSTs determines the probability of joint force success in carrying out the mission. The more planning accomplished, the higher the probability of mission success. The introduction of NFN makes this axiom no less true: planning is critical to mission success. The following paragraphs discuss the steps that should be taken long before the user ever seeks to receive, screen, and exploit tactical sensor data. Whether the targeting process is planned or time sensitive in nature, careful intelligence preparation of the battlespace (IPB) and collection planning are key to mission success.

2.4.2 Intelligence Preparation of the Battlespace (IPB)

IPB is a systematic, continuous process of analyzing the threat and environment in a specific geographic area.[13] IPB forms the basis on which a number of decisions important to joint targeting are made. Specifically, IPB helps to facilitate the following important functions:

1. Collection planning and management. IPB helps identify probable locations or operating areas where TSTs may be found. This data can be used to make specific ISR search area requests with collection management authorities or to plan local unit tactical reconnaissance (TACRECCE) operations. NFN collection planning is addressed further in section 2.4.3.

2. Target cueing. Operators using NFN systems are able to receive and monitor real time sensor data from various ISR platforms. The amount of data received can potentially overwhelm operators if it is not managed

[12] When operating in a joint environment or in any area where other NFN assets are operating, units should coordinate before arrival into theater to ensure NFN system communications and interoperability issues are addressed. CONOPS and/or theater ROE may not support the full application of current NFN capabilities (e.g., sensor control of an ISR platform that belong to another service component). When able, naval leadership should become engaged in the objectives and guidance phase to educate theater personnel on the capabilities of NFN. Appendix G includes a checklist of items that should be considered when coordinating/preparing for multi-unit NFN operations.

[13] IPB relies on an intense study of the lines of communication (LOC), terrain, vegetation, population and military characteristics of the area of interest (AOI). All of these features are limiting factors for mobile OOB. Dissecting these battle-space factors into their basic elements and analyzing how TSTs will be affected by these factors is how the Targeting Officer can assess the locations of potential deployment sites. Joint Publication 2-01.3 *Joint Tactics, Techniques, and Procedures for Joint Intelligence Preparation of the Battlespace* (24 May 2000) and the draft ACC/CFFC/C3F/C2F *Joint Time-Sensitive Targeting CONOPS* (15 July 2002) provide detailed guidance on the conduct of IPB.

properly. IPB, coupled with all source fusion data, helps operators anticipate targets and eliminate potential "noise" (those contacts that may appear as targets but are not). The display of IPB data during sensor screening is addressed in section 2.5.

3. Exploitation. Target folders for specific target sets can be developed prior to hostilities. These target folders should contain information developed during IPB that helps to optimize target identification and exploitation (section 2.6).

4. Development of preplanned TST response options. Enemy trend analysis can help formulate naval response options in case a TST is located. Location of one type of target may cause redirection of ISR assets to search for other, more lucrative, targets in the same area. IPB target folder development also facilitates the execution phase of the targeting cycle (section 2.8.2).

NFN systems provide numerous tools that aid the IPB process. GCCS-M provides tools for analysts and operators to access, query, display, and update the MIDB. These tools include Intel Office, which allows analysts and operators to use Microsoft products to manage OOB information within the MIDB.[14] This MIDB data can be saved in spreadsheet form and imported into TES-N as shape files[15] (see Appendix G for procedures) for display on the ITD.

The GALE-Lite software in GCCS-M and TES-N can be used to perform a historical analysis of ELINT data within the unit's area of operations. This information can be used to detect trends in enemy operations and can be used to direct friendly force collection planning efforts and/or response options. Section 2.6.5 will provide more detailed discussion on ELINT exploitation.

An inventory of available imagery within JSIPS-N and TES-N should be conducted. Precollected imagery available remotely (e.g., at the JCA) should be retrieved for local use (section 2.5.1.2). Deficiencies in imagery coverage should be noted and collection planning (section 2.4.3) initiated. Available imagery should be analyzed closely to determine enemy lines of communication (LOCs) and possible deployment sites. This imagery can be sent to GCCS-M and/or TES-N for display on the COP or ITD, respectively, where multiple source track and MIDB data can be displayed over the imagery.[16] This display of data over imagery may significantly increase the analyst's understanding of enemy activity and deployment patterns. The analyst can use JSIPS-N or TES-N exploitation tools (section 2.6.2) to annotate the imagery accordingly. The analyst can also create TES-N shape files that can be quickly displayed on the ITD for future correlation with sensor data tracks.

Target folders containing annotated imagery and other data for all planned and time sensitive targets should be created during the IPB process. Various target folder options currently exist for strike planners:[17]

1. JSIPS-N Strike Planning Folders (SPF)

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[14] The MIDB, which contains information on the location and disposition of targets, units, associated equipment and facilities, chain of command and related information, is stored on the GCCS-M Intelligence Shared Data Server (ISDS). It stores national (strategic) and local (tactical) views of enemy OOB data. Theater Joint Intelligence Centers can provide continual updates to the strategic view of the MIDB via replication. This technology allows changes made to one ISDS database to transfer to other ISDS databases automatically in near real time. Replication is a critical technology, which ensures multiple ISDS databases throughout the theater contain the same information and can be used as a tactical intelligence database to maintain current OB status.

[15] Shape files (*.shp) display lines and polygons on Arcview based software (e.g., ITD or Falcon View). These files are normally used to display geographic boundaries or to highlight specific areas of user interest. Users can create shape files manually in the Arcview based software, import shape files created by others, or import tab delimited text files (created by standard spreadsheet programs), which are then transformed into shape files. When entering a new AOR, units should check to see if shape files have already been created for the geographic area that can be imported into TES-N.

[16] The TES-N/GCCS-M track interface (Appendix F) allows sensor data collected and processed in one system to be passed to the other system for display. GCCS-M also allows fusion of multiple sensor tracks into a single track. See section 2.7 for additional information on COP management.

[17] The automated target folder concept is relatively new and this document does not recommend which target folder solution should be used. Target folders are discussed in greater detail in section 2.8.1, Execution Planning.

2. JTT Automated Target Folders (ATF)

3. Quiver.

2.4.3 Collection Planning/Requests

Identification of TST target lists, combined with IPB data showing anticipated target locations, should help focus the efforts of strike and mission planners. Recent imagery may not always be available, however, for desired target areas. Moreover, ISR assets may be desired to support real time strike operations.[18] Naval units should be familiar with the procedures necessary to plan and/or request collection support. The collection request and planning process varies based upon the type of ISR platform desired: national, theater or tactical.

2.4.3.1 National Platforms

JSIPS-N is the primary national imagery dissemination system afloat. Operators should first attempt to fulfill national imagery requirements by searching through image archives on the local IPL, PTW, or DIWS. Imagery can also be found within the JCA COPS archive (section 2.5.1.2 describes the process for retrieving national imagery from various JSIPS-N archives). If imagery is not available within local or concentrator archives, the unit can pursue the imagery request as a target in the JCA Imagery Exploitation Support System (IESS) server (or in the local NIS IESS server if the unit has not yet been upgraded with JCA).

The JCA IESS server, accessed by IESS Client software on the local IPL, maintains a database of fleet-wide local imagery/target coverage requirements and performs the brokering between the JCA and the National Technical Means (NTM) source to determine what is available versus what is desired by each remote user site. (The NIS IESS contains only local site, versus fleet-wide, requirements.) IESS Client users create "**local requirements**" (when, why and how) and "**local targets**" (who or what). If a target is not identified in a local requirement, imagery is not being requested for dissemination to your site.

Operators should begin by determining if a target exists in the IESS. Targets are geographic locations with latitude, longitude, and radius as defined in the MIDB database base load or created by a local site IESS user.[19] If a target has active requirements against it but imagery has not been disseminated, the site will have to initiate a collection requirement via site-established procedures. If the target is in IESS but there are no requirements associated with it, IESS will not order the imagery. A Fast Access Format (FAF) Block Recalculation can be initiated on IESS to determine if the source has any imagery that can satisfy the target. If the FAF Block Recalculation is successful, then imagery can be requested from the source via the IESS.[20] After the imagery is requested, the site should create a requirement against the target so imagery will be automatically disseminated to the site in the future.

The JCA user can select from three pre-built templates when establishing standing local requirements for imagery dissemination:[21]

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[18] NSAWC NTTP 3-03.1-02 *Unmanned Aerial Vehicle (UAV) Support of Time Sensitive Operations (TSO)*, dated October 2001.

[19] The Concentrator IESS server is not connected to theater intelligence center IESS servers, so sites are free to create local target BE (Basic Encyclopedia) numbers without having to use the normal Defense Intelligence Agency (DIA) approval chain.

[20] If the FAF Block Recalculation is not successful, imagery is currently unavailable for the desired target area. It is important to note that JSIPS-N imagery dissemination leverages off of National collection strategies. If individual sites desire/require national system tasking then the appropriate theater Collection Management Authority (CMA) should be contacted.

[21] Additionally, sites can initiate "adhoc" requests for imagery/target coverage when operational tempo precedes establishing a standing local requirement and awaiting dissemination of new coverage. If the imagery need is of a more immediate nature, then you should contact your site Collection Manager and discuss collection tasking nomination and/or wait for future collection tasking accomplishments.

1. Push Only — Performs near real-time auto-dissemination to a sites IPL when imagery/target coverage requirements are meet.

2. Pull Only — Only performs dissemination to the Concentrator Open Primary Server (COPS) archive when imagery/target coverage requirements are meet. Imagery is then available for chipping or full product retrieval when a site user desires.

3. LIMDIS — Only performs dissemination to the COPS archive when imagery/target coverage requirements are meet and an approved Military Proper Use Statement (MPUS) is filed locally with ONI collection managers. LIMDIS is required for all CONUS imagery requests.

When imagery coverage is collected by NTM, the source notifies the IESS server via the DE of each image it has available (Figure 2-6). The IESS server then performs two correlations: 1) local IESS requirements to available imagery (RIC, Requirements to Imagery Correlation) and 2) local IESS targets to available imagery (Target to Image Correlation (TIC)). The IESS server then orders, via the DE, the appropriate imagery coverage from the Source, and passes received imagery to a long-term imagery archive (JCA COPS server or NIS RAID). The Concentrator IESS server also requests that the Concentrator DE auto-disseminate imagery to each site IPL, as specified by their IESS Local Requirements. If imagery is unavailable or restricted, the IESS notifies the requesting user that dissemination will not be accomplished. Once in the site IPL, imagery can be further disseminated by operators using the IPL Q2 software to other JSIPS-N components, GCCS-M, TES-N or to other destinations connected to SIPRNET or IT-21 networks (section 2.5.1.2). If received via the NIS, imagery may need to be sanitized and manually transferred to a Secret GENSER system for processing.

Managed properly, this process results in NRT dissemination of national imagery. Dissemination based on each site's IESS local requirements (i.e., only data for high interest targets are pushed) results in better utilization of available Challenge Athena III (CAIII) communications bandwidth. Units in transit from one geographic region to another (bottom of Figure 2–6) should turn off local requirements for the area they are leaving. This will also ensure efficient use of bandwidth by preventing the dissemination of imagery not currently needed. See Appendix B for more information about CAIII.

2.4.3.2 Theater Platforms

Theater reconnaissance platforms (Global Hawk and Predator UAVs, U-2, etc.) are considered high value, low-density assets. They are usually controlled/coordinated at the JFC level to support strategic and theater reconnaissance objectives, which likely do not coincide with the emergent operational and tactical objectives of the forward deployed warfighter. Therefore, significant coordination and planning must occur between operational and theater levels to achieve ISR/Ops synchronization with non-organic ISR assets.

Doctrinally, collection requirements are normally set at the component commander (JFACC, Joint Force Air Component Commander/JFMCC, Joint Force Maritime Component Commander/JFLCC, Joint Force Land Component Commander) or above level, based on collections requests from within each component. A Joint Force level collection manager will make a determination as to the best sensor to gather target cueing data given ISR asset availability and other mission area requirements that have been forwarded to him via the theater collection management process. ISR platform tasking is usually disseminated through the ATO when all requirements have been determined.[22]

NFN systems do not directly support or influence the theater collection management process per se. Asset allocation decisions will continue to be made at the joint force level. Once a decision has been made, however, that a theater ISR

[22] A potential problem that tactical forces may encounter is that force application (asset allocation) often occurs before execution planning (i.e., the ATO is generated before specific mission planning begins). It is therefore often difficult to integrate ISR assets into real-time strike operations. Upon arrival in an AOR, fleet unit intelligence organizations should review current contingency plans / response options to ensure ISR platforms are incorporated into those plans. Otherwise, it will be necessary to submit immediate / ad hoc requests for ISR support after the ATO is published. See NSAWC NTTP 3-03.1-02 *Unmanned Aerial Vehicle (UAV) Support of Time Sensitive Operations (TSO)*, dated October 2001 for additional considerations on integrating ISR assets into TSS missions.

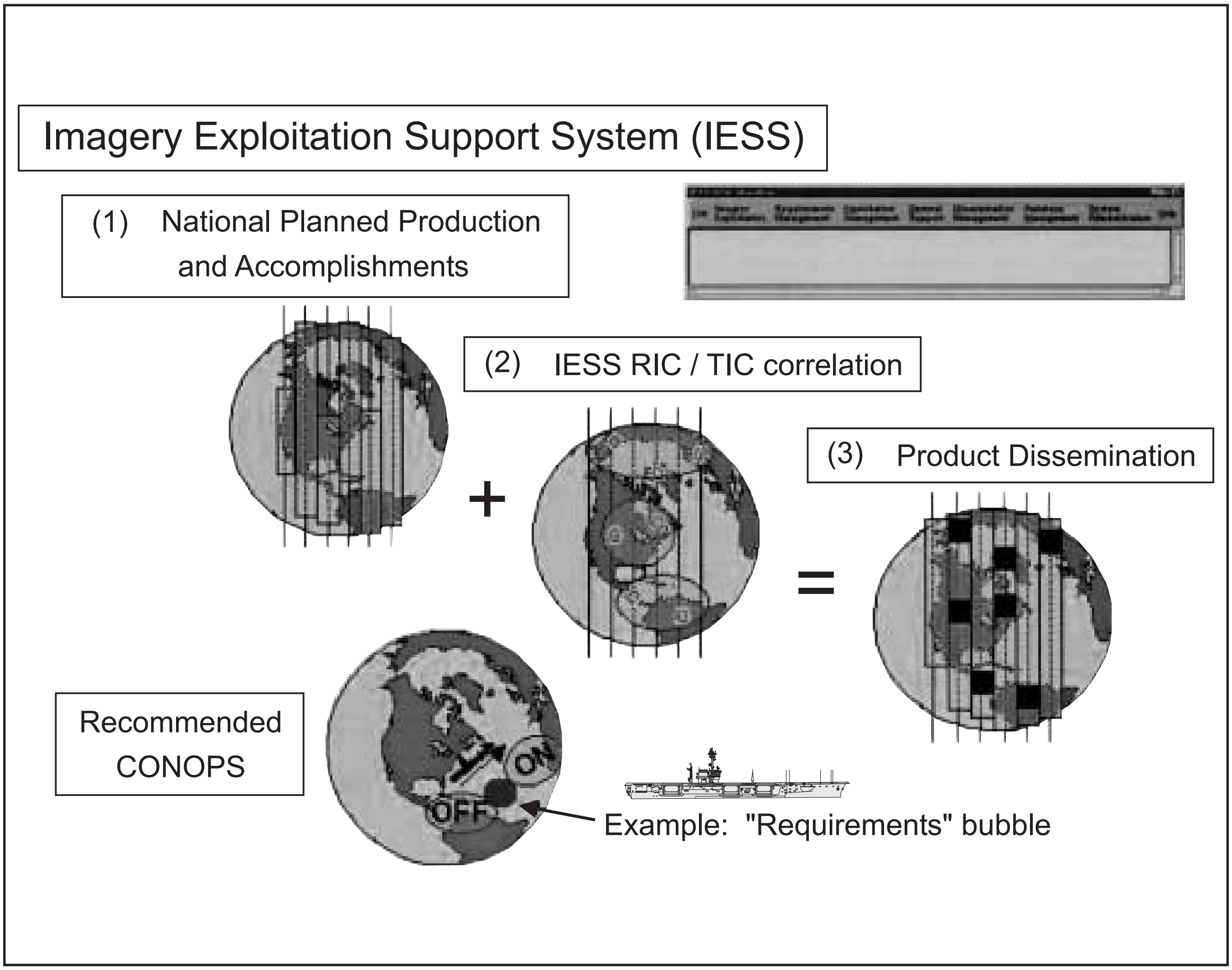

Figure 2-6. NTM Imagery Dissemination Management

platform will support a naval mission, several steps can be taken prior to the mission that will facilitate the platform's integration into fleet operations. Specifically, the ISR asset's navigation and collection (sensor) plans should be entered into the appropriate NFN system and, if applicable, TES-N IESS local requirements should be defined to facilitate the exploitation process. If theater ROE and inter-service memoranda of agreement (MOA) allow, TES-N can be used to design navigation and collection plans for specific ISR platforms.

2.4.3.2.1 Navigation/Collection Plans

Both TES-N and JSIPS-N (configured with a TIS, section A.3.1.6) are capable of receiving sensor data from CDL-N compliant platforms. Each has a CIP capable of processing the platform/sensor combinations in Table 2–2.[23] The TIS is also able to process FA-18E/F SHARP data (section 2.4.3.3 Tactical Platforms).

[23] A TES Remote Terminal Component (RTC) does not have a CIP, but by using Data Input/Output Processing (DIOP) is able to remotely control a CIP located at a full TES-N site. The RTC can therefore receive, display, and exploit ISR sensor data processed at the full TES-N site.

Platform	Sensor	Sensor Type	Modes	CIP Version
U-2	ASARS-2	SAR	Spot 1, Spot 3, Continuous Spot 1, Continuous Spot 3	x.x
	SYERS	EO/IR	EO: Full Field/Full Resolution Full Field/Half Resolution Half Field/Full Resolution IR: N/A	x.x
	ASARS-2a	SAR	Point, High Resolution Search, Medium Resolution Search, Coarse Resolution Search	x.x
	ASARS-2a	MTI	Wide Area Moving Target Indicator (WAMTI), Swath Moving Target Indicator (SMTI)	x.x
FA-18	APG-73	SAR	Strip, Spot	
FA-18D	ATARS (MAEO)	EO	N/A	x.x
	ATARS (LAEO)	EO	Vertical, Forward	x.x
	ATARS (IRLS)	IR	Wide, Narrow	x.x
Global Hawk	Global Hawk	EO/IR	Point, Spot, Wide Area Search (WAS)	x.x
	Global Hawk	SAR	Wide Area Search (WAS), Spot (near), Spot (far)	x.x
	Global Hawk	MTI	Wide Area Moving Target Indicator (WAMTI)	x.x

Table 2-2. CIP Compliant Sensors

The EMPS is the primary TES-N software component that allows users to manage and monitor U-2 and other theater ISR platform operations. EMPS has four primary functions:

1. Produce and distribute navigation plans and collection plans for U-2 ASARS-2, ASARS2A (AIP, Avionic Improvement Program), and SYERS missions.

2. Provide complete mission monitoring of ASARS-2 operations (section 2.5.1.3.2).

3. Provide mission monitoring for any aircraft and sensor combination (section 2.5.1.3.2).

4. Support full mission reporting capability (section 2.5.1.3.2).

EMPS maintains full interoperability with the U-2's operating base. This allows electronic exchange of navigation plans and collection plans, as required. Navigation and collection plans for other platforms are manually entered by the operator.[24]

Electronic tactical collection requirement messages (1684s) are received by TES-N and automatically inserted into the EMPS database. (**Note:** Collection Requirements are also frequently received as a list via secure fax, etc., and must be entered manually.) Targets, navigation plans and collection plans that have already been developed by other users (e.g., the U-2 unit) can be received via SIPRNET, or the user can manually create them from within EMPS. Graphical map underlays and a variety of mission components (targets, aircraft, route, etc.) are used to assist

[24] In addition to the current U-2 collection planning capability, the USAF is funding/developing collection planning for Predator and Global Hawk as part of the (TES) ISR-M program element. This will be implemented in the 5.X TES common software to be fielded in 2QFY2003.

operators in the mission planning process.[25] While general operations and navigation planning are identical for ASARS-2 and SYERS missions, collection planning varies according to the sensor.

Collection planning for ASARS involves automatic and/or manual planning of individual targets defined by collection requests. Information contained in collection requests includes the target location and the sensor mode of operation. The operator uses EMPS to select targets from a list of candidates. Each target is subsequently mapped to the specified navigation plan, and becomes a scene in the collection plan. The EMPS software automatically provides the optimal collection geometry for each target. The operator has the option of overriding default sensor parameters.

SYERS collection planning differs from ASARS-2 collection planning in that scenes are associated with the legs of the aircraft route as opposed to individual targets. Once a SYERS sensor is associated with a collection plan, each leg of the aircraft navigation plan becomes a SYERS scene. The scenes are then split and dragged to either side of the flight path to provide target coverage. Each SYERS scene can cover multiple targets.

TIS version 1.6 will display SHARP and manually entered U-2, Global Hawk, and Advanced Tactical Airborne Reconnaissance System (ATARS) navigation and collection plans over charts. Real time mission monitoring with TIS and Tactical Exploitation System (TES) is discussed in section 2.5.1.3.2.

2.4.3.2.2 TES-N IESS Local Requirements

An IESS (part of the full TES-N and LSS configurations, section A.4.2) handles management of exploitation requirements. Exploitation requirements identify the intelligence information that is to be extracted from collected imagery, who should be sent the data, what form it should take, and when it is needed (due date, etc.). IESS exploitation requirements can be generated automatically by EMPS or can be manually inserted by the user.

As part of the final stages of the EMPS mission planning process, ASARS2 Collection Plans and SYERS autochipping lists can be translated into exploitation requirements that are sent to the IESS. This generation is accomplished via a software process called Local Requirements Generation (LRG). LRG formulates an IESS Requirements Update (REQUPD) message that is sent to IESS for manual review and approval at the IESS (Figure 2-7). This is not an automatic process and some user intervention is required. The REQUPD message is generated and sent to the IESS when the “Update IESS” button is clicked in EMPS. The REQUPD message must then be manually processed at the IESS.

Exploitation requirements automatically generated by the LRG have the following properties:

1. Output product = Initial Photo Interpretation Report (IPIR).
2. Lifetime set in original Collection Request or 1 year.
3. Classification — Secret.

[25] Before creating and/or receiving navigation and collection plans, users should be sure to load maps that will be used by EMPS. Map formats include:

)= ADRG (Arc Digitized Raster Graphics) format
)= Jet Navigation Charts (JNC) 1:2,000,000 scale
)= Operational Navigation Charts (ONC) 1:1,000,000 scale
)= Joint Operations Graphics (JOG) 1:250,000 scale
)= Topographic Line Maps (TLM) 1:100,000 or 1:50,000 scale

)= DTED (Digital Terrain Elevation Data) format
)= DTED Sun Shaded – a representation of terrain elevation
)= DTED Raw – imports only terrain elevation values
)= DTED Both – imports both Sun Shaded and Raw data

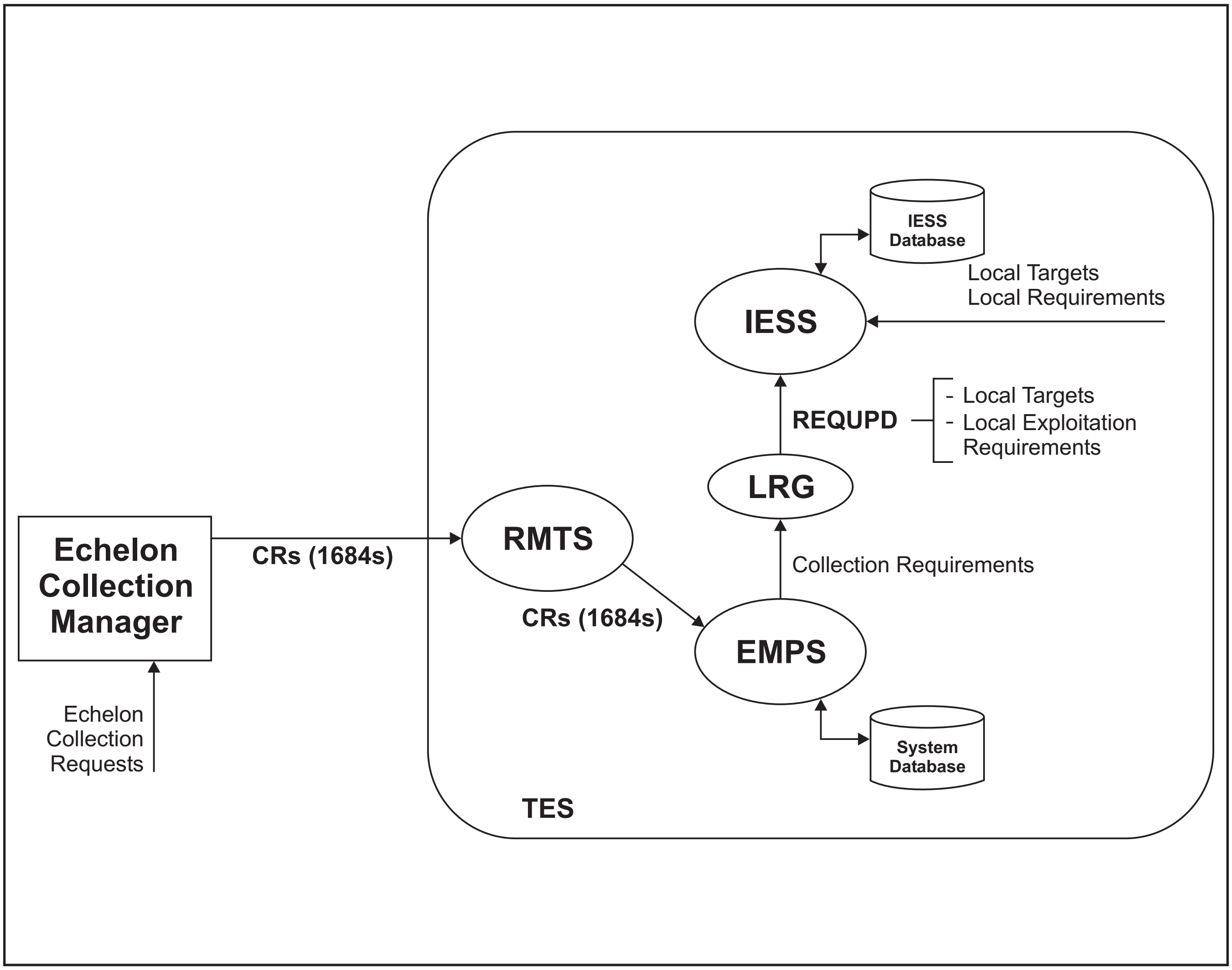

Figure 2-7. Exploitation Requirements Generation Process

4. Target specification geometry mirrors EMPS collect geometry.

5. If no target exists at the collection location, then a "soft BE" is generated in the following format:

   a. WWWWPPNNNN where

      (1) WWWW World Aeronautical Chart (WAC) cell of target location

      (2) PP producer code

      (3) NNNN number assigned incrementally.

6. Tactical targets that are collected every day keep a standing local requirement in IESS.

7. LRG processing should not create a new local requirement each time the same tactical target is resubmitted via REQUPD from the daily Collection Plan.

Users should be aware that REQUPD message processing takes time. **The collection plan should be finished and updated to the IESS before acquiring downlink with the ISR platform.** In scenarios where the collection plan is not available until downlinked from the aircraft, some exploitation requirements will not get scheduled in the IESS before imagery arrives from the CIP. These scenes aren't lost but are placed in the Default Softcopy queue because the IESS will not know which exploitation requirement is related since the image does not contain any pending targets. See the TES-N Users Manual for specific procedures on how to downlink a collection plan.

2.4.3.3 Tactical Platforms

For organic naval TACRECCE assets (F-14 TARPS, FA-18D ATARS, FA-18F SHARP), component commander ISR tasking will generally be limited to required point or LOC targets to be covered. This allows tactical aircrew to conduct their own mission planning based on threat data and knowledge of sensor coverage. Aircrew must manually determine standoff/overflight requirements, sensor on/off times, and optimum routing. JSIPS-N offers many connections to various flight planning and target folder systems (e.g., TAMPS, Quiver and PFPS). See section 2.8.1 for additional information on execution planning.

TIS version 1.6 will enable import of F-18 SHARP collection plans into the Situation Awareness Processor (SAP) for display over system charts (other sensor/platforms must still be entered manually). Real time mission monitoring of SHARP TACRECCE flights with TIS is discussed in section 2.5.1.3.2.

2.4.3.4 Planning for Direct Down Link (DDL) Operations

DDL operations involve the direct receipt and display of imagery and data from the ISR platform or its supporting satellite through a user-located datalink without filtering or processing at another location (Figure 2-8). This architecture has significant advantages over "reachback" operations. Specifically, faster receipt of ISR platform data

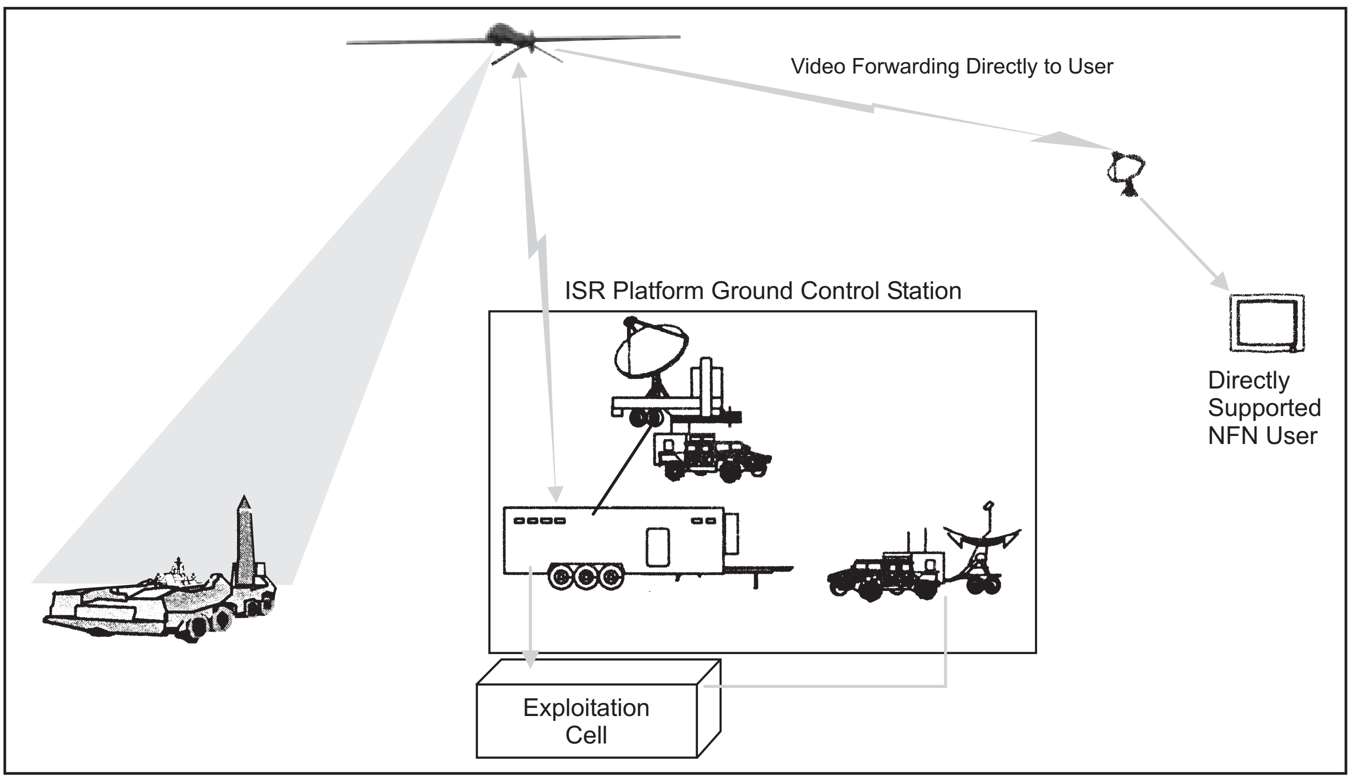

Figure 2-8. Direct Downlink Operations

products can be anticipated.[26] This is mainly because most of the bandwidth "bottlenecks" that can be encountered along intermediate stops are avoided. Fewer nodes along the Command, Control & Communication (C3) pathway also mean that the user is less prone to lose connectivity due to a single point of failure along that pathway. However, geographic LOS and hardware availability becomes a consideration.

User-training requirements for DDL operations are more robust than for reachback operations and require more in depth knowledge of ISR platform operations, capabilities, and performance. In addition, DDL requires that the user possess the specific hardware necessary to interact directly with the air vehicle/sensor. This hardware could be a simple remote video terminal (RVT) that receives video via an omni-directional antenna on a Pioneer, Hunter, or (some) Predator UAVs. As discussed earlier, DDL operations from a U-2, Global Hawk HAE UAV or FA-18 SHARP requires a CDL-N antenna and a CIP.

The ability to receive DDL products will vary depending upon the ISR platform, service-specific Concept of Operations (CONOPS) and procedures that have been established within the unified combatant commander's area of operations. Even if DDL is allowed, the user may not be able (or permitted) to directly control the sensor. Therefore, when establishing this type of architecture, and when the ISR platform is tasked to directly support naval operations, users should make every attempt to establish real-time communications and interaction with the ISR platform sensor operators.

2.5 SENSOR DATA RECEIPT & MANAGEMENT

Both the "Find" and "Track" phases of the TST process (Figure 2-5) involve the receipt of ISR sensor data. Many ISR platform sensor products are available to support NFN (Figure 2-9). Each sensor product typically enters the NFN architecture via a particular component system (GCCS-M, JSIPS-N, or TES-N). Once in that component system, the sensor product can usually be passed to other components for exploitation, analysis, and/or display (assuming the components are connected via network as discussed in section 1.3.1). The rest of this document will refer to "primary" and "alternate" sensor paths to describe the manner in which sensor data arrives into an NFN component system.

2.5.1 Imagery Receipt/Processing

Both TES-N and JSIPS-N (if equipped with a TIS) are capable of receiving imagery directly from tactical and theater airborne reconnaissance systems. JSIPS-N is also capable of receiving imagery derived from national technical means (NTM). Within this document, imagery received from airborne systems is referred to as "tactical imagery." Imagery received from NTM is referred to as "national imagery". In order to fully understand how the various NFN component systems manage imagery, however, users must have an awareness of how that imagery enters each system. The data paths by which tactical and national imagery enter the NFN architecture determines not only what steps users must take to process the imagery, but also how each system will handle exploitation task management.

2.5.1.1 Imagery Formats

Intelligence and operations personnel should be aware of the format of incoming imagery. Some imagery formats have imbedded intelligence data within the image, while others do not. Moreover, not all NFN component systems are able to read and process all imagery format types. The format of imagery received is largely dependent on the data path by which the image arrived.

[26] For example, the Global Hawk HAE UAV Advanced Concept Technology Demonstration (ACTD) dramatically showed that product receipt direct from the UAV took approximately 2.5 *minutes*. Product receipt via reach back was normally 3.5 *hours*. Available communications bandwidth plays a critical role in the speed of sensor data receipt. See Appendix B for more information about communication bandwidth issues.

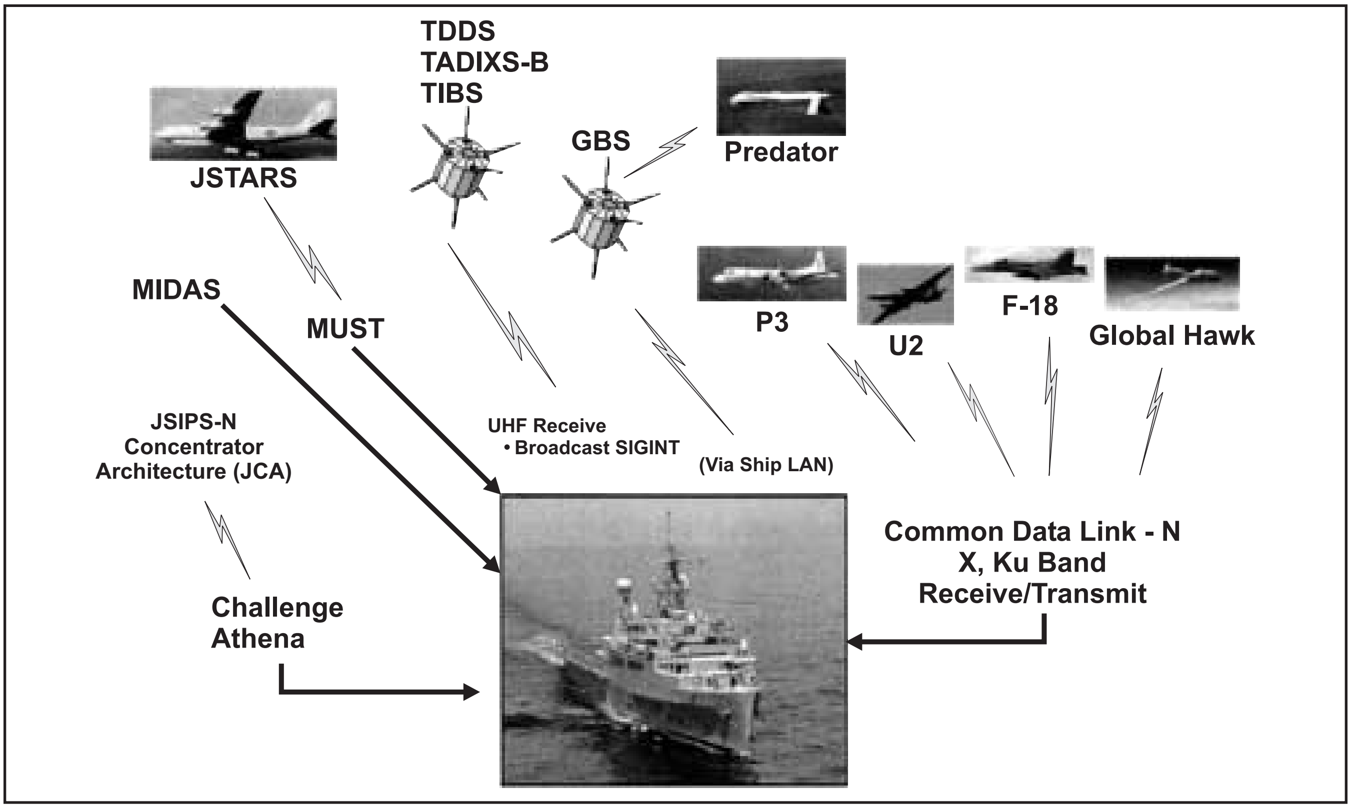

Figure 2-9. NFN Sensor Inputs

Two national imagery formats currently exist— National Imagery Transmission Format (NITF) and Tape Format Requirements Device (TFRD).[27] Both national formats contain metadata (precise location data, etc.) related to the pixels of the image, greatly increasing its exploitation value. NITF and TFRD formats are support by JSIPS-N for receipt, storage, display and secondary dissemination (electronically or via magnetic media). GCCS-M and TES-N, however, do not support the display of TFRD imagery — all files transferred from JSIPS-N to these systems must be converted to NITF 2.0 format.

Tactical sensor data received via a CDL-N antenna is processed by a Common Imagery Processor (CIP) and by default is converted into NITF 2.1 imagery format. TES-N and GCCS-M, however, are currently able to display only NITF 2.0 image files. When saving chipped images, the operator screening incoming sensor data should manually save the image file in NITF 2.0 format.

Tactical sensor data received via means other than the CDL-N antenna usually arrives at the ship in JPEG format (e.g., Tomcat Fast Tactical Imagery (FTI)) or in video format (e.g., Predator UAV) where it is processed by COTS video chipping software to create a JPEG (or similar commercial image format). Commercial image formats do not contain metadata and therefore do not have any intelligence data imbedded within the image. While tactical situational awareness can be obtained from these images, precise geopositioning (section 2.6.3) is usually not possible.

[27] The NITF format is 8 or 11 bits per pixel and is considered to be "Uncompressed" imagery (unless JPEG compression has been applied). The TFRD format is 1.29 bits per pixel and is considered to be "Compressed" imagery. Because of the imbedded pixel density, there is a dramatic file size difference between the two formats - approx. 7 or 10 times depending on an NITF bit per pixel rate of 8 or 11. (i.e. a 100Mb TFRD 1.29bpp image is a 900Mb NITF Uncompressed 11bpp image). Primarily, PMA281 systems utilize the TFRD format and consider the 1.29bpp compression rate the lowest density to be used in support of PGM targeting (TLAM included). Johns Hopkins Applied Physics Lab completed an extensive study for PMA281 in support of the TFRD format utilization.

2.5.1.2 National Imagery Receipt/Retrieval

Auto-disseminated NTM data (described in section 2.4.3.1) is stored locally on a site NIS or IPL for archiving, retrieval, and further dissemination. Because the JCA provides near-real-time dissemination of national imagery, your logical starting point for imagery queries will be on your local site IPL (Figure 2-10), which functions as a site's "long term" local imagery archive (1 or 4Tb RAID) and imagery server.

The operator should log into the IPL and initiate a query of the IPL holdings via the Quick Query (Q2) software. (The Q2 web based software provides users with the functionality to browse local holdings maintained on the site IPL, preview image overviews and perform further dissemination to exploitation/mensuration workstations. All GENSER systems connected to the JSIPS-N LAN have the capability to browse and disseminate imagery from the IPL via the Q2 software.) If the query is successful, the operator can select the imagery that satisfies the requirement and have that imagery transferred to a workstation. If the image requirement cannot be satisfied by the local imagery holdings on the IPL, the operator will need to expand the search to include JCA assets.

Long-term archiving of all fleet imagery requirements is accomplished by the JCA Concentrator Open Primary Server (COPS), which provides a "reach-back" imagery archive scaled to support 5 years on online imagery. COPS does not store all collected products, only products requested for dissemination by registered fleet local requirements (section 2.4.3.1). The COPS Web client is the site user interface to the COPS server at the JCA. The COPS Web Client provides the user with the functionality to browse the entire JCA library and either pull "as stored" or "chipped" imagery/target coverage.[28] The files requested are transferred via file transfer protocol (FTP) to the IPL and Quick Query must then be used for local retrieval, previewing, and further dissemination. If the Concentrator COPS server holds no imagery coverage then the user will query the Concentrator IESS server via the IPL IESS client (section 2.4.3.1). If the Concentrator IESS server holds no imagery coverage information then none is available. Figure 2-11 provides a summary of the national imagery retrieval process.

National imagery stored in the IPL can be manually forwarded, as required, to the imagery servers in TES-N and GCCS-M (Figure 2-12). The IPL can also be set up to forward imagery automatically as it is received from the JCA, but this is not necessarily recommended for NFN operations. This is because the image storage resources of the receiving systems can become overwhelmed with imagery that is already stored on another system. Imagery forwarded from the IPL to TES-N and GCCS-M should be converted to NITF 2.0 format before sending. Procedures for forwarding imagery from the IPL are included in Appendix G.

2.5.1.3 Tactical Imagery Received Via CDL-N

Both TES-N and the JSIPS-N TIS are able to receive and process tactical imagery from the sensors listed in Table 2-2 via the CDL-N antenna.[29] In addition, the TIS is able to process FA-18E/F SHARP sensor data. Figure 2-13 graphically represents data receipt and processing of tactical imagery received via the CDL-N.

2.5.1.3.1 CDL-N Data Receipt

In order to receive directly downlinked sensor data from a U-2, Global Hawk or FA-18 SHARP aircraft, the respective platform must be within line of sight (LOS) of the local CDL-N antenna. If the ISR platform is not within LOS of the local CDL-N antenna, sensor data will need to be retrieved by a remote site that is either within LOS of the platform or has satellite communication (SATCOM) connectivity with it. The remote site will process the raw sensor data and forward imagery to the afloat unit via SIPRNET, JWICS or another designated communication channel.

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[28] Site user access to the COPS server should be limited to a few authorized users who have the responsibility to order imagery for the site. If too many users have access to the Concentrator, the site bandwidth allocated for imagery receipt may be over utilized and cause a delay in the near real time imagery delivery to that site.

[29] The USMC FA-18 Advanced Tactical Airborne Reconnaissance System (ATARS) is unable to transmit NRT data to the CDL-N antenna. Data must be processed via tape once the aircraft has landed. In all other respects, however, processing is the same as that for other sensors described in this section.

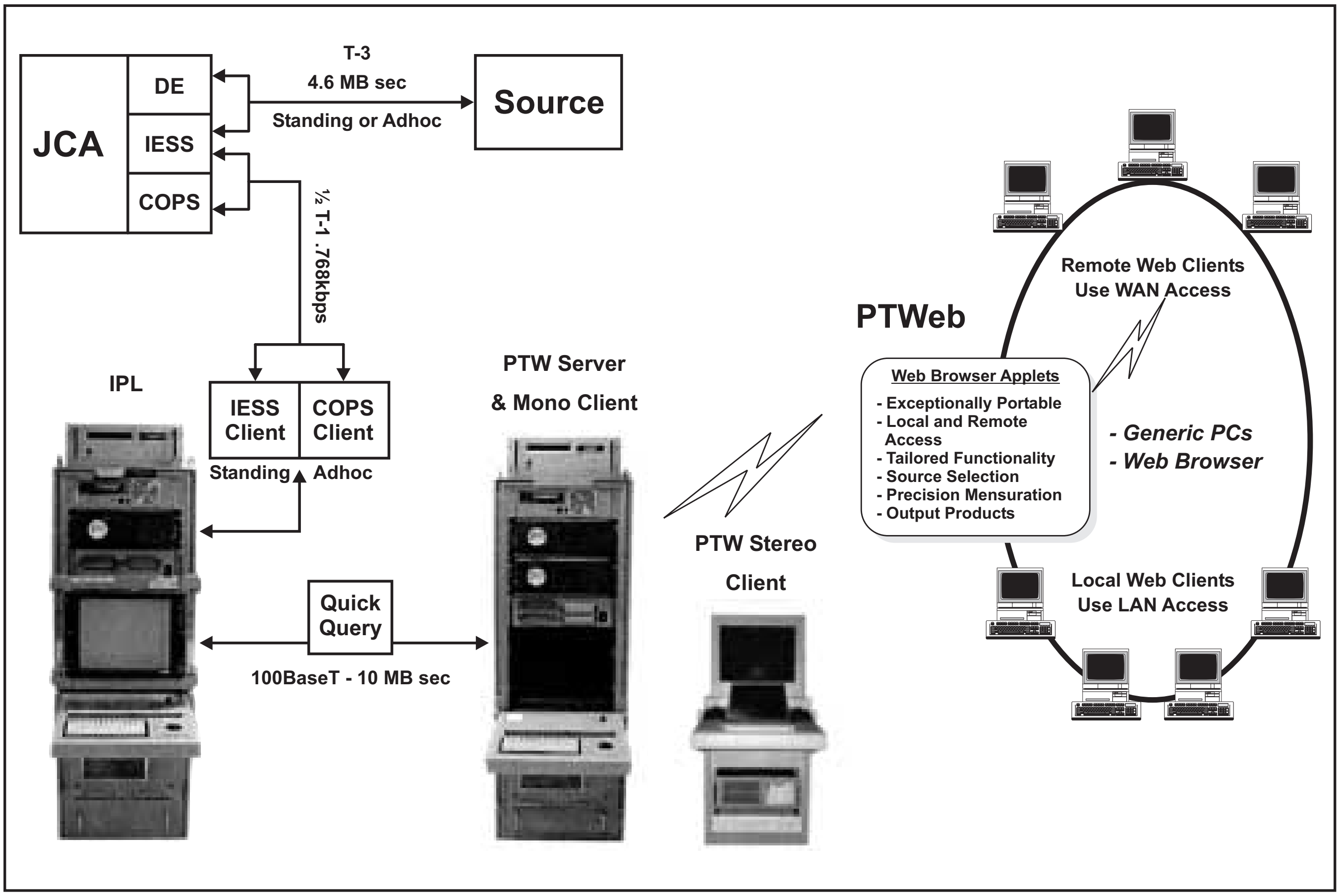

Figure 2-10. JSIPS-N Image Archive Architecture

If the ISR platform is within LOS of the local unit, tactical sensor data is downlinked via the CDL-N and processed by the TES-N or TIS CIP, which forwards formed imagery to System Server 1 (SS1) or the Screener Processor Element (SPE), respectively.[30] These servers host many software processes related to tactical imagery operations including CIP configuration, datalink interaction, telemetry data processing, image seaming, and tape control. SS1 and SPE also host the screener and chipper applications (discussed in greater detail in section 2.5.1.3.3) that allow users to view and selectively chip images from the incoming sensor data.

2.5.1.3.2 Mission Monitoring

NRT monitoring of an ISR mission (or time late if from a pre-recorded tape) is possible via the TES-N Enhanced Mission Planning Software (EMPS) or the TIS Situational Awareness Processor (SAP). Both are designed to present operators with a situational awareness display of charts, imagery, target cueing data and ISR platform navigation plans, collection plans and current location. This display should be used by intelligence personnel as they are screening incoming sensor data to anticipate upcoming preplanned target collection. Target cueing (ELINT tracks, etc.) can also prompt screeners to look for unplanned targets of opportunity. Mission reports can also be generated and disseminated from within EMPS and SAP based upon tactical exploitation requirements. EMPS and SAP nevertheless have slight variations in how they accomplish the above.

[30] The CIP, a component of the Common Imagery Ground/Surface System (CIGSS), is the primary signal processor for all sensor data except SHARP. SHARP data received via the CDL-N is processed directly in the SPE.

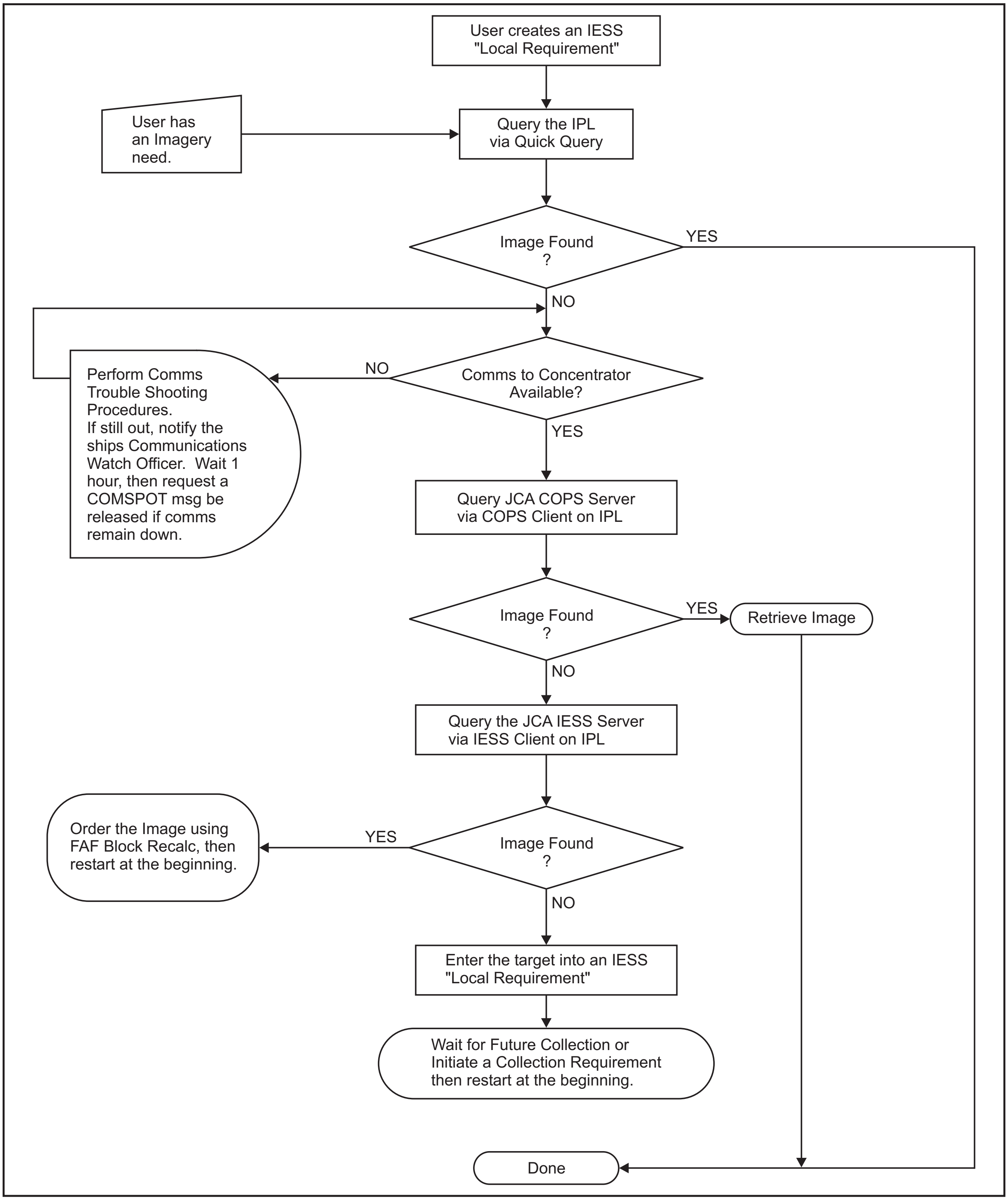

Figure 2-11. National Imagery Retrieval Process

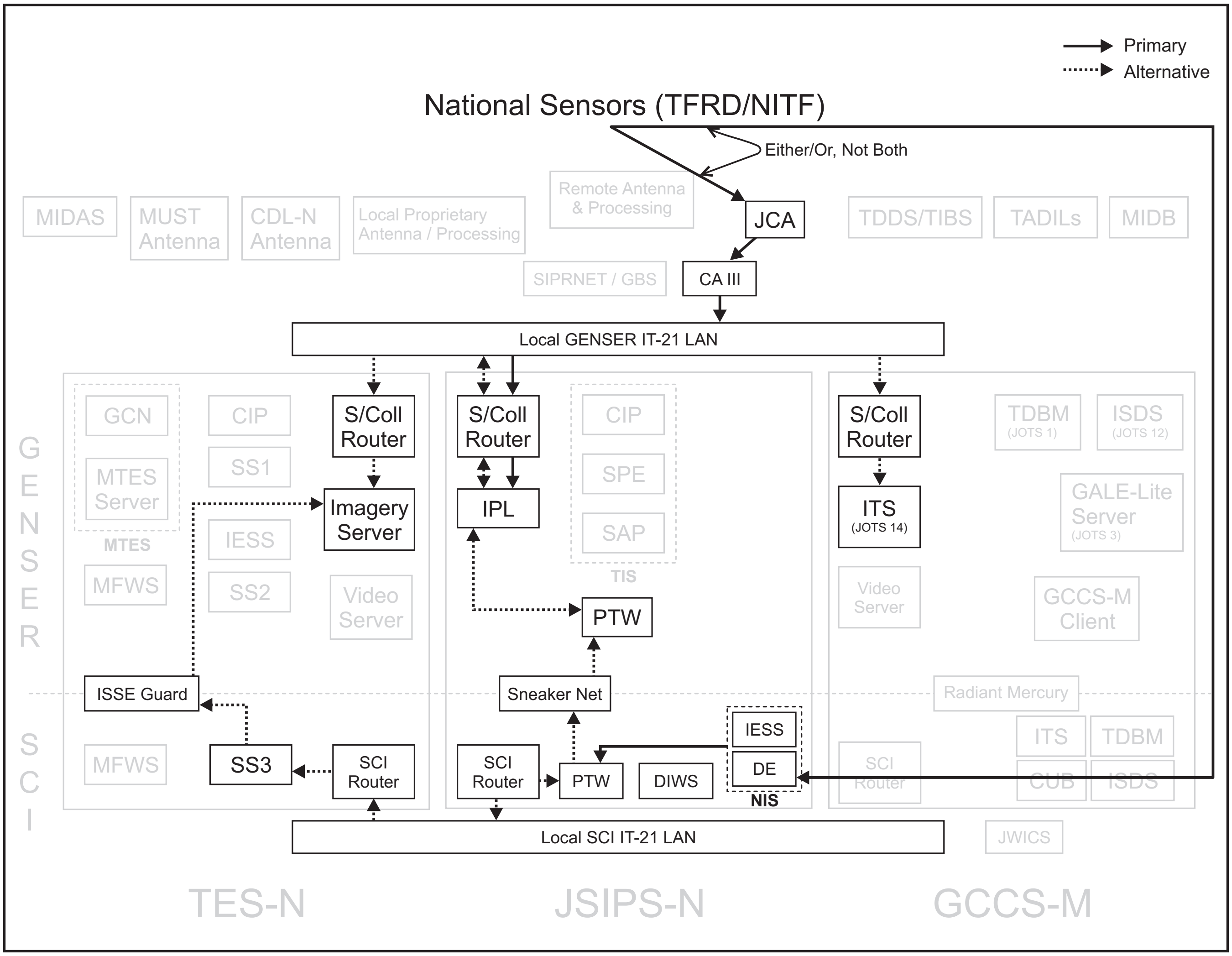

Figure 2-12. National Imagery Receipt

EMPS is accessible from any TES-N MFWS. It capable of providing mission monitoring for any aircraft and sensor combination, but is optimized for U-2 operations.[31] It can automatically import U-2 navigation and collection plans (all others must be manually entered) and supports operator retasking of ASARS-2 and SYERS sensors (section 2.5.1.3.4). EMPS interfaces with the Cross-INT database, allowing operators to display Graphical Situation Display (GSD) track symbology over loaded charts and imagery (see section 2.7.2.2, "ITD", for additional information about GSD symbology). To get the most utility from this feature (and to prevent overload and potential system slowdown) Cross-INT data should be filtered to display only high interest contacts and emitters within the area of interest.

The SAP is accessible from the TIS workstation. It also is capable of providing mission monitoring for any aircraft and sensor combination, but is optimized for FA-18 SHARP operations. The SAP provides its target cueing data from GCCS-M MIDB and ELINT data (like TES-N Cross-INT data, GCCS-M data should be filtered to maximize efficiency). Functionality of early versions is somewhat limited, but is increasing with each successive release: TIS

[31] In addition to the current U-2 mission monitoring capability, the USAF is funding/developing a mission monitoring capability for Predator and Global Hawk as part of the ISR-M program element. This will be implemented in the 5.X TES common software to be fielded in 2QFY2003.

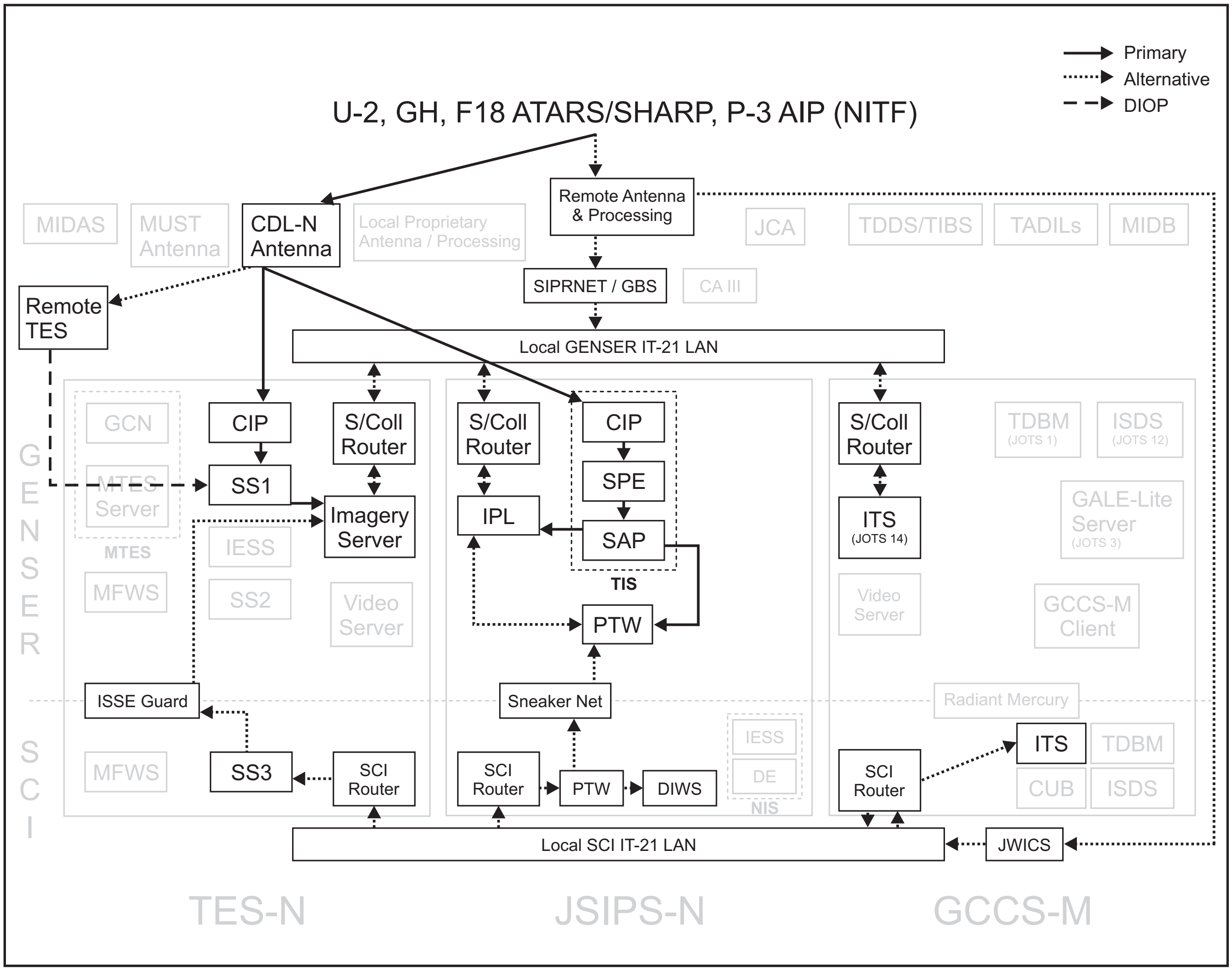

Figure 2-13. Tactical (CDL-N) Imagery Receipt

version 1.5 displays GCCS-M ELINT track data and collection footprints/aircraft position at the time of imaging on charts. TIS version 1.6 will also display GCCS-M MIDB data, SHARP (and manually entered U-2, GH, and ATARS) collection plans and real-time aircraft position over loaded charts and imagery. Additionally, TIS version 1.6 will inlay collected imagery as thumbnails on charts.

2.5.1.3.3 Data Screening

As imagery from the CDL-N (or from a pre-recorded tape) is formed by the CIP, it is transferred to SS1 or the SPE, where it is displayed on a screener display. The primary function of the screener application is to allow the operator to quickly determine image content, identify target coverage, roughly assess image quality (screener display is in reduced resolution) and select image chip(s) for dissemination as the imagery is being processed.

Waterfall images displayed on the screener are available for only twenty seconds; unless the mission is being recorded to tape (or already exists on tape), operators will be unable to screen a particular target area once the sensor has passed. It is for this reason that target cueing is extremely important. In addition to the target cueing provided by the EMPS and SAP applications (described above), Cross-INT track data (in TES-N) and GCCS-M MIDB/track data (in TIS) can be overlaid on top of the screener displays. The screener is normally enabled on a separate workstation with no other applications running on it to facilitate computer system speed.

Selected sub-images (chips) can be extracted from the image datastream via the screener display and sent to the Imagery Server or SAP. (Note: chipping imagery does not command the sensor; it simply creates a sub-image based on the screener display.) The user can create either full resolution or reduced resolution chips. Full resolution chips create a sub-image at the actual collection resolution and are not down-sampled. These chips are identical to imagery in full resolution display and are used for high-level detail. Reduced resolution chips create a sub-image at reduced resolution (8:1 down-sampling) and are identical to the imagery viewed in the screener display. These chips are used to capture large coverage areas of interest. Chipping can be performed manually or automatically (autochipping) from a designated list of target locations. The operator can also mark scenes as unusable if the image quality is poor. Users should be sure to save chips in NITF 2.0 format (the CIP default is NITF 2.1 format).

As imagery is chipped on the TES-N screener it is transferred to the NITF Import module on the Imagery Server (Figure 2-14). The NITF Import module creates a database record for the image and generates a Reduced Resolution Data Set (RRDS) to support exploitation. The Imagery Server then stores the image to system RAID and sends a Server Image Manifest Message (SIMM) to the IESS server to signify image arrival. The Imagery Server also sends a Single Image Target Area (SITA) Nomination Message (SITANM) to the IESS server which forces "requirement to image correlation" (RIC) and "target to image correlation" (TIC) against the image bounds (section 2.4.3.2.2 discusses TES-N IESS exploitation requirements in greater detail). If there is a matching local exploitation requirement within the IESS, an active softcopy exploitation task is generated and assigned to teams and queues that have been defined at the IESS (section 2.6.1, Workflow Management). If there is no matching exploitation requirement/target, the image database record is placed in a "Review Only" queue. The Database Organizer (DBO) provides operator access to imagery and map data sources stored in the system database. The DBO can also be used to verify that data is being received from the CIP.

The TIS SPE interfaces to the Real-Time RAID for temporary staging of NITF image data during screening. The SPE sends image products to the SAP for archive, where the selected image chip is forwarded to the IPL for long-term storage and, in the case of TST, forwarded simultaneously to the PTW for exploitation and precision geopositioning. Using the Archive RAID and a tape library, the SAP can archive SITA's and processed imagery from the SPE. Upon demand, the SAP can retrieve these files and make them available for dissemination or screening.

2.5.1.3.4 In Flight Sensor Requests/Control

TES-N software enables operators to control selected U-2 sensors. In the course of Joint operations, sensor control may be transferred to another component through deliberate planning (if allowed by theater ROE and with an MOA).[32] This will allow individual component commanders to employ the sensor optimally for Combatant Commander/JTF requirements and responsively prosecute a prospective high-value target in their AOR. This demonstrated capability also permits the U-2 to fly further without losing tether (communications) to supported units and reduces the concern of obscuration of a single downlink antenna. Transfer should occur at a predetermined point, at a specified time, and within a specified area of interest. This will allow all components to fully coordinate sensor control transfer responsibilities.

Dynamic sensor management must be governed by a deliberate set of rules. These rules provide the guidance for deviation from the established daily collection plan based on CJTF collection priorities. These priorities are based on JTF commander's critical information requirements (CCIR's) and priority intelligence requests (PIR's) and the time-sensitive target (TST) prioritization matrix, if used.

[32] The discussion that follows contains only general guidance for multi-service U-2 sensor control and handoff. Theater-level CONOPS will delineate specific coordination procedures if sensor control is permitted at all. See Appendix G for a coordination checklist that should be performed as naval units enter a new area of operations.

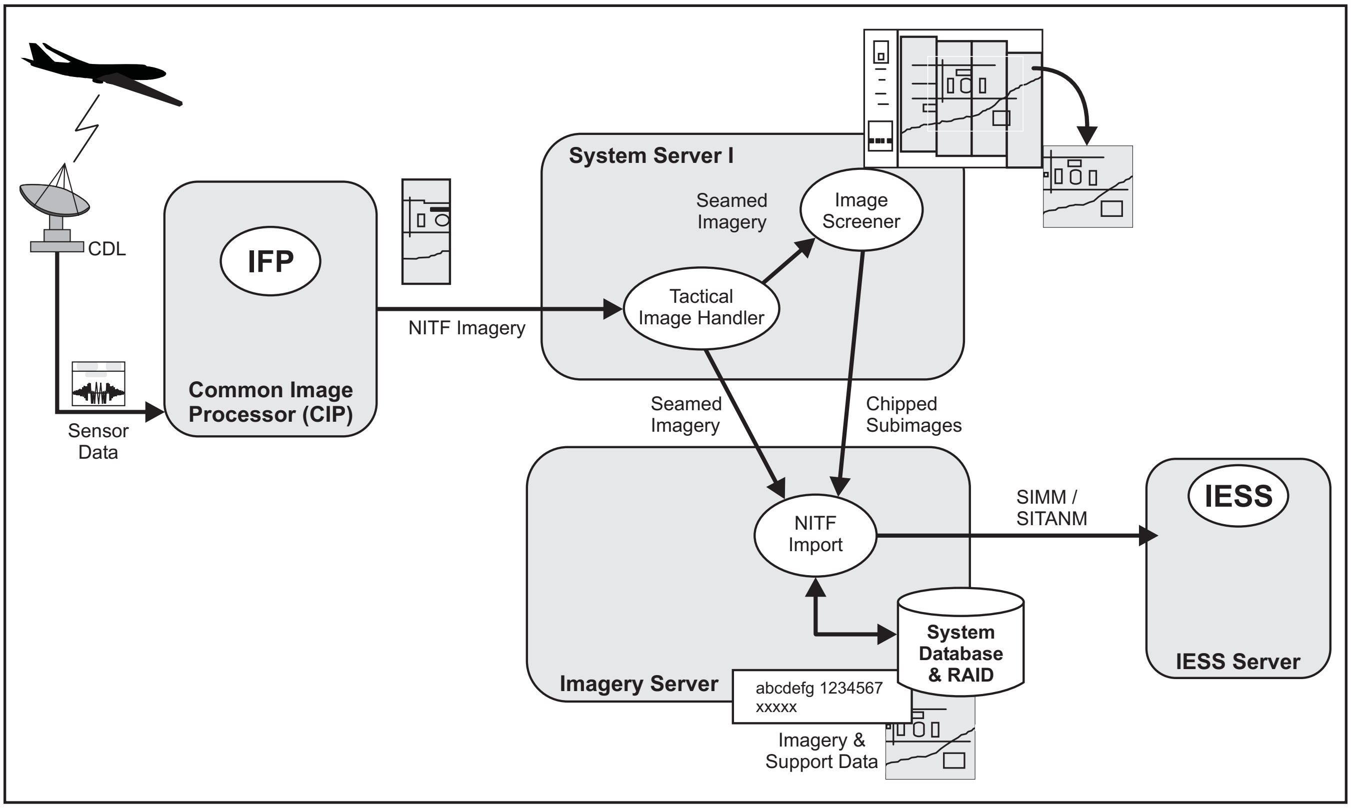

Figure 2-14. TES-N CDL-N Data Receipt Process

Mission control and dynamic retasking will be accomplished using EMPS and the TES-N screener software. Sensor platforms will drop link with home base at a specified time after verifying that the transfer agency/ground station is ready to receive data link. Sensor platforms will then establish data link auto-synch with the new controlling agency. During transfer, the sensor will continue collection according to pre-briefed mission plan. Sensor control transfer requires a good data link, confirmed imagery transfer, and positive communication between transferring agencies and the sensor platform. If handover does not occur within the defined opportunity window, the sensor platform will re-establish data link with home base.

Once transfer has occurred, the new agency will attempt to establish voice communications with the ISR platform over data link. If voice-over-datalink is not achieved, controlling agency will maintain communications with aircraft using appropriate/pre-briefed radio frequencies. The ISR platform's home base will retain threat warning advisory responsibility.

Several types of sensor control can be initiated from the TES-N EMPS and screener software (see the TES-N Operators Manual for specific procedures):

1. **Ad Hoc Spot Requests** can be issued during any mission, but require an ASARS-2 mission to perform collection (it is typically used to insert a collection request to be fulfilled by a later ASARS-2 mission). The request must be approved by the mission planning software and can be used in a current ASARS-2 mission only if an updated collection plan is up-linked to the aircraft.

2. **ASARS-2 Immediate Spot Requests** are typically issued from a search scene when unplanned targets appear. After the immediate spot has been collected, the search scene will continue, or the next scene in the collection plan will be collected. The database organizer (DBO) can be used to verify scene collection.

3. **ASARS-2 Search Range Adjust Requests.** Typically, the mission planner performs a wide-area search for targets, and if the angle of search is imaging too near or too far away from the desired search area, a search range adjust provides the means to correct the search.

4. **SYERS Slewing** allows the operator to manually direct the SYERS EO/IR sensor.

2.5.1.3.5 DIOP

The Data Input/Output Port (DIOP) capability of TES-N allows near real-time screening and exploitation of CDL-N downlinked tactical imagery by users without direct sensor access. DIOP provides the ability to transfer imagery from a full TES-N system (or LSS) to one or more remote sites (e.g., RTC and/or TES-C) and conversely enables a remote site to use sensor control or uplink collection plans. The DIOP Configuration Editor configures remote sites for the transfer of full resolution and reduced resolution (screener) imagery from a single fixed site location to one or more remote site locations. Typically, the DIOP Configuration Editor is used during live ASARS-2 and SYERS missions to configure participating remote sites for image transfer. Alternately, imagery from recorded mission tapes can be transferred between fixed and remote sites.

The speed in which imagery is transferred from a full TES-N system to an RTC or TES-C depends upon available bandwidth. Telemetry data of the airborne assets is transferred in a near real time fashion using EMPS, which gives the remote site the ability to update or dynamically retask the sensor onboard the U-2.

2.5.1.4 Tactical Imagery Received Via Alternate (Non-CDL) Channels

Tactical imagery that is not received via the CDL-N will arrive via one of two methods:

1. A local antenna/processor designed to receive and process a particular sensor input (e.g., a local Pioneer UAV unit or a Digital Cameral Receiving System (DCRS) designed to receive F-14 Fast Tactical Imagery (FTI)), or

2. A remote antenna/processor (e.g., a land-based Predator UAV ground control station). Imagery and/or video processed at a remote location will be forwarded to afloat units via SIPRNET, JWICS, or another designated communication channel.

Tactical imagery received via means other than the CDL-N antenna (Figure 2-15) usually arrives at the ship in JPEG format or another commercial format, and therefore does not contain intelligence metadata normally found in NITF and TFRD imagery formats. Imagery tools within TES-N, JSIPS-N and GCCS-M can be used to convert these files to NITF format (so that they can be saved in each system's respective imagery servers), but the metadata is still absent from the files.

Streaming video (e.g., Predator UAV video) can be routed to video servers found in both TES-N and GCCS-M (Figure 2-16), where viewing and frame capture can be accomplished by the Video Exploitation Tool or the Java Imagery and Video Exploitation (JIVE) tool, respectively.

The TES-N Video Exploitation Tool allows the user to receive, display, and capture streaming video from a Video Cassette Recorder (VCR) through the AXIS Video Server. The Video Exploitation Tool allows the operator to switch between three different inputs from the AXIS Video Server. Typically, the AXIS-1 input will always receive its feed directly from the VCR. The remaining inputs are user defined and will receive inputs from the video buffer and the closed caption (CC) decoder. These additional inputs allow the user to receive video from sources other than the system VCR, such as the ship's video feed. The video display can be stopped and started, allowing a video frame to be captured from the video display. The captured video frame can then be saved on the RAID as JPEG, NITF2.0, or NITF2.1.

JIVE is the imagery/video exploitation tool in GCCS-M. It is used to view imagery cataloged on the ITS server, and also to monitor streaming video or full motion imagery from UAVs. JIVE Autoclip allows predefined clipping of this video stream, via time or location parameters. Individual images/clips can be stored, and software on the ITS server

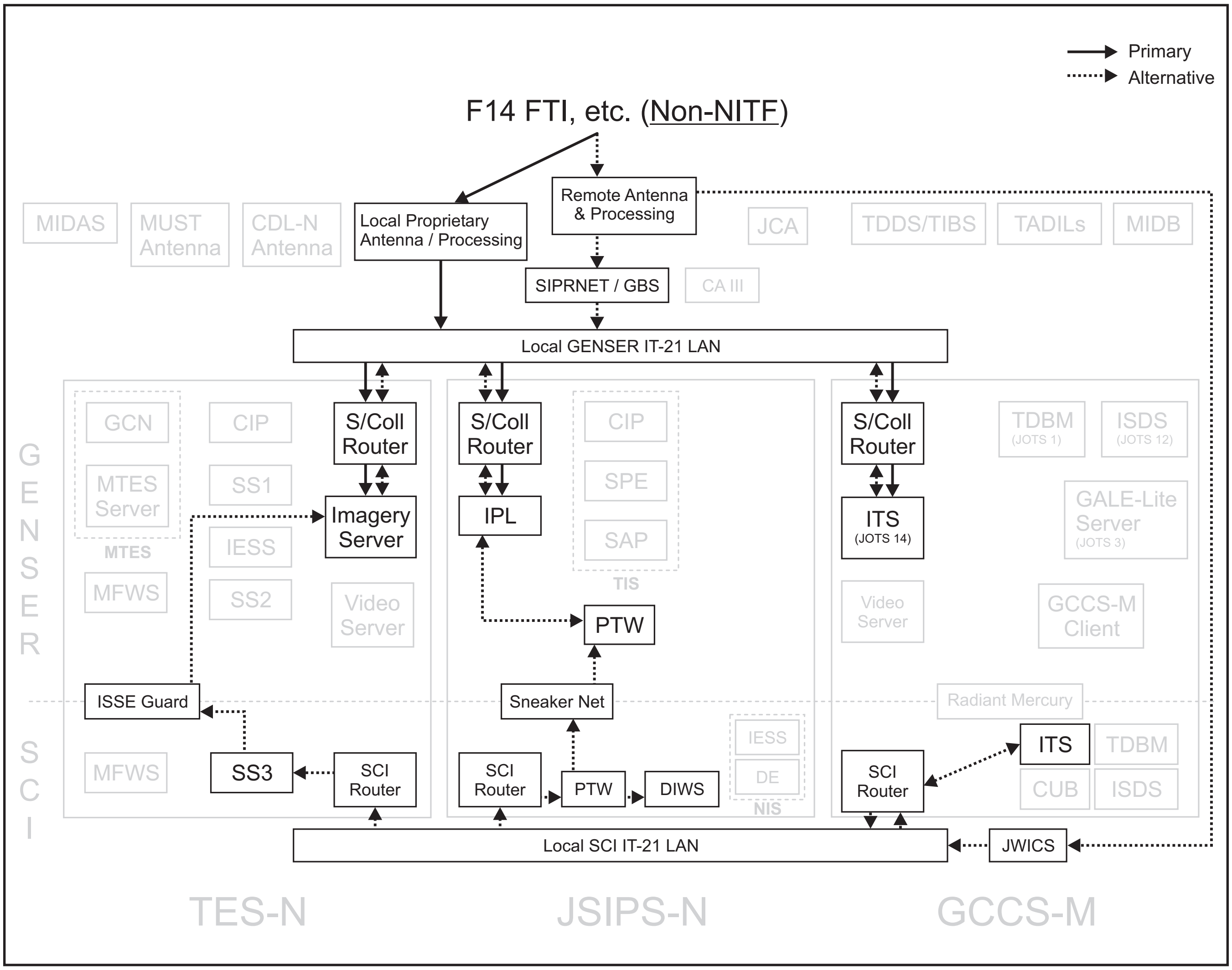

Figure 2-15. Tactical (Non-CDL) Imagery Receipt

will automatically generate a mosaic of the clip. If ISR telemetry data is transmitted on the video's CC channel, it can be processed by GCCS-M to display the ISR platform's sensor track (Figure 2-17).

2.5.1.5 JSTARS SAR and MTI

The Joint Surveillance Target Attack Radar System (Joint STARS) is a long-range, air-to-ground surveillance system designed to locate, classify and track ground targets in all weather conditions. Joint STARS consists of an airborne platform — an E-8C aircraft with a multi-mode radar system — and joint ground stations capable of processing downlinked tactical data. Radar operating modes include wide area surveillance, moving target indicator (MTI), fixed target indicator (FTI) target classification, and synthetic aperture radar (SAR). The antenna can be tilted to either side of the aircraft where it can develop a 120-degree field of view covering nearly 19,305 square miles (50,000 square kilometers) and is capable of detecting targets at more than 250 kilometers (more than 820,000 feet). In addition to being able to detect, locate and track large numbers of ground vehicles the radar has some limited capability to detect helicopters, rotating antennas and low, slow-moving fixed wing aircraft. The SAR system may be used in conjunction with the MTI system to provide a display of MTI data over SAR to increase situational awareness and confirmation of GMTI-detected targets.

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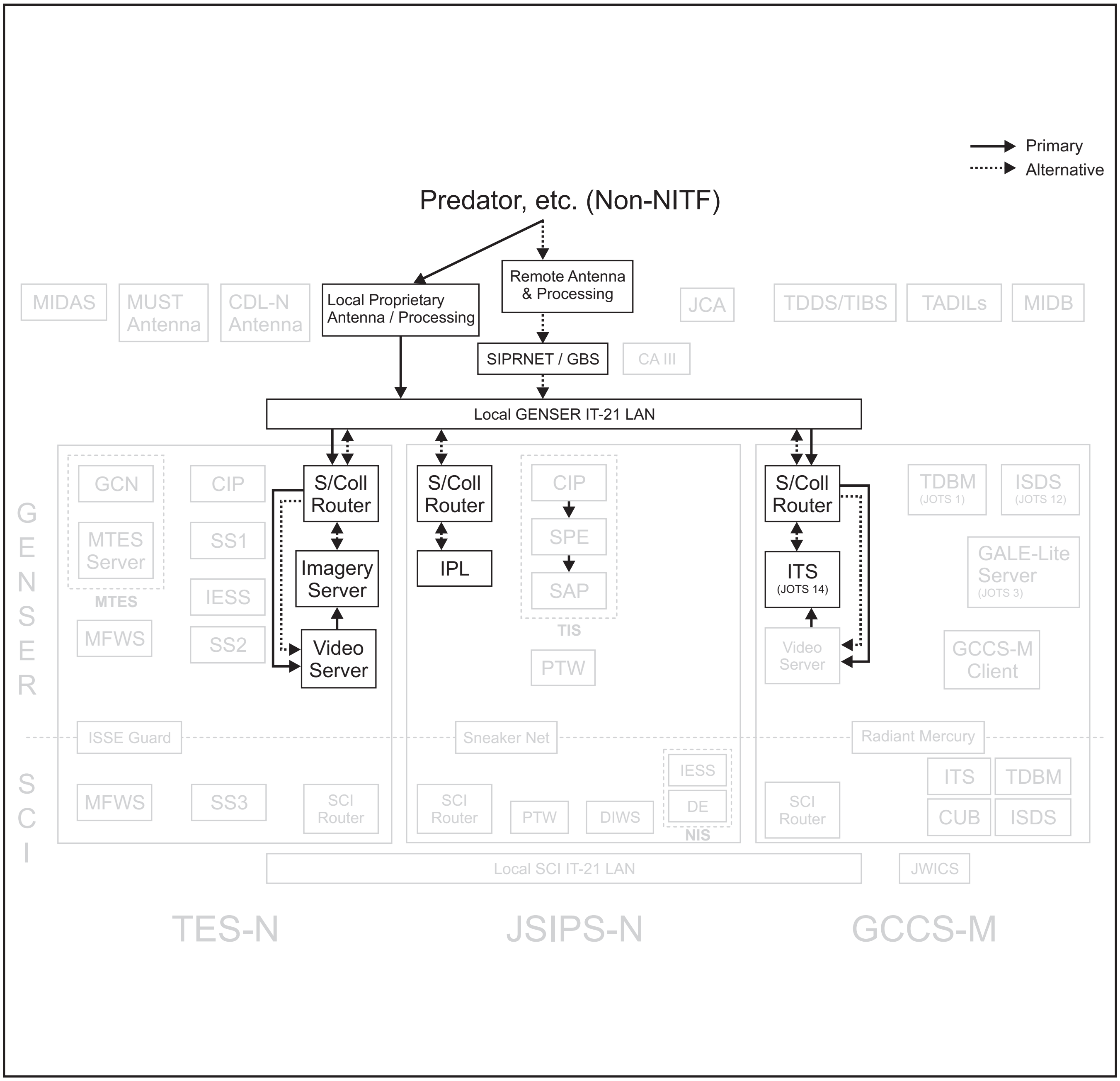

Figure 2-16. Tactical (Non-CDL) Video Receipt

Both TES-N (configured with a Moving Target Exploitation System (MTES)) and GCCS-M (configured with a Naval Joint STARS Interface(NJI)) are capable of receiving and processing Joint STARS MTI data (Figure 2-18). Only TES-N, however, can directly receive and process JSTARS SAR imagery (Figure 2-19). Units deploying without MTES (e.g., RTC units) must rely on remote units to receive, process and forward all JSTARS SAR imagery and MTI data.

MTES includes two major components: the Ground Communication Node (GCN) and the MTES Server. The GCN provides communications processing upon receipt of real-time Joint STARS data from a Multi-Service UHF SATCOM Terminal (MUST) antenna. It also supports post-mission playback mode for training and mission preparation purposes. The GCN converts the Joint STARS formatted MTI, SAR, and navigation data into a format that can

Figure 2-17. GCCS-M Display of NITF Registered Image, UAV Video Footprints, UAV Sensor Track and JIVE Playback of Streaming Video

be read and processed by the MTES server.[33] The MTES server provides the processing hardware and operator software tools required to exploit MTI data (section 2.6.4).

The GCCS-M NJI is a software interface that works over a network with a remote Joint Service Workstation (JSWS)[34] to display MTI data on the GCCS-M COP display. Basic MTI processing occurs at the JSWS ("dots" are tagged with latitude/longitude and some track quality data) while replay and manual tracking occurs at the NJI client. See section 2.6.4 for more information about MTI exploitation.

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[33] MTES can also receive MTI products (real and simulated) received over SIPRNET or another secure LAN. This information must be in the NATO EX format.

[34] The Joint Services Work Station (JSWS) is a real-time, multi-sensor Command, Control, Communications, Computers, and Intelligence (C4I) system that utilizes the same software as the JSTARS Common Ground Station (CGS) program. It provides the ability to interface with a robust suite of communications equipment for secure radio, satellite, and landline communications. JSWS acquires, processes, displays and disseminates information from multiple real-time sensors including Moving Target Indicator (MTI), Synthetic Aperture Radars (SAR); Unmanned Aerial Vehicles (UAV); Imagery Intelligence (IMINT) platforms; Signal Intelligence (SIGINT); Electronic Intelligence and other sources.

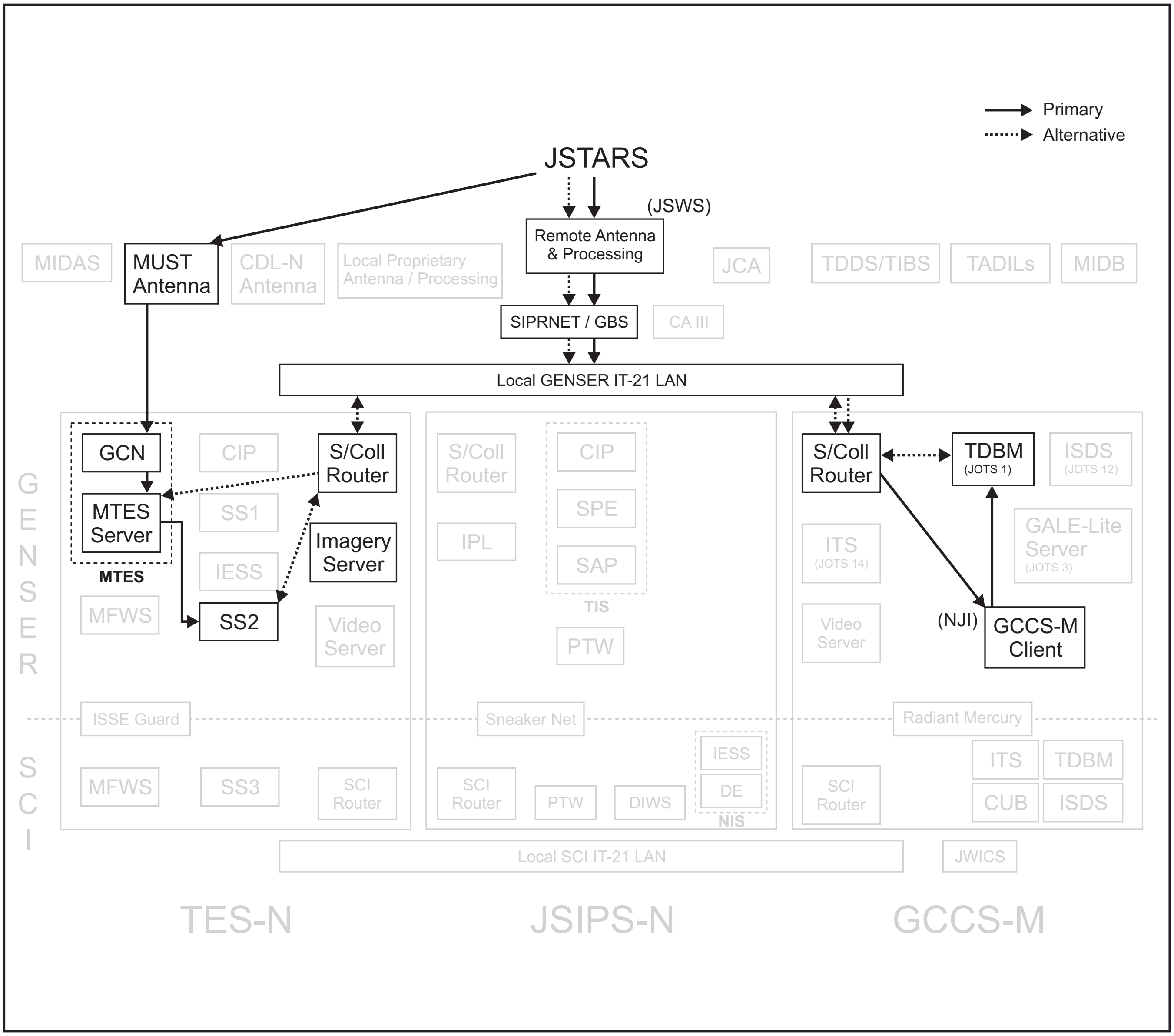


Figure 2-18. JSTARS MTI Data Receipt

2.5.2 SIGINT Receipt/Processing

2.5.2.1 ELINT

ELINT data enters the NFN architecture either from broadcast networks and via network file transfer. There are several near real-time tactical broadcasts (Figure 2-20) available to military forces, which include, but are not limited to:

1. **Tactical Related Applications (TRAP) Data Dissemination System (TDDS).** A worldwide UHF SATCOM broadcast of high-interest ELINT, contact reports, and parametric information at the SECRET collateral level. The TRAP equipment receives these reports from a number of sources and reformats the data into Tactical Data Information Exchange System-Broadcast (TADIXS-B) format for transmission. Naval units receive this data via shipboard Tactical Receive Equipment (TRE), where incoming data can be filtered

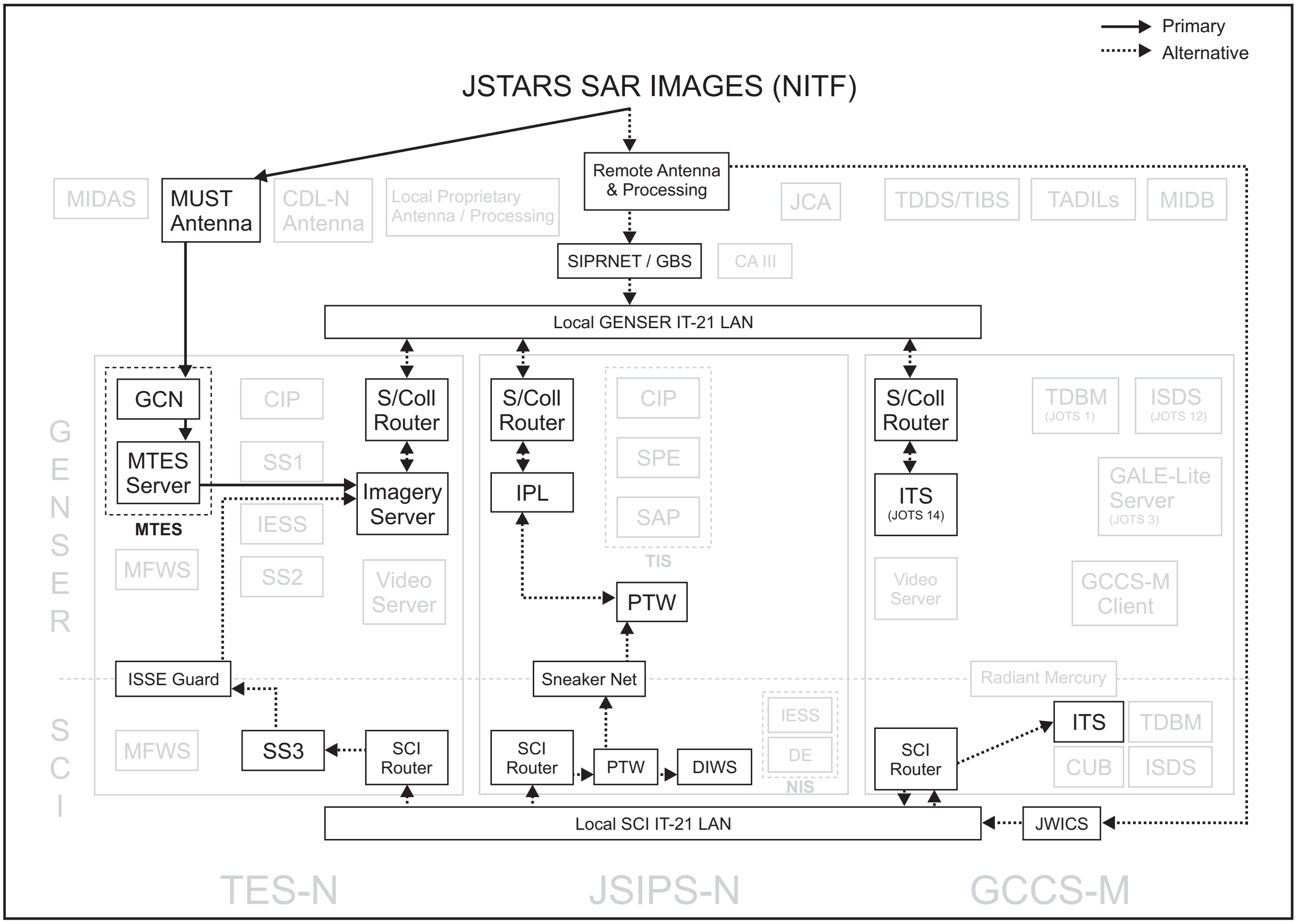


Figure 2-19. JSTARS SAR Imagery Receipt

by area of interest and other user-defined criteria using the Standard Tactical Receive Equipment Display (S-TRED). TDDS is also known as Integrated Broadcast Service (IBS) Simplex.[35]

2. **Tactical Information Broadcast System (TIBS).** A theater line-of-sight and UHF SATCOM interactive network of threat situational awareness data at the SECRET collateral level. TIBS can support up to 10 producers, 50 query nodes, and an unlimited number of receive-only users. In order to receive TIBS information, a TIBS node requires a satellite communications receiver and/or transmitter, a message processor, and a graphics display. TIBS terminals are typically deployed as part of a C2 unit or at the Air Operations Center (AOC) level, and is a theater asset used by the Air Force Rivet Joint platform. TIBS is also known as IBS Interactive.

3. **Tactical Reconnaissance Intelligence Exchange System (TRIXS).** A line-of-sight (LOS), UHF interactive network that transmits messages in near-real-time to up to 250 addressees. The TRIXS operates at the

[35] On October 24, 1995, the Assistant Secretary of Defense for Command and Control, Communications and Intelligence directed implementation of a plan to migrate legacy intelligence systems to the Integrated Broadcast Service (IBS). The legacy systems identified include TRAP, TIBS, TRIXS, and the Near Real Time Dissemination (NRTD) system. On 26 June 2000, the IBS Executive Agent announced the establishment of the IBS Support Office (IBSSO). The Navy, specifically Commander Naval Security Group, will direct the IBSSO with support from the US Army, US Air Force, and the National Security Agency.

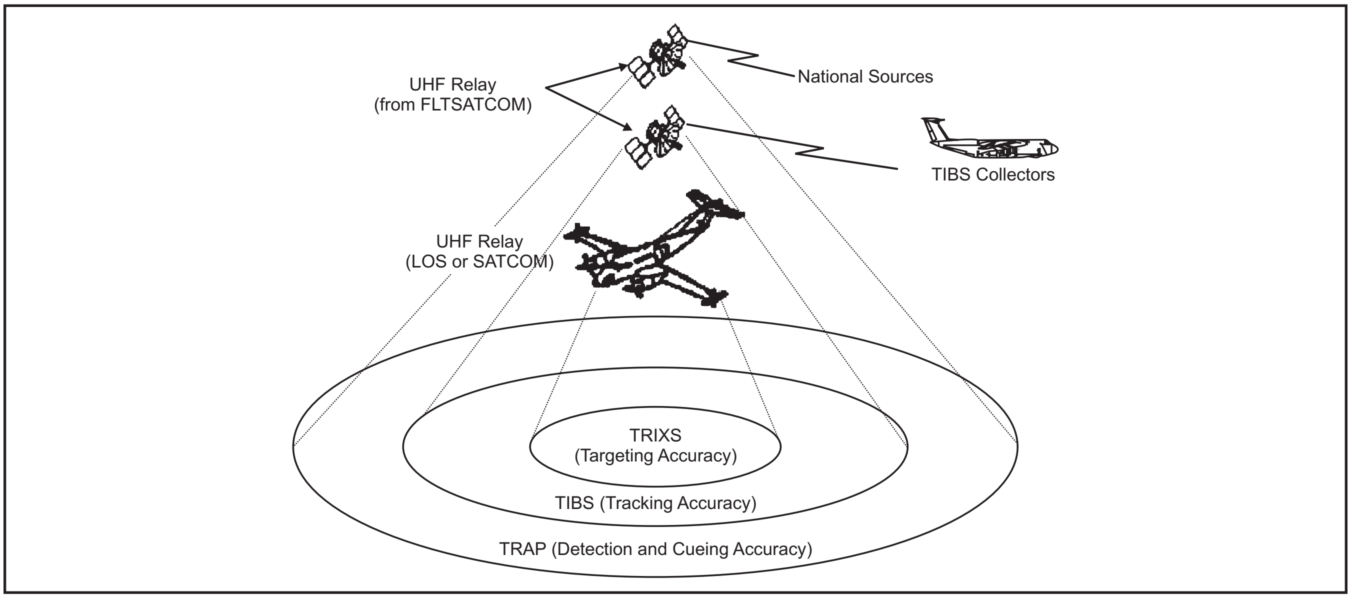


Figure 2-20. ELINT Broadcasts

SECRET collateral and SCI levels. TRIXS currently supports the following airborne relays and producers: 1) Army's Guardrail Common Sensor (GRCS) on board the RC-12 aircraft, 2) Air Force Contingency Airborne Reconnaissance System (CARS) on board the U-2, 3) Army's Airborne Reconnaissance Low (ARL) on the DHC-7, and the Navy's Storyteller (EP-3/E-8).

4. **MIDAS.** An SCI level system processed by the TES-N system. See TES-N classified documentation for additional information on MIDAS.

Both GCCS-M and TES-N have the capability to receive and process ELINT data (Figure 2-21). Both systems have various ELINT correlators and processors, including Gale LITE, used for analysis and display. ELINT analysis and exploitation is discussed further in section 2.6.5.

ELINT data entering the GCCS-M system is routed to two different locations: the TDBM, where automatic correlation and display of ELINT data is attempted, and the GALE-Lite server, where historical analysis can be conducted by operators. A Common Operating Environment (COE) correlator within the TDBM processes filtered[36] ELINT data and creates contacts/tracks or updates existing tracks previously associated by afloat ELINT analysts. Data is also passed in an unfiltered manner to the Gale-Lite server, where it is used for archival and long-term ELINT analysis.

Within TES-N, Secret GENSER broadcast data is routed to System Server 2 (SS2) for processing, while MIDAS data is routed to System Server 3 (SS3). The Gale LITE software resides on each of these servers and, unlike the GALE-Lite in GCCS-M, acts as a pre-processor before data is sent to an Automatic Statistical Platform (ASP) correlator.[37] Tracks within the Cross-INT databases resident in SS2 and SS3 are automatically created/updated for

[36] The COE correlator has limits on throughput (contacts/second), such that the entire worldwide TDDS broadcast cannot be processed. This is why filters should be set within S-TRED for TRAP data entering the TRE. Incoming data should be limited to the current area of interest.

[37] The existence of different ELINT correlators and implementations of GALE-Lite within GCCS-M and TES-N is being analyzed by the Converged Architecture team. Future implementations of NFN should resolve this disparity. See chapter 3 for additional information about the converged architecture process.

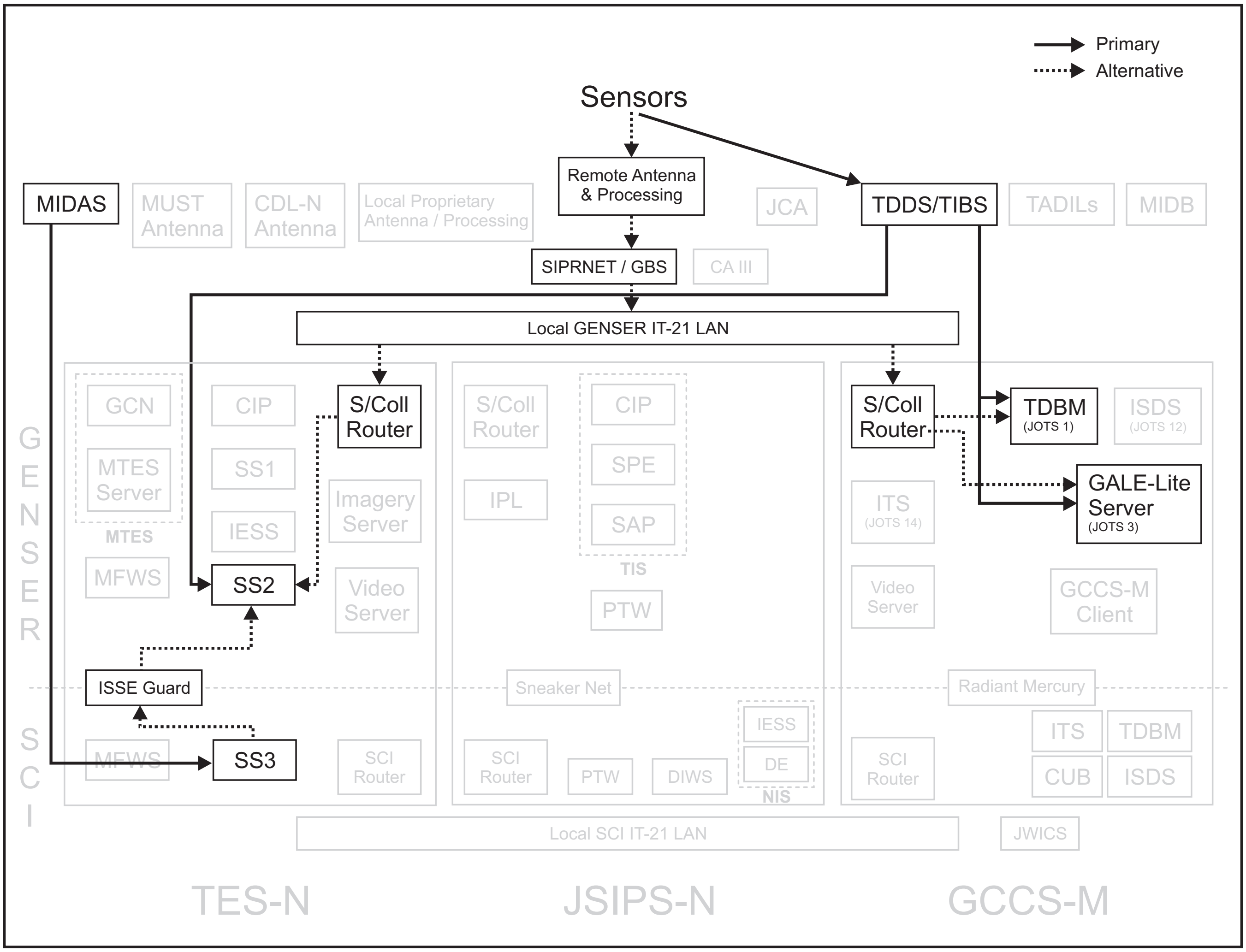


Figure 2-21. ELINT Receipt

correlated emitters. Tracks on the SCI Cross-INT database can be sanitized and forwarded to the Secret GENSER Cross-INT database via the ISSE Guard.

2.5.2.2 COMINT

Within the SCI portion of GCCS-M, cryptology-related applications and databases reside on the Cryptologic Unified Build (CUB) server, often labeled JOTS-18. These cryptologic tools include collections planning, analysis and dissemination applications/ databases that assist the Cryptologic Resource Coordinator and team in the coordination of collections planning, analysis and dissemination across the SCI-capable units in the CVBG/ARG, and between afloat and ashore cryptologic assets.

Additional MIDB information also exists in the SCI ISDS to support SIGINT analysis. This information is coupled with CUB applications to support SIGINT operations and the association of communications intelligence (COMINT) with platform tracks. If an association is made, a sanitized version of the track can be passed through Radiant Mercury to the GENSER GCCS-M network, which makes that track available to operators on the COP network.

2.6 EXPLOITATION

Section 2.5 explained the various means by which imagery and other sources of intelligence data enter the NFN architecture. This plethora of data can quickly overwhelm intelligence analysts (IAs) if means are not available to manage and quickly exploit the data at hand. Tools that facilitate workflow management and the quick creation of imagery intelligence (IMINT), signals intelligence (SIGINT) and cross intelligence (Cross-INT) products are increasingly important in an environment where ever decreasing targeting timelines are sought.

2.6.1 Workflow Management

Target Decks must be properly managed to avoid burdening the operator and system beyond their capabilities and to ensure local production requirements are met. Exploitation priorities dictate the flow of products for analysis, dissemination,[38] and storage (archiving). Relative task priorities, workstation task loading, and detailing tasks to the appropriately capable workstation must be considered when tasking production.

Intelligence personnel must consider several factors when assigning tasking to NFN architecture systems:

1. Zenith Angle and National Imagery Interpretability Rating Scale (NIIRS) requirements for TLAM Digital Scene Matching Area Correlator (DSMAC), route profiling, or target complex production

2. Exploitation requirements including task complexity and processing requirements

3. Timeline requirements

4. Previous photogrammetric control of imagery

5. Availability of PPDB or Digital Point Positioning Data Base (DPPDB)

6. Secondary dissemination requirements

7. Current location of imagery (e.g. is task already loaded at a particular workstation.)

8. Photographic exploitation experience available locally.

Incoming imagery is normally reviewed by operators and then manually placed into one of several targeting folder systems (SPF, JTT ATF, Quiver, etc.) for further exploitation. If CDL-N/CIP compliant sensor data is being processed by a full TES-N or LSS system with an IESS, incoming imagery is automatically placed into target folders based upon exploitation requirements defined prior to collection (section 2.4.3.2.2).[39]

The TES-N IESS is notified by System Server 1 whenever imagery is received by the CIP.[40] IESS exploitation requirements will be set to active and softcopy exploitation tasks will be created for all associated targets found within the four corner points of the acquired imagery. The softcopy exploitation tasks created by the IESS are stored in

[38] Fleet imagery exploitation reporting is currently only required by IAs conducting tactical imagery exploitation of BG organic assets (i.e. F-14 TARPS, F-18 SHARP). Fleet IAs exploit NTM and theater ISR products in support of BG tasking only and have no requirement to produce imagery exploitation reports for theater dissemination. NTM exploitation reporting is a functional role of the theater intelligence component – (i.e. JICPAC or JFCOM). Product dissemination is discussed in greater detail in section 2.8.

[39] Although an RTC can process and exploit CDL-N/CIP sensor data received from a full TES-N system (using DIOP), target folder creation and image routing is not automatic. This is because the RTC lacks an IESS found in the full TES-N system. RTC operators use the Database Organizer (DBO) application to manually accomplish these tasks.

[40] The IESS is not informed of imported or locally manipulated images, because they are not considered "primary" imagery and therefore there is no exploitation work to be managed. Access to these types of imagery is through the Database Organizer (DBO).

softcopy work queues established by the user.[41] These same tasks are duplicated within the Workflow Manager (WFM) application (Figure 2-22). WFM groups the primary image, maps, and Target Reference Files (TRFs) associated with each task generated by IESS. (TRFs allow the analyst to associate additional images of interest with a particular target.) The WFM thereby provides exploitation analysts access to current exploitation tasks and the source materials needed to execute each task.

Task completion is set by three events in the system:

1. Upon completion of a task, each image analyst closes the task from the WFM display. A popup dialog allows the analyst to select from the following states:

    a. **Requirements Satisfied.** The analyst was able to readout required equipment-to-equipment interfaces (EEIs); required product produced; task is done.

    b. **Requirements Not Satisfied.** Imagery did not meet the analyst's needs; unable to meet requirement.

    c. **Return to Ready.** Task needs to be re-opened at a future time.

2. Tasks are automatically marked as complete in IESS when the associated report is validated and transmitted from IESS. Although this automatic event occurs in IESS, it is still necessary to correctly close tasks in WFM to assure that imagery that is no longer needed will be routinely purged from the system database.

3. Task status can be manually updated using the IESS client.

Closing tasks has important consequences for workflow and imagery management in the TES-N system database. It removes completed tasks from the WFM display and marks imagery as no longer needed by the system. A system background purge process routinely deletes image source materials that are no longer needed or are outdated. TRFs and their associated imagery are not routinely purged from the system database, as are other exploited images.

2.6.2 Imagery Exploitation

As imagery products are received the operator is responsible for screening to ensure sufficient NIIRS quality, zenith angle, cloud-free and target/facility coverage requirements are met. This exploitation is accomplished by sending the imagery to one of many ELTs within NFN. The method of product exploitation depends on the imagery source, type of product desired, product requirement(s), and current workload at individual stations. For example, F-14 Tactical Air Reconnaissance Pod System (TARPS) annotated image products and target area graphics can be produced by digitizing the hardcopy film on the JSIPS-N Vexcel digitizer and providing annotations on the PTW. When SCI national imagery (received via the NIS) is exploited, the SCI PTW or DIWS is the preferred workstation because of its direct interface with the NIS. This SCI imagery can also be sent to an SCI TES-N workstation for exploitation. Secret GENSER national imagery can be exploited on the GENSER PTW or sent to a GENSER TES-N workstation.

ELTs allow analysts to quickly input, roam, annotate, manipulate, and output images from photographs, maps, satellite images, and other real world data. The analyst utilizes the tools within the ELT, including roam, zoom, brightness, and contrast, to complete the analysis of the image. If information of significance is found, the analyst creates a sub-image, or chip, and annotates the chip with graphic symbols. The analyst may then choose to disseminate the chip to an external source. The chip may also be saved to the system database. The analyst can also prepare and disseminate imagery interpretation reports (IIRs).

[41] WFM always has an additional queue, "Local Queue", to handle local tasks generated using Database Organizer and WFM. Local tasks are not managed by the IESS since they are not associated with IESS requirements.

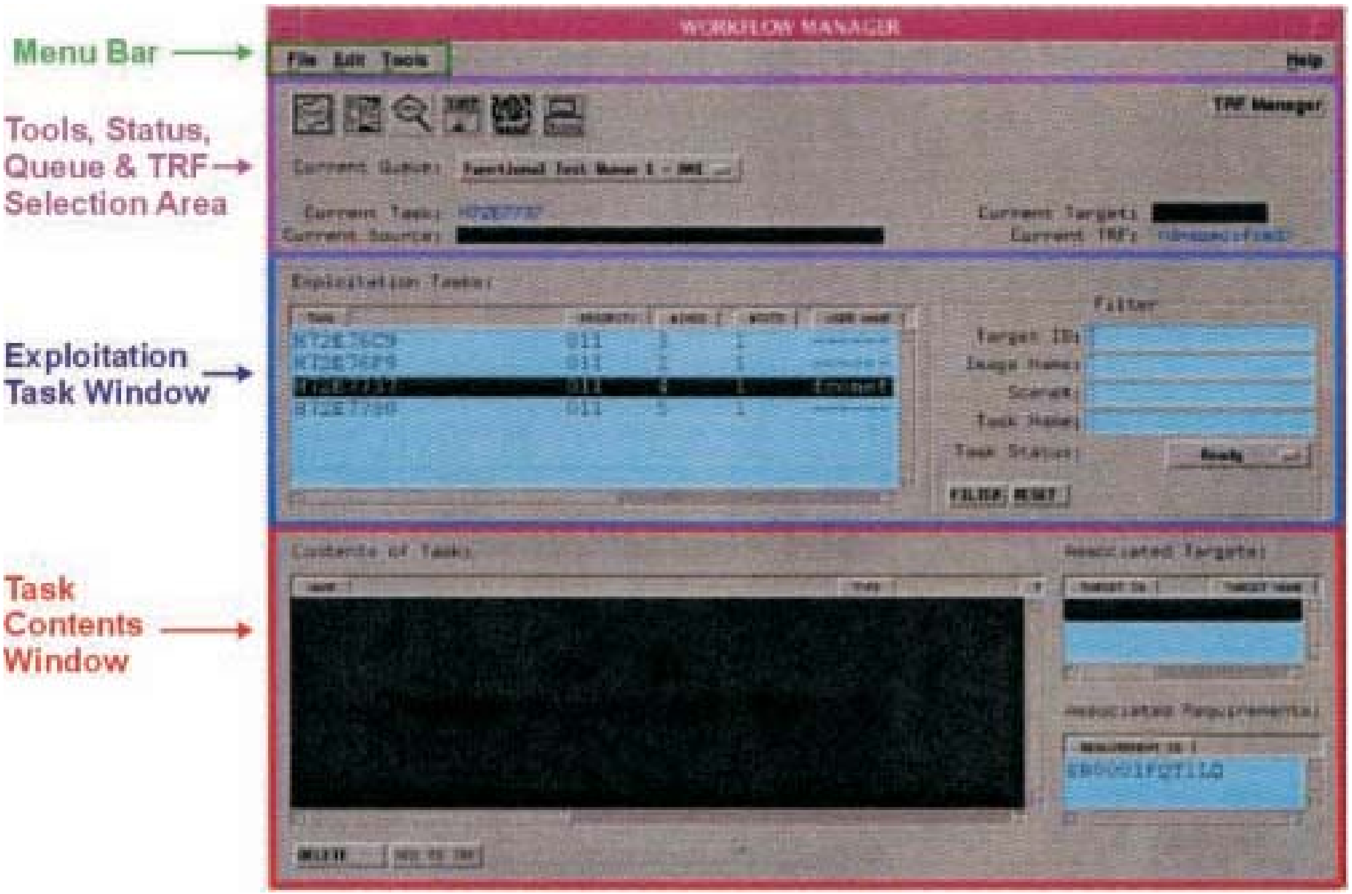


Figure 2-22. TES-N Workflow Manager

The following ELTs/exploitation tools reside within JSIPS-N:

1. **Socet Set ELT.** Utilized by the PTW operator in support of monoscopic and stereoscopic imagery exploitation and precision geopositioning. The PTW workflow manager provides the strike or imagery analyst with a step-by-step process flow in support of task completion.

2. **VITec ELT.** Utilized by the PTW operator in support of monoscopic and stereo-resection imagery precision geopositioning. The VITec ELT also supports monoscopic imagery exploitation. The PTW workflow manager provides the strike or imagery analyst with a step-by-step process flow in support of task completion.

3. **PTWeb ELT.** Utilized by the PTW operator in support of monoscopic and pseudo-stereo imagery precision geopositioning. The PTWeb ELT also supports monoscopic imagery exploitation. The PTW workflow manager is not utilized by PTWeb but the window panel is columnized for top down task completion.

4. **Matrix ELT.** Utilized by the PTW operator in support of monoscopic imagery exploitation only. This ELT cannot determine absolute accuracy (precision geopositioning) in support of PGMs, but does support relative accuracy mensuration (i.e. length of a runway, area of a building...etc.).

The following ELTs/exploitation tools reside within TES-N:

1. **Remote View ELT.** Utilized by the TES-N operator in support of monoscopic imagery exploitation. In addition to typical ELT functions, the Cross-INT database can be queried for graphic situation display (GSD) symbols to display on the exploited imagery. Based upon intelligence gathered from the image, the analyst can then generate a graphic representation (GRAPHREP) overlay file (produced from GSD symbols placed on the image) that can be disseminated to the Cross-INT database.

2. **Multi-Image Exploitation Tool (MET).** Used to create special products with multiple images (e.g., mosaic, multiview, blend/fade combinations, flicker session, orthorectified, etc.). Multiple sensor type images and maps can be combined semi-automatically or manually to form a single image (Figure 2-23). MET's default view orthorectifies the image — projecting the image to the ground plane using available elevation data. MET can currently only be used with national imagery transmission format (NITF) 2.0 imagery.

Java Imagery/Video Exploitation (JIVE) is the imagery/video exploitation tool in GCCS-M. It is used to view imagery cataloged on the ITS server (and also to monitor streaming video or full motion imagery from UAVs, section 2.5.1.4). If the exploited imagery is in NITF format, ITS has the capability to automatically associate the image with OOB data in the MIDB. Image exploitation capabilities include data transformation (rotation and scaling) and image data format translation.

2.6.3 Geopositioning/Mensuration

Weapon delivery accuracy is directly proportional to the precision of the mensuration technique used. DIWS and PTW 4.0 are both certified by National Imagery & Mapping Agency (NIMA) for deriving mensurated coordinates suitable for PGMs. The following sources are certified for PTW 4.0 use in support of GPS-guided PGM to include JSOW, SLAM-ER, and JDAM.[42]

1. Digital Point Positioning Data Base (DPPDB)

2. Multi-Image NTM Geopositioning (MIG) using electro-optical sensors

3. Single NTM image registered to DPPDB using DTED Level 1

4. Single ray (monoscopic image) NTM using DTED Level 1.

No tactical sensor models have been validated for operational use in deriving PGM coordinates for any service aimpoint generation system. PTW 4.0.1/4.1 ATARS, SYERS, and TARPS-CD models may be used for situational awareness but are not certified for use in PGM. Approval for operational PGM use of these models and future sensors such as SHARP and Global Hawk is pending collection of sufficient airborne sensor data and validation activity. More information on mensuration requirements and procedures is available in NTTP 3-03.4.1, *Global Positioning System and Precision-Guided Munitions Targeting*.

Non-PGM geolocation takes place in order to get a pilot in the area of a target so that non-PGM weapons can be employed — typically laser guided bombs or "dumb" bombs. Any system that provides imagery and coordinates is suitable for this function. PTW 4.0 and the Precision Targeting Module (PTM) within TES-N are both capable of deriving non-PGM geolocation coordinates.

[42] 051132Z JUN 02 PEOSTRKWPNSUAVN PATUXENT RIVER MD.

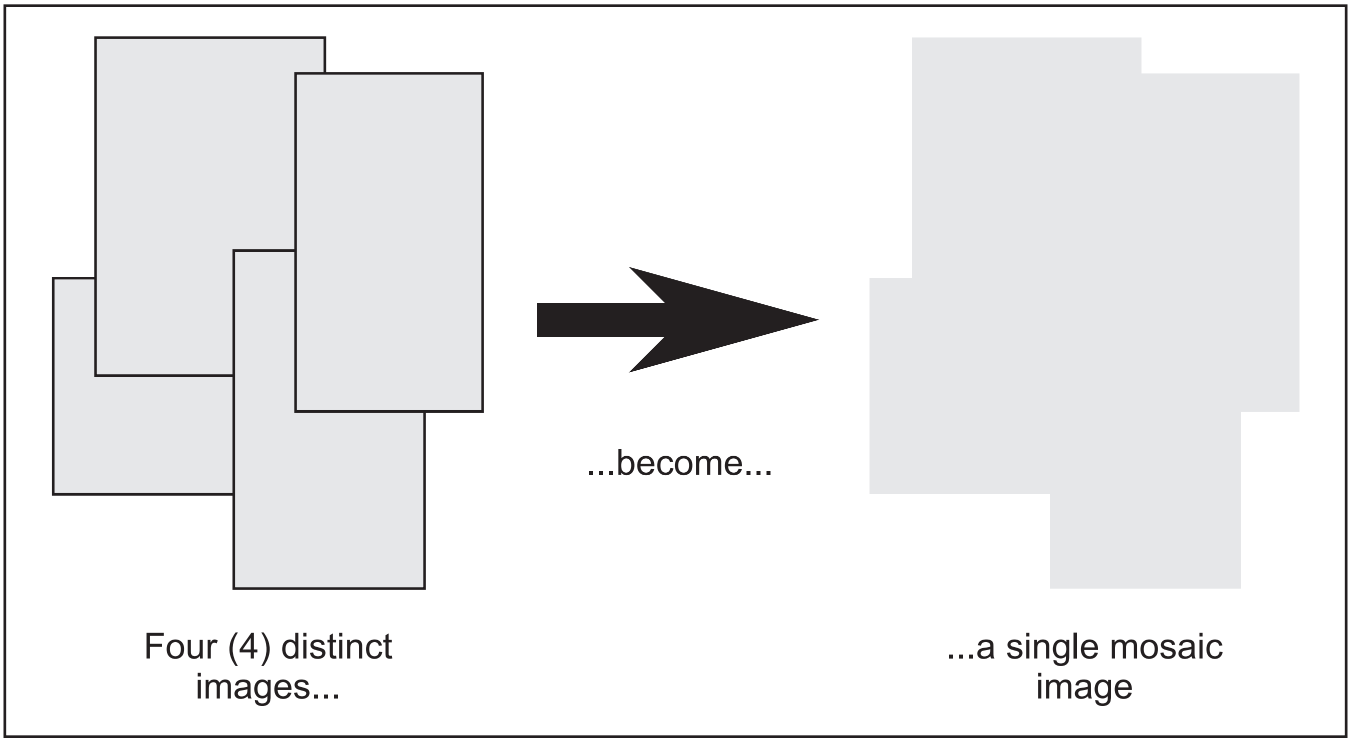


Figure 2-23. Multi-Image Exploitation Tool (MET)

2.6.4 Moving Target Indicator (MTI) Exploitation

As will be described in section 2.5.1.5, JSTARS MTI data enters the NFN architecture through TES-N and/or GCCS-M, where it is exploited by the MTES or by the NJI, respectively.

The MTES provides a set of components and tools to capture, process, display and exploit Joint STARS MTI-based data, and then disseminate resulting high value exploitable products to an operator at a TES-N MFWS. The system delivers a variety of capabilities to the MFWS operator:

1. Automatic tracking (using Kinematic Auto Tracking (KAT)) on all MTI. Tracks can be exported and integrated into the Cross-INT database for display on the Integrated ITD.

2. Ability to create, modify, select, or delete area "sentinels" which provides a traffic movement analysis tool alerting the operator to changes in expected target movement into and out of a selected area. This capability is part of the Semi-Automated Movement Analysis (SAMA) tool.

3. Traffic Flow Analysis tools to analyze movement patterns to determine lines of communication tendencies and characteristics.

4. A sensor visibility tool to highlight screened areas that the sensor cannot "see".

5. An MTES Mission Tool for controlling operation in real time, history replay, or batch (process post mission data) modes. This tool includes an Admin Tool to process both historical and real-time databases.

6. Data catalog and storage capability. These data catalogs provide a near-real time accessible archive of MTES products indexed by time, location, and keyword attributes. This persistent storage of MTI-based products is crucial to history playback functions that are the foundation to tracking and targeting of hostile movers.

Within the MTES server there are separate servers set up for each of the real-time components. Specific exploitation within the real-time servers occurs with the KAT and SAMA Sentinel servers.

The KAT server processes MTI data and produces real-time track reports, which are then passed to both the MFWS and the Cross-INT database located on System Server 2. To reduce the volume of MTES tracks that are parsed into the CROSS-INT database, the MTES software allows an MTES operator to manually nominate tracks. A filter can be set within MTES that allows only nominated tracks to be forwarded to the Cross-INT database; if this filter is not set, then all tracks will be sent. Once a track is nominated on the MTES workstation, updates to that track are automatically sent to the Cross-INT database (and to GCCS-M if the TES-N/GCCS-M interface, Appendix F, is established).

The SAMA Sentinel server executes processes that monitor operator-specified criteria concerning traffic movement, providing alerts for changes and/or significant events (e.g., chokepoint control) within the tactical situation.

The GCCS-M NJI receives MTI raw data from a remotely located Joint Service Workstation (JSWS). Experience with this interface during Fleet Battle Experiments has illustrated that the fusion of TADIL, MIDB and track data onto a geo-registered chart (Figure 2-24) allows operators to identify and classify much more rapidly than when an MTI operator observes MTI data alone. Processing done at the NJI client involves replay and manual tracking. Tracks are held locally unless manually promoted by the operator to TDBM tracks, in which case they are then shared throughout the COP.

2.6.5 SIGINT Exploitation

ELINT exploitation occurs by using the GALE-Lite software available on both GCCS-M and TES-N. GALE-Lite is a software package that provides intelligence analysts with improved tools to access and exploit available target information. Although the tools in GALE-Lite are generic and applicable to a variety of data types, emphasis is placed on the analysis and exploitation of ELINT. The analyst can utilize the tools to display, sort, compare, and correlate information using versatile and personalized analytic approaches. The GALE-Lite system has been designed as a "toolbox", allowing the analyst a high degree of latitude in approaching the analysis problem. The system will display information in color, on maps and graphs, relate new and old information, display Electronic Order of Battle, and build a Disposition of Forces file.

Within the GCCS-M architecture, an interface exists between the GALE-Lite analysis software and GCCS-M Track Data Base Manager (TDBM). This interface, called the GALE-Lite Interface Segment (GLIS), is an application that resides on GALE-Lite client GCCS-M workstations and allows the manual dissemination of correlated and fused ELINT tracks from GALE-Lite into the Common Operational Picture (COP). The interface also allows for the co-display within the ELINT tools of non-ELINT track information to support ELINT analysis.

ELINT data residing in the GCCS-M TDBM and the TES-N Cross-INT database can be used to cue operators to the existence of enemy targets and should be used as a cross-reference when searching for TSTs. ELINT data can be displayed over imagery and tactical sensor screeners (section 2.5.1.3) to facilitate the target cueing process.

As described in paragraph 2.5.2.2, GCCS-M contains Cryptologic Unified Build (CUB) applications that are designed to support COMINT collection, analysis, and dissemination. These are networked with organic, non-organic, and national cryptologic assets, to provide real time intercept, analysis, and reporting. High interest COMINT traffic is used to generate SCI tracks, which are passed to the GENSER GCCS-M COP network via the Radiant Mercury sanitizer.

2.7 DISSEMINATION AND INTEGRATION OPERATIONS

As the exploitation, analysis, and production phase of the targeting process (Figure 2-5) is completed, intelligence data is disseminated and integrated into military command and control (C2) operations. Secure C2ISR networks that allow for the rapid exchange of pertinent information between multiple commands are critical for NCW operations. TST operations, in particular, will be heavily dependent on a C2 infrastructure that supports fast and dependable coordination, collaboration and synchronization of operations among Joint and allied forces. The intelligence team must correlate multiple sensor data and present the result rapidly to decision makers if effective tasking of assets is to

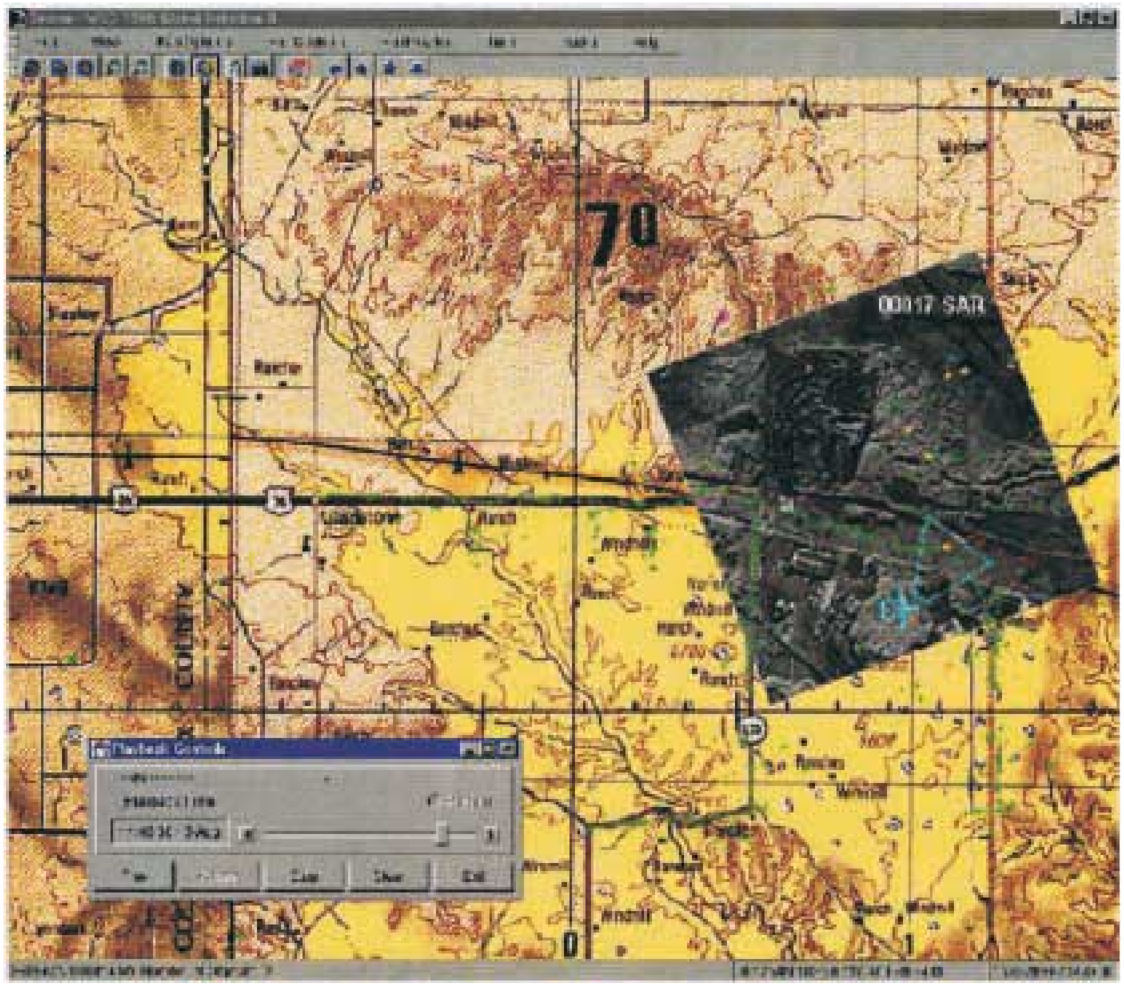


Figure 2-24. Naval JSTARS Interface (NJI)

be achieved. Timely information and near-real time (NRT) intelligence updates should be provided to all C2 nodes, sensors, and weapons. Graphic displays of the common operational picture (COP) (both air and ground) and rapid dissemination of plans and orders through collaborative tools, email and web pages allow commanders and their staffs to coordinate and "self-synchronize".[43] NFN systems provide numerous tools that facilitate these operations.

2.7.1 Product Dissemination

All of the NFN systems are capable of disseminating imagery interpretation reports (IIRs), annotated imagery, and a host of other intelligence products to other units.[44] Likewise, these products can be received from other units and processed/exploited by local NFN systems. Reports or data file transfers can be exchanged over UHF SATCOM,

[43] Extract from USJFCOM *Coherent Joint Fires 2000,* draft 3.5 dated 2/18/02.

[44] Fleet imagery exploitation reporting is currently only required by imagery analysts conducting tactical imagery exploitation of BG organic assets (i.e. F-14 TARPS, F-18 SHARP). Fleet analysts exploit NTM and theater ISR products in support of BG tasking only and have no requirement to produce imagery exploitation reports for theater dissemination. NTM exploitation reporting is a functional role of the theater intelligence component – (i.e. JICPAC or JFCOM). If tasked, however, NFN systems can provide reports on targets/entities not of local unit interest but meeting report priorities of other components or the CJTF.

SIPRNET (JWICS if operating SCI) or USMTF message over AUTODIN/DMS. In addition to "static" images and reports, NFN units with a full TES-N are able to forward NRT sensor information to RTC equipped units via DIOP (discussed earlier in section 2.5). Bandwidth and storage capability will dictate how much and what type of information can be passed among units. It is important to note that if information is stored onboard the ship, it is immediately accessible to the intelligence/operations team. Onboard storage resources are somewhat limited, however, and must be carefully managed.

Product Dissemination involves the delivery of intelligence products not only to supported commands, but also within one's own unit to fulfil local targeting requirements. The JSIPS-N TAMPS Interface Module (JTIM) provides an electronic interface between JSIPS-N and TAMPS in support of target aimpoint product dissemination. Target information provided by JSIPS-N is loaded by TAMPS into Mission Planning Modules (MPMs) and provided to strike aircraft for execution.

Finally, intelligence data should be shared/disseminated among the different systems within the NFN architecture. Imagery products, in particular, should be shared[45] so that users can take advantage of each system's particular strengths. TES-N derived imagery can be passed to the JSIPS-N system so that precise target mensuration (section 2.6.3) can occur. By passing TES-N and JSIPS-N derived imagery to GCCS-M, imagery can be displayed over the COP to increase operator situational awareness (section 2.7.2.1).[46] JSIPS-N imagery can also be passed to TES-N for correlation with Cross-INT data (section 2.7.2.2). The current method of passing imagery among all three systems is via File Transfer Protocol, discussed earlier in section 1.3.1.

2.7.2 COP Management and Visualization

The COP can be best defined as a system of systems that provides each level of a joint force common situational awareness. The unifying element is that each unit's system derives data from a common database or from linked databases. NFN systems currently provide one COP (in GCCS-M) and one "pseudo-COP" (in TES-N's ITD). Figure 2-25 provides a diagram of the system components that contribute to COP management and visualization.

2.7.2.1 GCCS-M COP

The COP within GCCS-M consists of track data (retrieved from the TDBM) and MIDB data (retrieved from the ISDS) displayed on client workstations in traditional Naval Tactical Data System (NTDS) format. Imagery stored on the ITS can be geo-registered and displayed on the COP workstation so that track data can be viewed over it, providing better situational awareness to operators. GCCS-M supports the manual capability to associate track data with MIDB data. This makes it possible for operators to drill down to the unit, equipment, and site information from a track symbol, potentially facilitating the targeting process. When able, the GCCS-M COP will correlate emitter tracks to known EOB or MOB sites. Part of the responsibility of intelligence personnel is to make these correlations when the software cannot.

COP Sync Tools (CST) is a database replication mechanism that ensures all participating nodes[47] maintain the same data in their respective track databases. Track data entered in one unit's database (whether from a local TADIL, a TES-N interface (section 2.7.2.3) or manually entered) will be automatically forwarded to other GCCS-M, TBMCS,

[45] Each system currently has one or more local imagery server (GCCS-M: ITS; JSIPS-N: IPL, PTW, DIWS; TES-N: Imagery Server or RTC Server). As the NFN system evolves towards a converged architecture (Chapter 3), the feasibility of consolidating these multiple imagery servers will be investigated.

[46] The ITS system can also link with existing JSIPS-N IPL databases so that GCCS-M local storage of imagery is not necessary.

[47] Since CST will require up to 32KB of throughput, most unit levels do not participate in the COP CST network, choosing instead to use OTCIXS or TADIXS to receive OTH tracks. Some battle groups use a NETPREC protocol over the SIPRNET to push all the OTH tracks to non-COP participants on a timed schedule, to overcome the latency inherit in the slow OTCIXS and TADIXS satellite networks. For more information about communication architecture and bandwidth issues, see Appendix B.

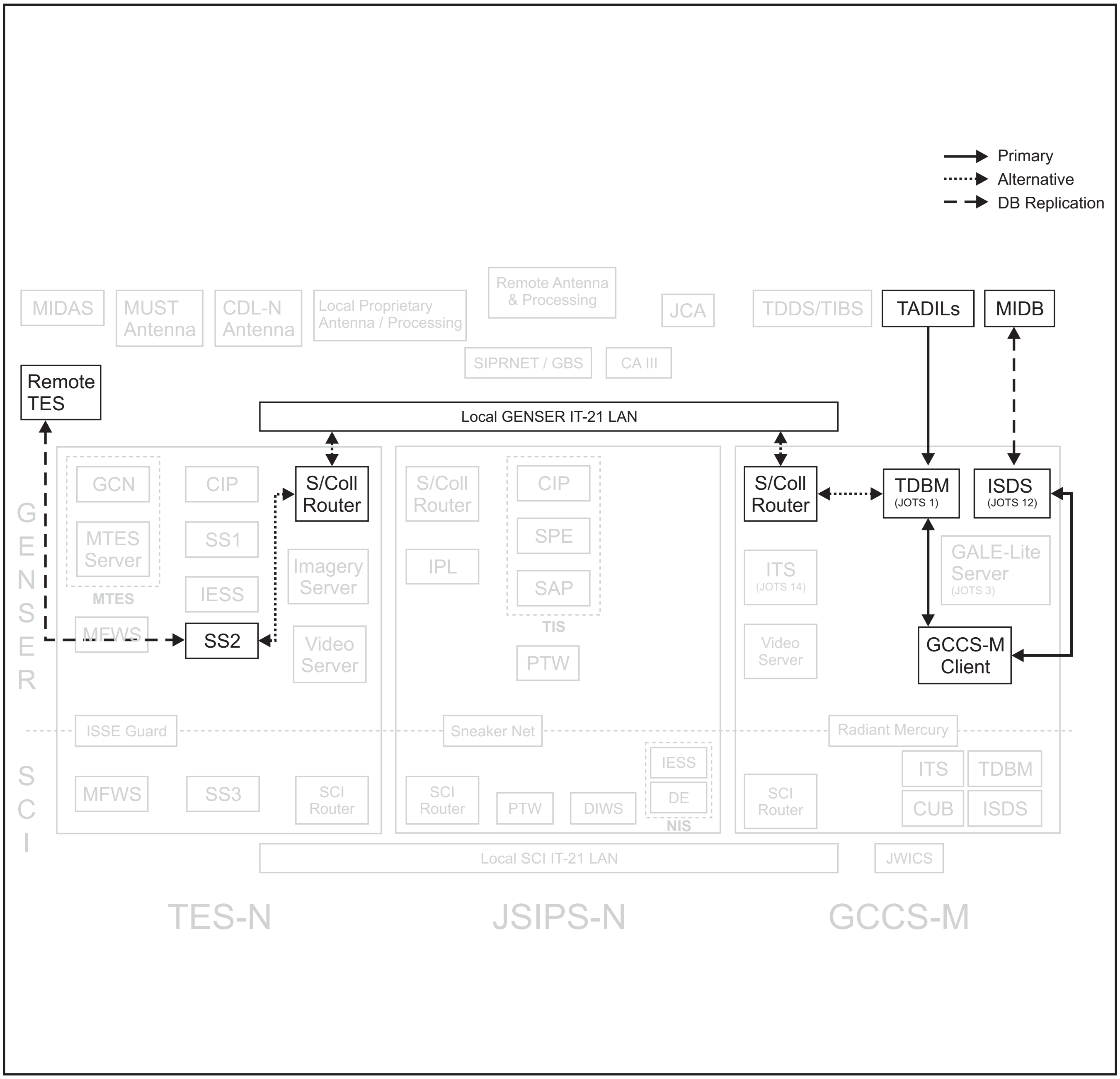


Figure 2-25. COP Management within NFN

and GCCS Joint users. This rapid association and continuous dissemination of track information across the battlespace is a primary goal of COP management.

2.7.2.2 TES-N Integrated Tactical Display (ITD)

The ITD is an ArcView-based application within TES-N that provides a single integrated display of Cross-INT data, U2 navigation and collection plans, image wire frames, and map wire frames overlayed upon imagery and maps. Using the ITD, an operator can create target nominations, manual contacts, reference points, and combined object data types. The user may configure the system for automatic updates if desired or may request a manual update at any time.

Unlike the traditional NTDS symbology used by GCCS-M, TES-N uses Graphical Situation Display (GSD) symbols.[48] A GSD tactical symbol (Figure 2-26) is composed of a frame, fill, and icon and may include text and/or graphic modifiers that provide additional information. The frame attributes (i.e., affiliation, battle dimension, and status) determine the type of frame for a given symbol. Fill color is a redundant indication of the symbol's affiliation. A GraphRep is an overlay that contains specific GSD symbols.

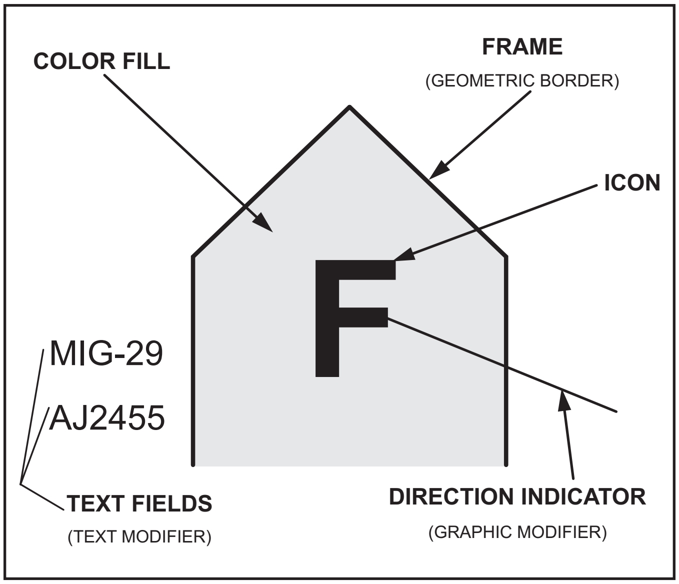


Figure 2-26. GSD Tactical Symbology

One of the strengths of the ITD is its ability to allow operators to enable and disable display of various layers of Cross-INT information on top of each other so that tracks can be correlated and greater situational awareness can be attained[49] (Figure 2-27). Cross-INT operations enable the operator to define filter criteria for a query of any combination of IMINT data, GRAPHREP data, or SIGINT data. The TES-N analyst has the capability to overlay this data on top of any system map product or NITF image in the TES-N library. Clicking an icon displays detailed information associated with it, such as ELINT parametrics. Text reports can also be displayed. Geographic and temporal modeling tools compliment the analyst's capabilities to perform functions such as assessment of target movement and line-of-sight or force limitation analysis. GraphReps can be generated as a result of these analyses using a GSD icon palette. These GRAPHREPS can then be stored in the system Cross-INT database and/or disseminated to external GSD-compatible applications (e.g., Remote View and EMPS) or to other units with TES systems.

Users can also use the ITD to create shape files. These files are normally lines and polygons used to display geographic boundaries or to highlight specific areas of user interest. Users can create shape files manually in the ITD,

[48] GSD is a set of Government-Off-The-Shelf (GOTS) software libraries developed for the Army Space Program Office (ASPO). GSD also receives funding from the National Imagery and Mapping Agency (NIMA) for the development of software for rendering mapping, charting, and geodesy symbology (GeoSym). GSD implements the MIL-STD-2525 Common Warfighting Symbology standard (battlefield and tactical geometry) and the MIL-PRF-89045 Geospatial Symbols for Digital Display performance specification (mapping, charting, and GeoSym). GSD also provides the ability to communicate the common picture by implementing the USMTF GraphRep-Overlay message (message number C203), which has been designed expressly for the purpose of transmitting MIL-STD-2525 data. The GraphRep-Overlay message is an ASCII file that contains all the information necessary for reconstructing a tactical overlay but in a format that is one-tenth the size of an image. Its standard message format allows different software programs (e.g., ITD, Remote View, EMPS) to quickly share tactical track information. Previous versions of GSD (those that implemented MIL-STD-2525A) were available as DII COE segments; however, current versions (those that implement MIL-STD-2525B and later) are not available as DII COE segments. For additional information about GSD, go to http://gsd.resva.trw.com. For additional information about MIL-STD-2525 symbology, go to http://www-symbology.itsi.disa.mil/symbol/mil-std.htm.

[49] While multiple layers can be viewed for correlation purposes, TES-N does not allow analysts to "fuze" correlated tracks into a single track.

import shape files created by others, or import tab delimited text files (created by standard spreadsheet programs), which are then transformed into shape files.

The ITD is best described as a situational awareness tool and not as a full-fledged COP. One of the limitations of the ITD is its lack of a multi-unit synchronization mechanism (such as CST used by GCCS-M). Users can manually disseminate Cross-INT data to other TES units in theater. In addition, TES-N provides a replication feature where the

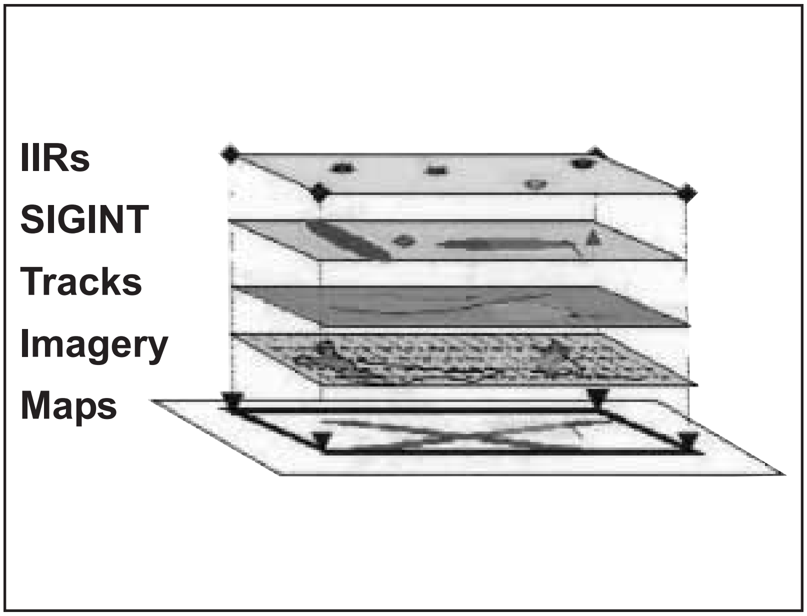


Figure 2-27. Cross-INT Overlays

Cross-INT database of a full TES-N is copied to that of an RTC or another TES unit.[50] However, data entered at a lower echelon unit and forwarded to a higher echelon is not automatically forwarded to all other lower echelons. The operational picture viewed by multiple units may be manually shared, but it is not necessarily "common."

2.7.2.3 TES-N/GCCS-M Interface

By establishing an interface between TES-N and GCCS-M, GCCS-M can accept some TES-N data (specifically MTI, manual contacts and reference points) that enhances fleet situational awareness, and TES-N can accept GCCS-M friendly force track data to help analysts correlate Cross-INT track data. GCCS-M CST functionality allows the dissemination of TES-N-generated tracks to non-TES-equipped commands that do have one of the GCCS family of systems. Additionally, this capability will be used locally within a given afloat platform to disseminate non-TES-generated tracks (e.g., TDDS-derived, SCI-derived, Blue Force, or MIDB-derived) to TES-N. The TES-N/GCCS-M track interface module is discussed in greater detail in Appendix F.

2.7.3 Collaborative Tools

Distributive operations demand a collaborative environment. Exploitation of ISR sensor feeds will not occur in the forward-deployed location alone. The ability to provide virtual production and coordination is critical to bringing the right people together as a cohesive team and providing a means for engaging resources and expertise not previously

[50] Unfortunately, this replication results in the deletion of preexisting data in the receiving unit's Cross-INT database. Therefore it should only be performed when a unit first enters a new area of operations and it wishes to receive Cross-INT data from a unit already in theater.

available to the deployed force. To assist in multi-unit synchronization, applications are needed that provide a "virtual " environment where TST intelligence and C2 nodes can communicate, collaborate, and share information regardless of their geographic location. These collaborative applications should take virtual meetings one step further and enable virtual co-location through persistent virtual rooms, each incorporating people, information, and tools appropriate to a task, operation, or service. There are many areas within the TST process where such a collaboration enhancement can be used, including:

1. Organizational interactions (e.g., TST Team to ISR platform LNOs)
2. Operations management (e.g., TST Team leader to JFACC/JAOC's operational watch standers)
3. Distance learning (e.g., capabilities and limitations of strike and ISR platforms)
4. TST management (e.g., management of/coordination among members of TST Team)
5. Collaborative planning (e.g., cooperative collection & ISR cross cueing)
6. Collaborative production (e.g., production of sensor to shooter data elements).

To make this environment exist, reach back nodes (e.g., theater Joint Intelligence/Analysis Centers (JIC/JAC)) should be on-line with key players in the JTF.

Secret GENSER and SCI NFN systems are connected to SIPRNET and JWICS, respectively, and provide email, web browsing and chat room functionality. Each system allows user access to the Joint Collaborative Environment (JCE), a web based set of collaboration services. The Joint Targeting Toolbox (JTT) will be installed on each NFN system and provides the BG component with access to a Theater CINC's operational priorities, Joint Prioritized Integrated Targets List (JPITL) supporting tasking/targeting deconfliction. Chat rooms should be established not only for remote collaboration with off-ship personnel, but also for collaboration among local personnel located at different workstations. TES-N includes an internal communications network (voice over IP) that enables collaboration among multiple MFWS.

2.8 ENGAGEMENT OPERATIONS

When a TST is found that meets the criteria established by the C/JFC, it will be fixed, identified, tracked, and flagged in the common operational picture (COP) for engagement. The engagement phase of the TST process (Figure 2-5) can be divided into three sub-phases: weaponeering, force application and execution planning/force execution.

The weaponeering assessment process links the desired method of engagement with specific aim points or objectives based on the most current information available. Personnel supporting weaponeering assessment must be thoroughly familiar with the type and quality of information required for completing mission planning for all types of weapons systems,[51] as well as the collateral damage aspects of these systems. The assessment results in recommended numbers and types of weapons, methods and directions of attack, weapons fusing techniques and delivery modes to ensure the objectives are met. Currently, naval forces must conduct this weaponeering assessment manually — **there is currently no target weapon pairing functionality resident within the NFN component systems.**

[51] The accuracy and precision of the weapon must be closely matched to the quality of the targeting. The fidelity and granularity of all sensors is not equal. Although in-flight target updates reduce the error associated with target movement, they do not reduce the error associated with the sensor. An accurate and precise weapon will not be very effective against a target associated with a large target location error. Conversely, it makes little sense to match accurate and precise targeting to an inaccurate weapon.

Force application is the decision to attack a particular target and the selection of lethal or non-lethal forces to perform the mission.[52] In the targeting process, this is where the weaponeering assessment is matched to available attack resources. Based on JFC's intent, guidance, and objectives, component forces conduct force application planning to prosecute the target, develop alternative weapon system solutions, and identify munitions or look at non-lethal force applications. An evaluation is made of available strike assets that are on alert or have been pre-staged for TST operations. If necessary, a decision may be made to divert assets already enroute to a preplanned target. Currently, the force application phase is also performed manually based upon all available data — **there is currently no TST force application/asset management functionality resident within the NFN component systems.**[53]

Given the above limitations, one should be wary of making statements that the NFN architecture, as currently configured, is able to solve the Navy's time sensitive targeting problems. While NFN certainly facilitates time sensitive targeting (and even includes some execution planning components and weapon system interfaces, described later in this section), the current lack of critical C2 decision support functionality precludes its description as a complete end-to-end time sensitive targeting system. Chapter 3 provides additional information on the goals and future development of the NFN architecture.

2.8.1 Execution Planning

Execution planning within the NFN architecture can be divided into two different groups: TLAM planning and tactical aircraft strike planning. TLAM planning is accomplished by the Afloat Planning System (APS). The JSIPS-N DIWS is a key component of the APS and supports key TLAM planning functions (section A.3.1.5). In this regard, TLAM is the only system that NFN currently provides a complete sensor-to-weapon targeting capability.[54]

Tactical aircraft strike planning is accomplished via direct connection to various Naval Strike Planning Systems. GCCS-M supports planning by providing tactical level planners with direct access to detailed information on MIDB targets. OOB data, imagery, and threat information provide the necessary information for warfighters to adequately plan the mission. This information is directly available to a range of Navy mission planning systems, including TAMPS, Quiver, and PFPS. These systems can also send tasking to and receive responses from PTW v4.x (via PTW's Image Product Archive (IPA) web browser interface) in support of imagery dissemination and precision geopositioning requirements.

Various targeting folder/management systems exist (or will soon exist) within the NFN architecture:

Quiver is a target management tool that supports aircrew mission planning by providing intelligence and targeting information for specific mission crew briefs and mission-planning products including strip charts for the cockpit. Quiver is included in the GCCS-M v3.1.2.1P1 software baseline.

JTT contains Automated Target Folders (ATF), which can be shared among the components and theater intelligence centers to allow a distributed approach to populating the targeting data within these folders. These folders pull updated targeting, weaponeering, and other force disposition information from the MIDB, each time they are re-opened. They are also linked directly to Commander's Guidance (See section 2.3) and Quiver.

The JSIPS-N Strike Planning Folder (SPF) allows strike planners to capture and integrate information from various sources from any computer loaded with browser software. The SPF consists of software, a web server, and database interfaces that collect or provide strike-planning information from Naval Strike Warfare Planning Center (NSWPC)

[52] NWP 2-01.11 *The Joint Targeting Process and Procedures for Targeting Time-Critical Targets*, p. 1-7.

[53] If the targeting cycle is interpreted as the traditional 72 hour ATO cycle, then the NFN architecture does support force application to the extent that the ATO can be retrieved, parsed and viewed by each NFN component system. This is accomplished by incorporation of the JTT, described in section 1.3.4.

[54] As mentioned previously, however, there are no automated C2 decision support tools within NFN that help to determine if TLAM is the appropriate weapon for a particular target.

component systems and other systems in the Aircraft Carrier Intelligence Center (CVIC). SPF enables users to access the information electronically from their workstations. SPF acts as a common repository for NSWPC systems, providing a common planning picture. The SPF provides the user with various tools that are intended to help the strike planner during the mission planning process. The upper level of the strike-planning tree (Description, Overview, Tasking Area of Interest, Air Tasking Order, ATO Details, Airspace Control Order ACO Details, and Strike Team) includes relevant administrative data pertaining to the Strike. Appearing below those nodes are folders where strike pertinent information and data is accumulated. These folders include:

1. TASKING FOLDER: contains a combination of specific strike package tasking details (Mission ID, Task Unit, Mission & A/C Type, Call Signs, Weapon Configuration Codes), target location data extracted from the ATO, and a Briefs repository.

2. ASSETS FOLDER: provides a summary table of required (HHQ tasking) versus assigned aircraft, a user editable assigned aircraft table initially populated from ATO tasking, and a Briefs repository.

3. SITUATION FOLDER: contains situational awareness (SA) data pertaining to friendly and enemy OOB, threat, Intel assessments based on the specified area of interest (AOI), and a Briefs repository.

4. METOC FOLDER: provides weather conditions for day-to-day mission planning, target and area of operations, and a Briefs repository.

5. WEAPONEERING FOLDER: provides access to targeting analysis systems for detailed study of the target(s), DMPI, desired level of damage, assigned weapons to verify that the desired Probability of Damage (Pd) can be satisfied, and a Briefs repository.

6. ROUTE PLANNING FOLDER: provides access to route planning system(s) routes and a repository for all phases of strike route planning which includes route admin, straight-line concept and final routes, ingress and egress, tanker routes, and a Briefs repository.

7. KNEEBOARD CARDS FOLDER: provides a tree containing kneeboard card templates and preview folders used to create and insert data into kneeboard card presentations.

8. FINAL BRIEF FOLDER: contains final brief templates and a preview tree used to create and insert the data into the final brief.

9. POST STRIKE ANALYSIS FOLDER: provides repositories for debrief material, strike imagery, and lessons learned.

10. MAP VIEW BUILDER: allows the user to create a specific view of a map and save it for further manipulation or repeated display. With this function, the user can build a map using ATO data, ACO data, MIDB data, GCCS-M Overlays, TMS data, and user-created data. The view also captures the position and zoom level.

2.8.2 Force Execution

Force execution includes the capability to transfer targeting data directly to tactical strike assets. **NFN has no automated means of deconflicting blue air forces among themselves nor does it resolve the collision risk between blue munitions and friendly aircraft.**[55] In addition to the JSIPS-N/TLAM interface mentioned above, GCCS-M has a Multi-TADIL capability (MTC) that allows a 2-way interface to/from GCCS-M and the TADIL A/J networks. This allows link tracks to be displayed on the COP along with non-link tracks, and allows force orders to be sent from

[55] Although tracks are generated and displayed by GCCS-M, this system is not a deconfliction tool. Blue forces are deconflicted through the normal Airspace Control Authority procedures which are promulgated by the airspace control order, issued by the JAOC, normally delegated to the JFACC. JP3-52, *Joint Doctrine for Airspace Control in the Combat Zone* fully describes the procedures for airspace deconfliction of Blue forces.

any GCCS-M workstation directly into the TADIL network. MTC is accomplished by creating an interface between the Air Defense System Integrator (ADSI) hardware and MTC software running on GCCS-M. This combination is installed on Command ships, certain CV/CVNs, and at NAVCENT in Bahrain.

2.9 MULTI-SERVICE OPERATIONS

Sequencing, coordination, deconfliction, and synchronization of TSS with other military operations is important and can occur across a full range of independent, Joint and combined military operations. NFN component systems are designed to be compatible with other service systems as described below.

TES-N uses a common software application baseline to interface with other service TES-based systems.[56] This commonality enables the Naval commander to share real-time battlespace awareness rapidly and seamlessly with other Services and to participate fully in Joint collaborative prosecution of time critical targets. TES-N and LSS are functionally identical to and interoperable with TES-Army (TES-A). The Marine Corps employs the TEG system, which focuses on an imagery-only functionality but also allows ingest and dissemination of ATARS data throughout the TES-N network. The Air Force is employing the TES operating system in the ISR Manager (ISR-M). DIOP sessions can be configured between these systems so that NRT sensor data can be exploited among multiple services. Database replication and the passing/sharing of Cross-INT data is also supported. See Appendix G for a checklist of coordination issues to be considered when entering a multi-service theater of operations.

TES-N is also able to send targeting information (via ATI.ATR message format) to the Advanced Field Artillery Tactical Data System (AFATDS). AFATDS is the fire support component of the Army's Battle Command System. AFATDS is the Army and U.S. Marine Corps' single tool for the planning, coordination and control of all fire support assets (mortars, close air support, naval gunfire, attack helicopters, offensive electronic warfare, field artillery cannons, rockets and guided missiles fires). AFATDS reduces engagement time by automatically implementing detailed commander's guidance on many critical tasks for operational planning, movement control, targeting, and fire support planning. The AFATDS system includes automated integration with the Air Force's Theater Battle Management Core System (TBMCS).

The COP data used and displayed within GCCS-M is compatible with the COP data used in all other Joint C4I systems including GCCS at Combatant Commanders and theater SOF Headquarters, TBMCS used by JFACC, and GCCS-A used by US Army Echelon Above Corps units. MIDB replication software synchronizes data updates among the various MIDB users. In other words, national updates made at the responsible producers sites are replicated worldwide to tactical users of GCCS, GCCS-M, TBMCS, IAS, and GCCS-Army systems. Additionally, locally produced tactical updates made by any of those same systems are replicated up-echelon to the theater CINCs for validation and approval and distribution to all components. Experience has shown that worldwide replication typically occurs within several minutes of approval by the responsible producer/validator of that data.

The JSIPS-N IPL can connect to the IPL of other services for national, tactical imagery and exploited imagery products.

Finally, as the name suggests, the Joint Targeting Toolbox (JTT) is designed to support multi-service operations. It is used to translate Commanders Intentions/Guidance into Candidate Target Lists (CTL) and Target Nomination Lists (TNL) at every echelon of command. Once the TNL is approved by the combatant commander, JTT permits the sharing of the TNL to all the components for early access to assigned missions for strike planning. JTT also contains Automated Target Folders (ATF), which can be shared among the components and theater intelligence centers to allow a distributed approach to populating the targeting data within these folders. These folders pull updated targeting, weaponeering, and other force disposition information from the MIDB, each time they are re-opened. The aforementioned data replicated among MIDB users also includes this targeting and weaponeering information.

[56] As with any multiple system operation, software version compatibility should be verified. This is particularly true when participating in experiments where fleet standard software may not be used. ISR-M Version 4.1 (accelerated/fielded engineering build) is currently incompatible with other TES version 4.0 systems for data replication. All services should be converting to a common TES version 5.0 in 1QFY2003.

CHAPTER 3

NFN ROADMAP

3.1 INTRODUCTION

Chapters 1 and 2 highlighted some areas of functional overlap among the different NFN component systems. Intelligence and Operations officers should be familiar with plans to address these overlaps and to more fully integrate NFN into a seamless NCW system compatible with other services and address all combat operations from sensor to shooter. This chapter therefore provides a brief description of the NFN converged architecture and plans to integrate NFN into the distributed common ground/surface systems (DCGS) architecture. In addition, plans for addressing shortfalls in the current NFN architecture, specifically current limited capability to perform the "to shooter" half of the "sensor-to-shooter" equation, will be discussed.

3.2 NFN CONVERGED ARCHITECTURE

Programmed upgrades (beyond twelve months out) planned for TES-N, JSIPS-N, and GCCS-M are not described within this TACMEMO. By redirecting these plans toward a streamlined, converged architecture, overlaps and duplicative capabilities can be eliminated, leading to reduced requirements for equipment space, manning, training, maintenance, and communications requirements. This will reduce the overall cost of ISR and streamline the targeting capability of the Navy. An engineering team has been established to design the converged architecture (Figure 3-1), utilizing the "best of breed" from all three programs. Human Systems Integration (HSI) methodologies, including human-centered system design and human factors engineering, will be applied to the maximum extent practical in the modification of existing systems to reduce life-cycle costs, increase human performance, and increase operational effectiveness.

3.3 DCGS ARCHITECTURE

The DOD has defined a DCGS architecture that shall be used to ensure compatibility among each of the services' NCW systems. The goal of the DOD DCGS is higher levels of interoperability and efficient allocation of scarce TPED assets in a collaborative environment. The DCGS Capstone Requirements Document (CRD) outlines the DOD's architecture for interconnecting family of systems (FoS) and system of systems (SoS). The "DOD DCGS" is illustrated in Figure 3-2.

The DOD DCGS will enable the support of multiple, simultaneous, worldwide operations through scalable, modular system deployments. Externally, the DOD DCGS in the aggregate will be interoperable with spaceborne, airborne, surface, and sub-surface ISR collection assets and intelligence producers; it will be able to access intelligence databases from these ISR resources to optimize ISR capabilities. The DOD DCGS will support Joint Task Force (JTF) level campaign planning, targeting, and combat execution. The DOD DCGS will support all echelons with critical intelligence for battle management across the spectrum of conflict. Service DCGS elements will be equipped for, and capable of, worldwide operations. Service DCGS FoS can accomplish wartime and peacetime missions while fully deployed, partially deployed, or in-garrison.

Important to note is that DCGS is a **distributed architecture**. The distributed exploitation concept leverages the synergistic capabilities of the service DCGS FoS exploitation nodes to provide operation-specific support. The overarching objective is to provide the Combatant Commander/JFC with a broader array of ISR employment options (joint and interoperable end-to-end) instead of relying on a single distribution node or path. **The goal of the NFN architecture is to fulfill the role of "DCGS-N"**. In its ultimate configuration, integrated with the DCGS architecture, NFN will provide the user with a comprehensive FoS designed to support both TST/TSS and planned targeting from beginning to end.

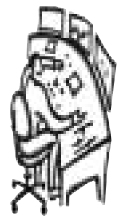
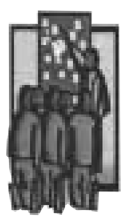
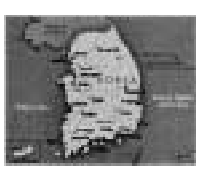
SENSOR INTERFACES		GCCS-M	JSIPS	TES-N	CA
					
	U-2 Sensor Control				
	BGPHES	X			GCCS
ISR MANAGEMENT	EO/IR/SAR			X	TES
	Natl Imagery Receipt		X		JSIPS
	Natl Imagery Exploitation		X	X	JSIPS & TES
	Tactical Imagery Receipt		X	X	Undecided
	Tactical Imagery Exploitation		X	X	JSIPS & TES
	ELINT Processing	X		X	GCCS & TES
	COMINT Processing	X			GCCS
	Other SIGINT Processing			X	TES
	Track Display	X		X	GCCS & TES
	Track Management	X			GCCS
INTEL EXPLOITATION	Multi-INT Correlation	X		X	GCCS & TES
	Image Archive (Ashore)		X		JSIPS
	Image Archive (Afloat)		X	X	JSIPS & TES
	MTI	X		X	GCCS & TES
	Workflow Manager (ISR)			X	TES
					
	Command & Control	X			GCCS
COMMANDER'S DECISIONS/FORCE ASSIGNMENT	Target/Weapon Pairing				
	Mission Planning Interface		X	X	JSIPS
					
	PGM Quality Mensuration		X		JSIPS
	Non-PGM Geolocation		X	X	JSIPS & TES
	Target Generation		X	X	JSIPS
PRECISION TARGETING & SENSOR PLANNING	Workflow Manager (Target)		X		JSIPS
WEAPONS INTERFACES	Tactical A/C Up Link	X		X	GCCS & TES

Figure 3-1. NFN Architecture Functional Overlaps

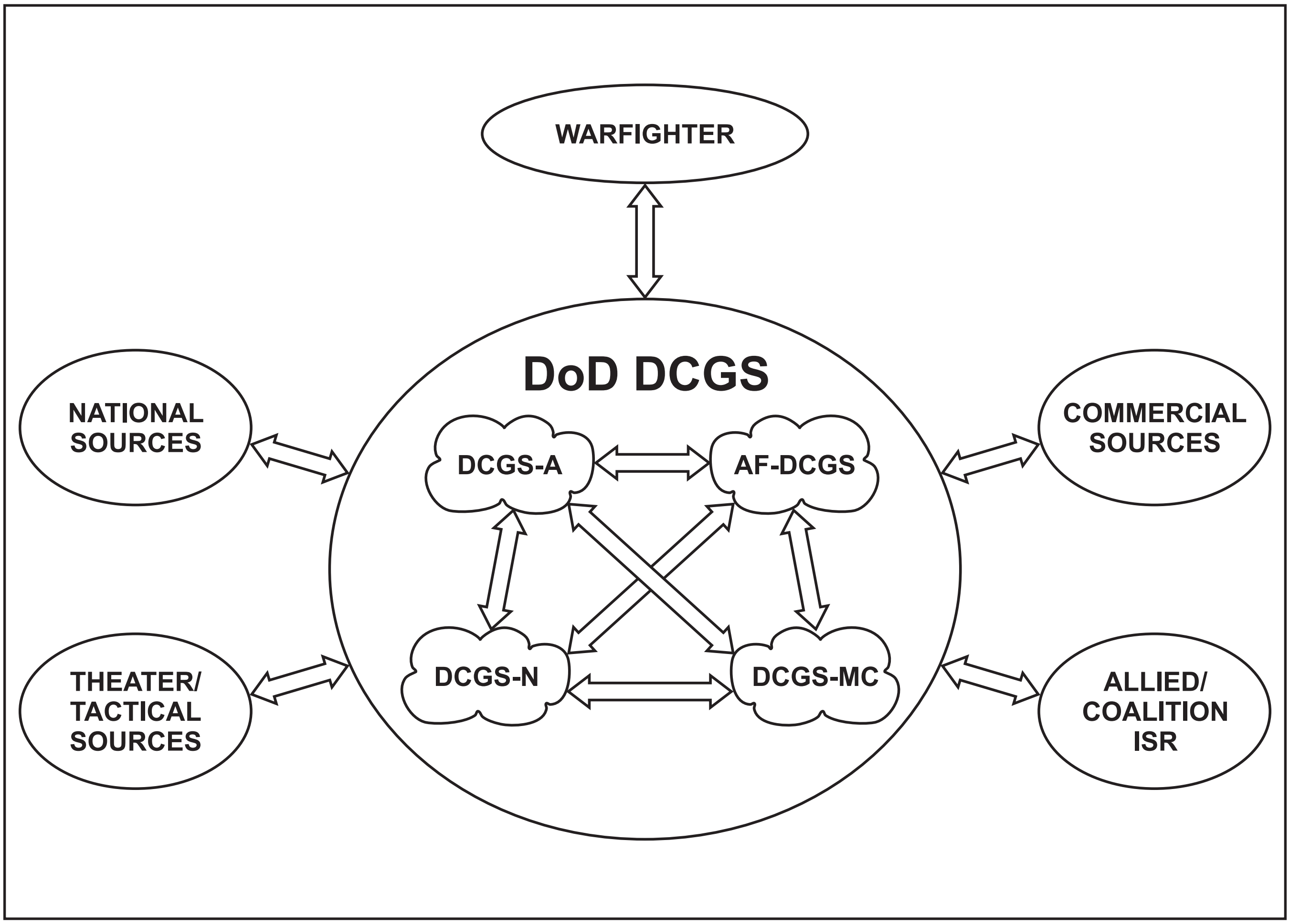


Figure 3-2. DOD DCGS

3.4 PLANNED NFN ENGAGEMENT COMPONENTS

A critical portion of the end-to-end capability within NFN is getting targeting packages and information to aircraft and other weapon platforms/systems. Current NFN systems are limited to TLAM interfaces (JSIPS-N and GCCS-M) and interfaces with TADILS networks (GCCS-M). Many other weapons control systems exist that are deterministic, high-reliability systems specialized for specific weapons or weapons delivery platforms. NFN is planning on implementing additional engagement components that will bridge the gap between the combat information system environment and the weapons control system environment. Functionally, these components can be divided into two different categories: 1) a Target / weapon Pairing component, and 2) components that electronically disseminate target packets to designated weapon platforms/systems.

3.4.1 Target Weapon Pairing

Traditional request for fires almost always specified a particular weapon and delivery system (e.g. 155mm artillery or an aircraft-dropped 500-lb. bomb) based on an implicit understanding of weapons effects. This target-weapon pairing is limited by the choices available to the commander.

The NFN suite that is currently being deployed does not include the capability to perform automated target-weapon pairing. Target-Weapon pairing continues to be done manually by the applicable watch officer who assigns the firing platform and specific weapon based upon what the watch officer decides is the best match among the available engagement assets at the time that a TST is identified and ready to be engaged. The Navy will continue to evaluate the functionality of programs that perform target weapon pairing functionality.[57]

3.4.2 TARGET DISSEMINATION TO STRIKE AIRCRAFT

In addition to current TLAM (JSIPS-N and GCCS-M) and TADIL network (GCCS-M) interfaces, methods are being explored for the direct dissemination of targeting data to tactical strike aircraft. The Tactical Dissemination Module (TDM) is being developed to provide tactical aircraft assets with tailored critical situational awareness products. Information includes text, imagery (SAR, electro-optical (EO), infrared (IR), hyper-spectral imagery (HSI)), weather, threat updates, maps, and 3-D graphics. The TDM, and its integral software applications, provides an efficient method of generating and distributing digital strike planning products over an aircraft-specific data link. The TDM Core system consists of the Target Package Generator (TPG) workstation, Tactical Dissemination Workstation (TDW), and the System Communication Unit (SCU) (Figure 3-3). The TPG receives targeting data (imagery and targeting coordinates) from TES-N and formats it into a target package consisting of a modified 9-line or modified 13-line brief, and, for those aircraft capable of receiving imagery, a series of images used for “funnel” navigation and target recognition. Once formatted, this data is converted by the TDW for transmission to tactical aircraft. The SCU contains the hardware and software necessary to control appropriate data radios and transmitters.

TDM’s network centric design allows any TPG to pass target packages to any TDW as well as any TDW to control any SCU, providing they all reside on the same network. TDM is equipped to communicate with joint Tactical Air (TACAIR) assets through the following links:

1. Rapid Imagery Transmission Assembly (RITA) data link capable of providing analog video real-time information into the cockpit (RTIC) of any aircraft configured with an AWW-13, AXQ-14, or ZSW-1 pod (F/A-18, P-3, S-3, and F-15E).

2. Fast Tactical Imagery FTI/Prototype F/A-18 Datalink (PRISM) capable aircraft can not only receive data but also transmit tactical sensor data back to the TDM system. The data can then be fed back into and used by the NFN for BDA or new target intelligence data (F-14 FTI, F/A-18 PRISM, Jaguar, and P-3 ICE).

3. Improved Data Modem (IDM) (F-16, EA-6, and AH-64) data link. This Data link will also allow communication with F-18’s equipped with the Digital Communication System (DCS).

Current development is underway to migrate this capability to Link-16/TADIL-J, and to include the ability to transmit in flight mission/target updates to such future weapon systems the Extended Range Guided Munition (ERGM).

[57] During Fleet Battle Experiments and fleet exercises, command ships will be afforded the opportunity to employ the Land Attack Warfare System (LAWS) or the Automated Deep Operations Combat System (ADOCS). These two essentially identical software programs are designed to provide automated target-weapon pairing tools to the decision makers. Within the context of commander’s intent, a planner can use inputs from NFN systems and information on available weapon inventory and firing system readiness maintained current in LAWS to generate a prioritized list of available weapons to strike a TST. This information is available to both the ISR and engagement networks to synchronize efforts among distributed platforms to precisely locate, generate precision coordinates on, and then strike emergent targets according to a pre-established priority criteria.

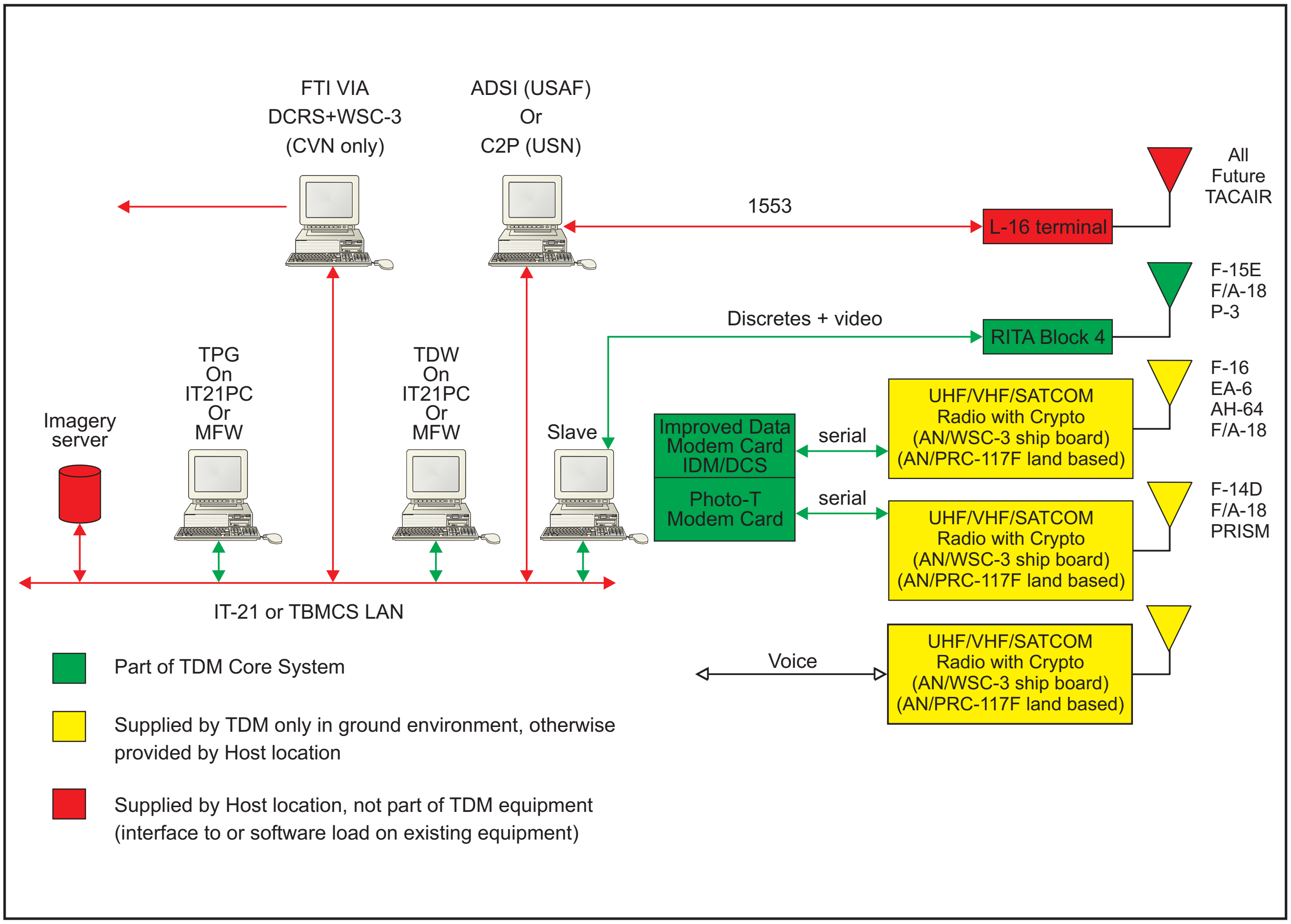


Figure 3-3. TDM

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CHAPTER 4

TACMEMO Evaluation Plan

4.1 INTRODUCTION

The introduction of NFN requires feedback and review in order to make an assessment of the applicability and effectiveness of the tactics, techniques, and procedures (TTPs) for the employment of NFN as presented in this TACMEMO. TACMEMOs are normally evaluated within two years of promulgation and either cancelled or incorporated into appropriate Naval Warfare Publications (NWPs). However, due to the evolving nature of NFN and this document's limiting scope of describing the architecture through twelve months after publication, NWDC envisions convening annual review conferences to evaluate the contents of the NFN TACMEMO. If the tactics, training, or procedures described herein are found to be substantially different by the fleet users, a revised TACMEMO will be issued.

4.2 OBJECTIVE

The objective of this chapter is to provide guidance in evaluating this TACMEMO and reporting the results of the evaluation. Evaluations should be conducted during fleet or joint exercises/operations where NFN is operational and will be employed for TST in the dynamic battlefield environment. The information that these small scale and limited evaluations will provide is not designed to supplant the professional testers in the Navy's developmental and operational test community but rather to supplement their efforts by identifying potential areas of interest for them to investigate while at the same time providing future deployers with some valuable information so they can avoid any pitfalls others have encountered. All feedback is considered valuable in assisting the Navy in making final recommendations for accepting the TTPs contained in this TACMEMO.

4.3 EVALUATION PLAN

Because of the nature of the NFN acquisition plan, made up of three separate systems managed by four program offices, the NFN architecture has not been fully evaluated in the operational environment. In order to provide feedback from the fleet operators, inputs are requested from the fleet to document the tactics, training, and procedures needing improvement so that future operators can benefit from lessons learned. This evaluation plan is recommended for use during any exercise or event that involves NFN.

4.3.1 Evaluation Requirements

In the absence of an operational requirements document or a clearly defined specification to measure against, the evaluation should concentrate on qualitative analysis of not only the operational utility of the NFN TACMEMO but also the manning, equipping, maintaining, and training requirements necessary to efficiently operate the architecture as a whole. The following areas should be addressed:

General

1. Does this TACMEMO adequately address the NFN architecture? If not, what areas are missing?

   a. Are the system descriptions adequate?

   b. Are the processes correctly documented?

c. Are the roles and functions of the individual NFN systems and subsystems in the "Find-Fix-Target-Track-Engage and Assess" phases correctly defined? If not, what is incorrect? If there is (are) redundancies, which is the preferred process?

d. Are all the associated training and manning, maintaining and equipping issues adequately addressed? If not, provide recommendations.

Effectiveness of NFN in the Targeting Process

1. Did NFN enhance the overall situational awareness of the decision maker?

2. Did NFN enhance the targeting process?

   a. Did NFN enhance the commanders SA in the deliberate process?

   b. Did NFN enhance the commanders SA in the TST process?

3. How many targets were found, exploited, and nominated for engagement using the NFN architecture during the given period (exercise, deployment, experiment)?

   a. What were the sensors used to detect the target?

   b. From time of detection, how long did it take to produce PGM and/or GPS weapon quality coordinates?

   c. How many targets nominated were actually engaged?

4. Was the timeliness of targeting affected by the sensor source or the NFN system used to do the exploitation?

Human/System Interface

1. How accurate was the COP?

   a. What pitfalls were encountered?

   b. How would the operators like to see the COP tools improved?

2. What were the procedures used to disseminate target coordinates/target packages to the shooter/weapon?

3. Did your watchstanders have the opportunity to control a sensor?

   a. What sensor? Which service/command owned the sensor?

   b. What were the process/training/limitations imposed by the sensors service/command?

   c. How much lead-time was required in order to obtain control?

4. Which intelligence support links were most useful and which ones that weren't provided were needed?

5. Which collaborative tool was the operator provided?

   a. Was it user friendly?

   b. What improvements are needed in collaborative tools for the operators to more effectively employ/operate the NFN architecture?

Reliability/Maintainability

1. What unscheduled maintenance was required (if any) for each of the three NFN related systems?

2. What integration/interface problems were encountered?

3. Were they Navy, Theater, or Joint specific?

   a. Were the interface problems between sea and land-based TES-N related nodes (TES-A, RTC, and RTC (Light), ISR Manager) TTP or communication related?

   b. Were they a result of training deficiencies or system/architecture deficiencies?

4. How accessible was engineering/troubleshooting support?

Manning/Training

1. When compared to a GCCS-M/JSIPS-M only configuration, were you manned appropriately to operate NFN?

   a. If not what additional manning was required?

   b. Will additional manning be required in the future (as MTTs are reduced)?

   c. What added operational capability would be achieved as a result of this manning increase?

2. What training was provided to the operators on each system?

   a. Was the training adequate?

   b. Was the training OJT or a Navy/contractor classroom course?

   c. Who taught the course(s)?

   d. If course was classroom oriented, how well did it prepare the operators for the real world operations?

   e. When was the training received in the training cycle? Was it the correct time to receive the training?

3. How was the watch station organized to employ NFN (physical positions of workstations)?

4. What were the roles, duties, responsibilities, workstations, chain of command, communication links, skills and training required of each watch station position?

Communication

1. What communication problems were encountered?

   a. Which specific system within NFN caused the problem?

   b. Did the problem result in failure of the mission?

2. How much bandwidth was required to operate NFN during strike operations?

   a. Did bandwidth limit strike operations?

   b. If so, what solution(s) (if any) were incorporated to resolve the bandwidth limit?

4.4 EVALUATION REPORT

4.4.1 Report Address

When reporting the results of TACMEMO evaluation, Figure 4–1 should be helpful in describing the thought process for reaching a final evaluation recommendation. Evaluation feedback may be submitted via Naval message, e-mail (NIPRNET or SIPRNET), or letter. The following address information is provided:

Naval message: COMNAVWARDEVCON NEWPORT RI //N5//
NIPRNET: knightr@nwdc.navy.mil
SIPRNET: knightr@nwc.navy.smil.mil
Letter: NAVY WARFARE DEVELOPMENT COMMAND
686 Cushing Road
Newport, RI 02841-1207
Commercial Phone: (401) 841-2718
DSN: 948-2718

Additionally, all users can submit comments on line using the Doctrine Discussion group, at the NWDC web page, following the links as listed:

www.nwdc.navy.smil.mil
"Doctrine Library"
"TACMEMOs"
"Naval Fires Network"
"Enter Comments"

4.4.2 Evaluation Report Format/Content

Guidance on evaluation feedback format and content is provided below:

From: (Evaluating Command/Unit)
To: NAVY WARFARE DEVELOPMENT COMMAND (Use applicable address from paragraph 4.4.1)

Subj: (TACMEMO Number); EVALUATION OF

1. Evaluation recommendations/comments of subject TACMEMO are provided below:

   a. TACMEMO Number: X-XX.X-XX

   b. TACMEMO Title: Provide Title

   c. Recommendation: (Provide one of the following specific recommendations for disposition of subject TACMEMO)

      (1) Cancel TACMEMO (*Provide rationale in paragraph 1.d Amplifying Comments*);

      (2) Continue TACMEMO evaluation (*Provide reasons for recommendation to continue evaluation in paragraph 1.d Amplifying Comments*);

      (3) Incorporate following changes in TACMEMO and retain for further evaluation (*Provide specific change recommendations in paragraph 1.d Amplifying Comments*.);

      (4) Incorporate following changes in TACMEMO and incorporate into NWP (*Provide specific change recommendations in paragraph 1.d Amplifying Comments*.); or

(5) Incorporate into doctrine (*Identify specific publication in paragraph 1.d Amplifying Comments*).

d. Amplifying Comments.

(1) *If recommendation (1) above (Cancel TACMEMO), explain rationale for cancellation recommendation; i.e., tactics ineffective; threat has changed/no longer exists; systems/software affected by TACMEMO are no longer in use.*

(2) *If recommendation (2) above (Continue evaluation), explain why; i.e., results of evaluation were inconclusive but TACMEMO is believed to have merit; unable to conduct evaluation; insufficient data to offer recommendation.*

(3) *If recommendation (3) or (4) above (make changes to TACMEMO and either re-evaluate or incorporate into doctrine), delineate specific change recommendations by individual paragraph number within TACMEMO.*

(4) *If recommendation is to incorporate TACMEMO into doctrine, identify applicable publication by title and number, and when possible identify specific chapters/sections of applicable publication in which TACMEMO should be incorporated.*

2. Provide command/unit point of contact information:

Point of Contact:
SIPRNET Address:
NIPRNET Address:
Mailing Address:
Com'l Phone Number:
DSN Phone Number:

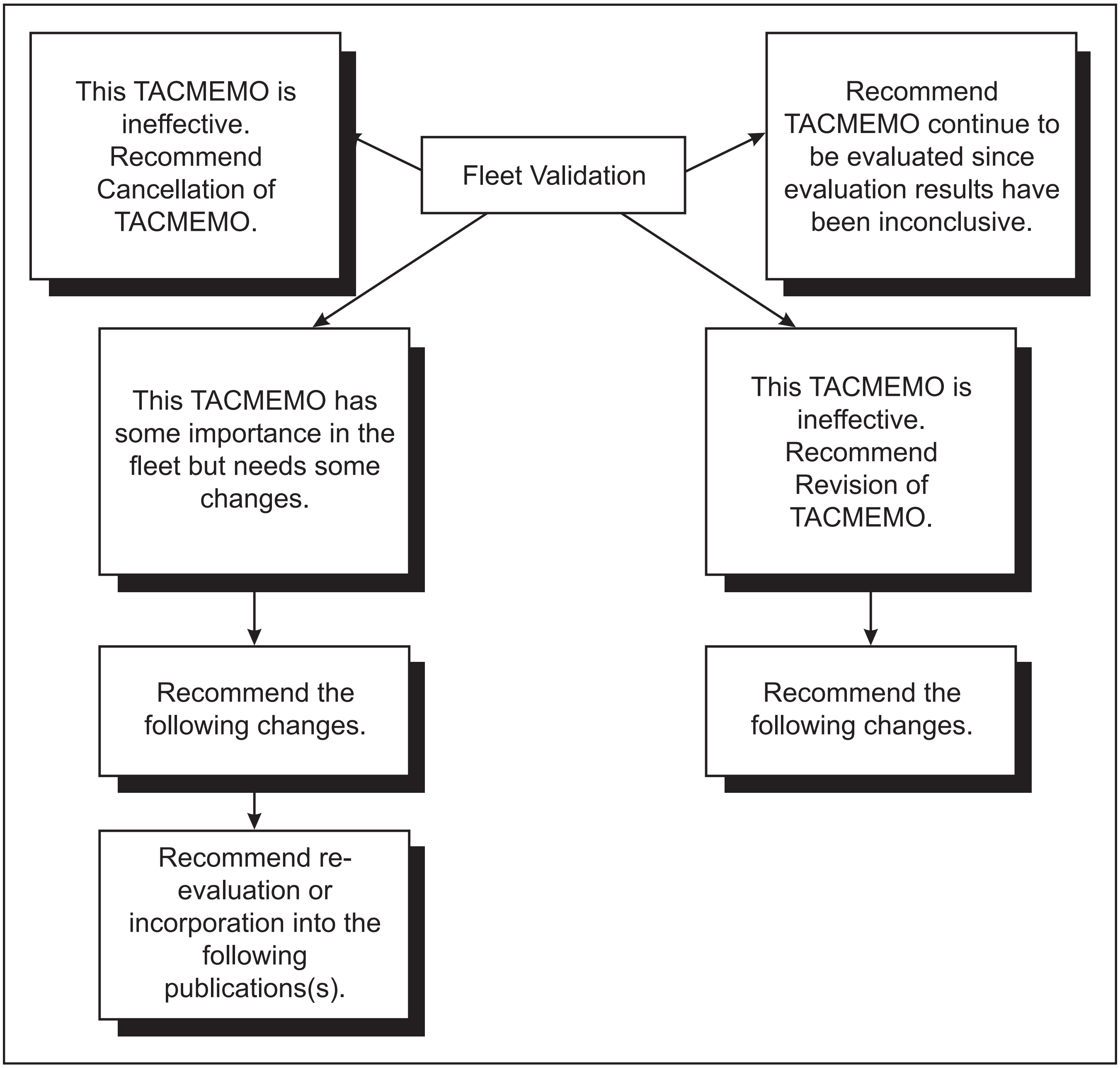

Figure 4–1. TACMEMO Evaluation Decision

APPENDIX A

Detailed System Descriptions

A.1 INTRODUCTION

Basic knowledge of the components that comprise GCCS-M, JSIPS-N, and TES-N is necessary in order to understand the capabilities and constraints of a given NFN Configuration. Commands will deploy with varying configurations of NFN, configurations that may not provide all the functionality of a full NFN, thereby limiting capabilities or requiring different procedures in order to accomplish the same task. This appendix provides detailed descriptions of the three NFN systems and should be used as a reference when specific system components are mentioned in the NFN TACMEMO.

A.2 GCCS-M

A.2.1 GCCS-M Major Hardware Components

GCCS-M hardware consists of Unix and PC-based workstations as shown in Figure A-1.

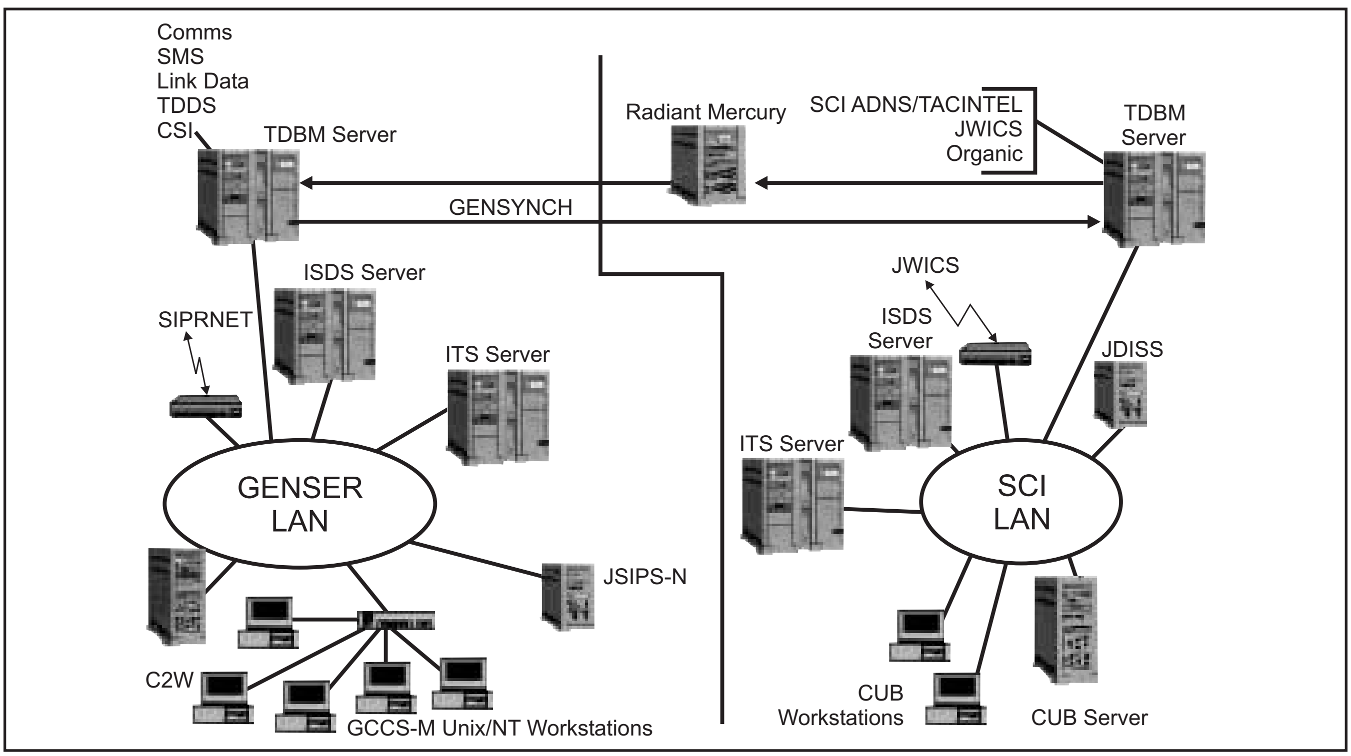

Figure A–1. GCCS-M Notional Force-level Schematic (Flagship, CVN, LHD, LHA)

Surface ships generally deploy with one of two GCCS-M configurations: a force-level capability (Numbered Fleet Flagships, CVNs, LHDs, and LHAs) or a unit-level capability. In either case, typically one workstation is designated the master for communications, one workstation is designated the master TDBM and all other workstations operate as clients.

A.2.1.1 Track Database Manager (TDBM)

The TDBM master workstation, also commonly referred to as Joint Operational Tactical System (JOTS 1), provides a COP to other networked workstations using client/server architecture. All versions of the GCCS-M system perform certain basic functions. These functions are included in the GCCS-M Common Load. GCCS-M also uses the TDBM and associated COP Synch Tools (CST) to share the COP with other GCCS-M, TBMCS, and GCCS Joint users.

A.2.1.1.1 Common Load

The Common Load provides multi-source track correlation and track database management. It supports the collection, processing, distribution, and maintenance of track-related data within the track database. This track database consists of data records containing the attributes, position history, activity history, and technical data history of reported ships, submarines, aircraft, land units, and other discrete fixed or moving objects of interest in the world within various intelligence domains.

The GCCS-M Common Load provides the essential services needed to support a C4I system, including:

1. Track correlation
2. Track database management
3. Track and geographic display
4. External interfaces
5. Communications handling
6. Input processing
7. Decision aids.

GCCS-M Common Load communications capabilities and interfaces include:

1. LINK-11
2. LINK-14
3. Officer in Tactical Command Information Exchange System (OTCIXS) Satellite Communications (SATCOM) Network
4. Tactical Data Information Exchange Subsystem (TADIXS)
5. Naval Tactical Data Systems (NTDS)
6. Messages containing overlays, PIMTRACKs, or Operator Notes (OPNOTEs)
7. Over-The-Horizon Targeting (OTH-T) GOLD Operational Tactical Group (OTG) Messages
8. United States Message Text Format (USMTF) messages

9. Automated Defense Information Network (AUTODIN)

10. Various Navigational Interfaces.

The Common Load maintains a dynamic tactical display through a Tactical Plot Manager. Tracks in the system appear as symbols on the tactical display representing objects or groups of objects (i.e., ships, submarines, land units, or aircraft). The position of the track on the screen reflects information contained in the latest contact report. Besides object tracks, the display also handles:

1. PIMTRACKs
2. Screen Kilo Formations
3. Four Whiskey Formations
4. Overlays
5. Data Link Reference Points (DLRP)
6. High Frequency Direction Finding (HFDF) Stations
7. Gridded Fields
8. Fixed Sites
9. Sound-Operated Submarine Underwater Surveillance System (SOSUS) Stations.

A.2.1.1.2 COP Sync Tools (CST)

The COP is used to pass platform tracks, and overlays around the COP network via the SIPRNET. It will also forward TADIL tracks if required to reach units that are outside the TADIL Radio Frequency (RF) architecture. CST is a database replication mechanism to ensure all participating nodes maintain the same data in their respective track databases.

Note

Since CST will require up to 32KB of throughput, most unit levels do not participate in the CST network, choosing instead to use OTCIXS or TADIXS to receive Over-The-Horizon (OTH) tracks. Some battle groups use a Net Precedence (NETPREC) protocol over the SIPRNET to push all the OTH tracks to non-COP participants on a timed schedule, to overcome the latency inherit in the slow OTCIXS and TADIXS satellite networks. For more information about communication architecture and bandwidth issues, see Appendix B.

A.2.1.1.3 Theater Ballistic Missile Warning and Display (TBMWD)

The TBMWD application enables GCCS-M to obtain, process, and display Theater Ballistic Missile (TBM) track information. The application includes the correlation and deconfliction of multiple Theater Event System tracks and fusion of correlated track parameters to define a single TBM track. The end result is increased situational awareness and force protection via rapid notification of a TBM attack. These notifications are an audible warning and/or a visual display, accompanied by a GCCS-M track and associated information including missile flight path and time of impact.

A.2.1.1.4 Multi-TADIL Capability (MTC)

MTC provides an interface between the Air Defense System Integrator (ADSI) hardware and MTC software running on GCCS-M. This combination is installed on command ships, certain CV/CVNs, and at NAVCENT in Bahrain. MTC allows a 2-way interface to/from the GCCS-M and the TADIL A/J networks. MTC allows link tracks to be displayed on the COP along with non-link tracks, and allows force orders to be sent from any GCCS-M workstation directly into the TADIL network.

A.2.1.2 Intel Shared Data Server (ISDS)

While the TDBM receives and processes track data (“wet tracks”) received via other C4I systems, the ISDS interfaces with the MIDB and other databases that contain more “static” contact information (“dry tracks”). Commonly referred to as JOTS 19, the ISDS is a central data repository for the GCCS-M system.

A.2.1.3 Imagery Transformation Server (ITS)

The ITS, commonly referred to as JOTS 14, serves as the imagery data store for the GCCS-M system. The imagery applications within GCCS-M provide non-imagery analysts with the capability to combine exploited imagery (received from JSIPS-N or TES-N) with MIDB intelligence data and to overlay imagery onto the COP display. If the exploited imagery is in National Imagery Transmission Format (NITF), ITS has the capability to automatically associate the image with OOB data in the MIDB. Image exploitation capabilities include data transformations (rotations and scaling), and image data format translations.

A.2.1.4 Gale-Lite Server

Force level units such as command ships, LHA/LHD and CV/CVN receive ELINT directly from TRAP TDDS broadcasts via Tactical Receive Equipment (TRE) or equivalent receivers. This data is used by the TDBM for tactical I&W of ballistic missile launches and other significant impending threats. The ELINT correlator in GCCS-M processes the ELINT data and creates contacts/tracks or updates existing tracks previously associated by afloat ELINT analysts. The TDDS feed is also passed in an unfiltered manner to the Gale Lite Server (JOTS 3), where it is used for archival and long-term ELINT analysis. If this ELINT analysis effort results in the generation of a high-interest track that needs to be disseminated via the COP, the ELINT track is passed to the GCCS-M COP database via the Gale Lite Interface Segment (GLIS).

Note

> Unit level ships normally do not have tactical receivers (e.g., TRE, Multi Mission Advances Tactical Terminal (MATT) or JTT radios) to receive TDDS data directly. However, units generally have a need for I&W of impending threats or high-interest units beyond the horizon of their organic self-detection Electronic Support Measures (ESM) capabilities such as the SLQ-32. A recently introduced capability is RADIANT ETHER, consisting of a PC/software to obtain a TDDS rebroadcast from a central shore site via SIPRNET. This ELINT is used in the Combat Information Center (CIC) Electronic Warfare (EW) module for I&W and in the assigned SSES/COMBAT DF spaces to assist in signals intelligence (SIGINT) analysis.

A.2.1.5 Cryptologic Unified Build (CUB) Server

GCCS-M is fielded on both the SCI and GENSER networks on Force-Level platforms. The SCI version has additional MIDB information in the ISDS to support SIGINT analysis. This information is coupled with cryptologic applications embedded within the CUB Server (JOTS 18) to support SIGINT operations and the association of COMINT with platform tracks. This data will be shared between the command ships and LHA/LHD, CV/CVN and unit level platforms. If this association is made, the LHA/LHD or CV/CVN will pass a sanitized version of the track through Radiant Mercury to the GENSER GCCS-M network, which makes that track available to operators on the COP network.

A.2.1.6 GCCS-M Client Workstations

The client workstations are used by various GCCS-M operators to perform functions such as contact ambiguity resolution, OTCIXS network administration, Force OTH Track Coordinator (FOTC) database quality assurance, and corrections to erroneous incoming messages.

A.2.1.7 IT-21 Workstations

As part of the Information Technology for the 21st Century (IT-21) initiative, PC-based hardware and software provide network management and office productivity applications. Additionally, all IT-21 workstations installed on every platform have a subset of GCCS-M capabilities, including the following:

1. C2PC — allows read only view of COP tracks and overlays. Versions higher than 5.4 allow plotting of MIDB data directly onto the chart display.

2. Intel Office — allows queries and updates to the MIDB via a Microsoft Excel interface. Allows easy manipulation of queries and resulting data. Data can be extracted and sent to Portable Flight Planning System (PFPS) or Quiver for tactical aircraft mission planning.

3. Microsoft Chat — Microsoft Chat is compatible with the Internet Relay Chat (IRC) servers and ZIRCON chat software used in GCCS-M. IRC is heavily used; with up to 50 chat rooms monitored in a continuous basis by each battle group asset. Its flexibility is replacing voice command and reporting circuits.

4. E-mail — SIPRNET e-mail is available on every workstation. The Navy Marine Corp white pages information database is replicated across the Navy domain, allowing automated lookups for users at every command in the USN.

5. Quiver — locally maintained targeting database with automated tools to build strike planning and briefing packages. Interfaces with MIDB through Intel Office for enemy order of battle information.

6. JIVE — Allows real-time monitoring of UAV streaming video.

7. ITS web — web browser access to Imagery stored on ITS web, with import capability from the JSIPS-N IPL.

8. ISDS Web — browser access to MIDB data stored on ISDS server.

A.2.2 GCCS-M Interface to Weapons Systems

GCCS-M has interfaces to numerous weapons systems. For the Advanced Tomahawk Weapon Control System (ATWCS), TTWCS, and Naval Fire Control System (NFCS), the information provided by GCCS-M is used to identify targets and the obstructions preventing munitions from reaching those targets. The type of data exchanges and the platforms where it is installed are illustrated in the Table A-1.

A.3 JSIPS-N

A.3.1 JSIPS-N Major Hardware Components

Figures A-2 and A-3 provide a graphical representation of the hardware components that make up the current (version 3.0) and objective (versions 3.1 and 3.2, deploying within the next 12 months) JSIPS-N architectures.

A.3.1.1 National Input Segment (NIS)

The NIS (present in JSIPS-N version 3.0 and earlier) is an SCI National Technical Means (NTM) imagery dissemination management system that allows appropriately equipped ships to directly request and receive imagery derived from national sources. The physical architecture of the NIS (Figure A-4) includes two primary NIMA components:

INTERFACE	TYPE DATA EXCHANGED	WHERE INSTALLED
ACDS Block 0	One way TADIL-A to GCCS-M	LHA, most CVs, LHDs
ACDS Block 1	OTH tracks from GCCS-M to ACDS. TADIL A/J tracks to GCCS-M in Model 4 taxonomy.	CV-67, CVN-68, LHD-1, LHD-7
AEGIS Baseline 6 phase I	OTH tracks from GCCS-M to Aegis Display System. TADIL A/J and local SPY-1 tracks to GCCS-M	CG-59, 65, 66, 68, 69, 71 DDG 79-84
AEGIS Baseline 6 phase II	OTH tracks from GCCS-M to Aegis Display System, C&D, and ACTS. TADIL A/J and local SPY-1 tracks to GCCS-M	DDG-85, DDG-90
AEGIS Baseline 6 phase III	OTH tracks from GCCS-M to Aegis Display System, C&D, and ACTS. TADIL A/J and local SPY-1 tracks to GCCS-M	DDG 91 and follow
ATWCS	OTH tracks from GCCS-M to ATWCS	CG-52-67
TTWCS	OTH tracks and history from GCCS-M to TTWCS	DDG-63
TTWCS (future)	OTH tracks and history from GCCS-M to TTWCS. MIDB JUNIT data to TTWCS for mission planning.	
NFCS	OTH tracks and history from GCCS-M to NFCS	TBD

Table A–1. GCCS-M Weapon System Interfaces

the Dissemination Element (DE) and the Imagery Exploitation Support System (IESS). The DE manages the receipt, catalog, archiving, and secondary dissemination of imagery. The IESS manages the registration of target coverage/imagery needs and dissemination between the source and the DE.[58] All products disseminated to the NIS are provided in response to a site request registered via the IESS local requirement (standing or adhoc) or a DE manual product request (adhoc only). All Unix based SCI systems connected to the JSIPS-N Local Area Network (LAN) have the capability to browse, chip and disseminate imagery via a remote mount of the DE Client software. Imagery can be disseminated in two national formats, NITF Uncompressed and Tape Format Requirements Document (TFRD).

The NIS is currently being replaced by the JSIPS-N Concentrator Architecture (JCA).

A.3.1.2 JSIPS-N Concentrator Architecture (JCA)

The JCA (fielded in JSIPS-N versions 3.1 and later) permits dissemination of primary national imagery and secondary tactical imagery in a network-centric dissemination architecture (Figure A-5). Unlike the NIS, most JCA components are located ashore and allow the receipt of imagery in the collateral secret environment (source data is extracted prior to dissemination). In addition to providing national imagery receipt, the JCA supports dissemination of tactical imagery and strike planning/target folders to other platforms or to a netted "concentrator" server facility for distribution to multiple sites. The JCA was developed to provide naval units with a capability to receive NRT imagery products and the capability to retrieve archived products as needed.

The JCA consists of three primary components: a Dissemination Element, an IESS, and a Concentrator Open Primary Server (COPS). Fleet interface to the JCA is via a unit's local site Image Product Library IPL (next section), which contains IESS Client and COPS Client software (Figure A-6).

The IESS server maintains the database of fleet-wide local imagery/target coverage requirements and performs the brokering between the JCA and the NTM Source to determine what is available versus what is desired by each

[58] In the event that IESS is offline, the DE provides a Back-Up Dissemination (BUD) mode that provides the same functionality as IESS.

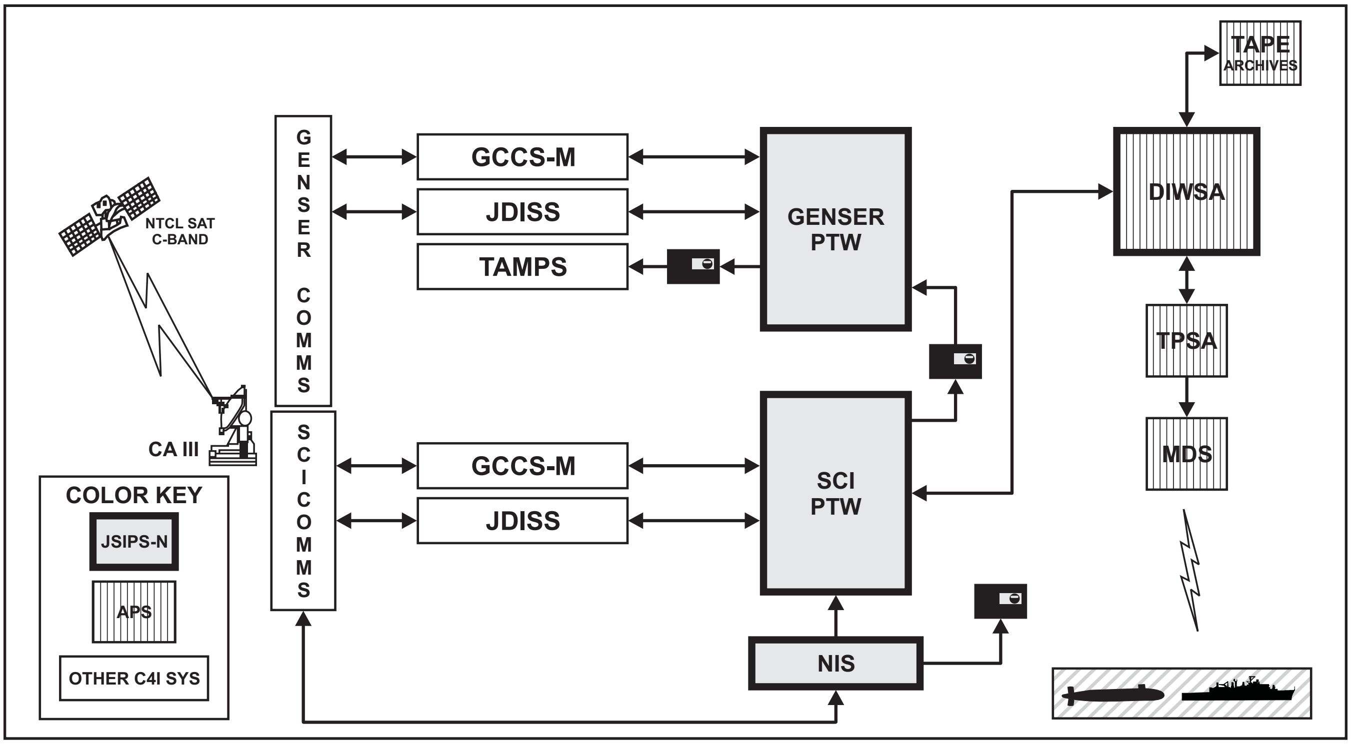

Figure A–2. JSIPS-N Version 3.0 Architecture

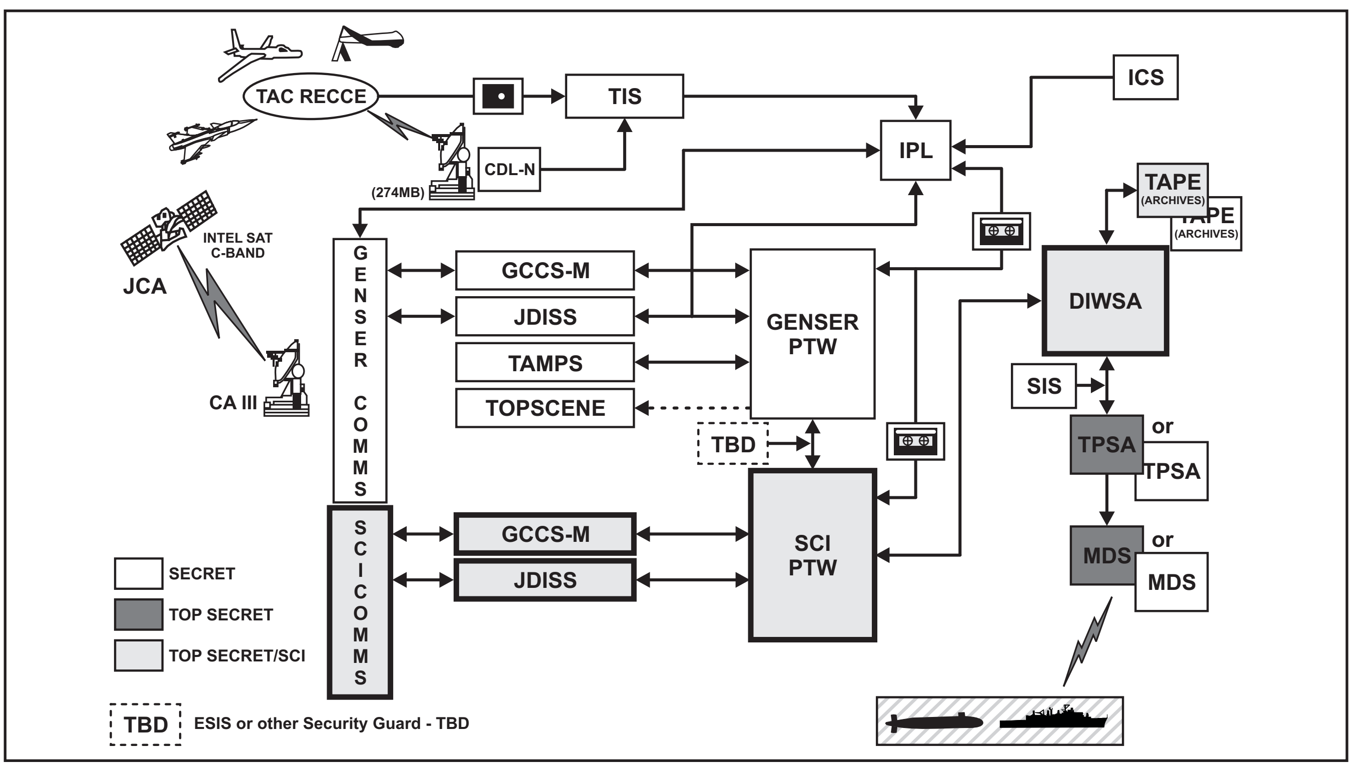

Figure A–3. JSIPS-N Version 3.1/3.2 Architectures

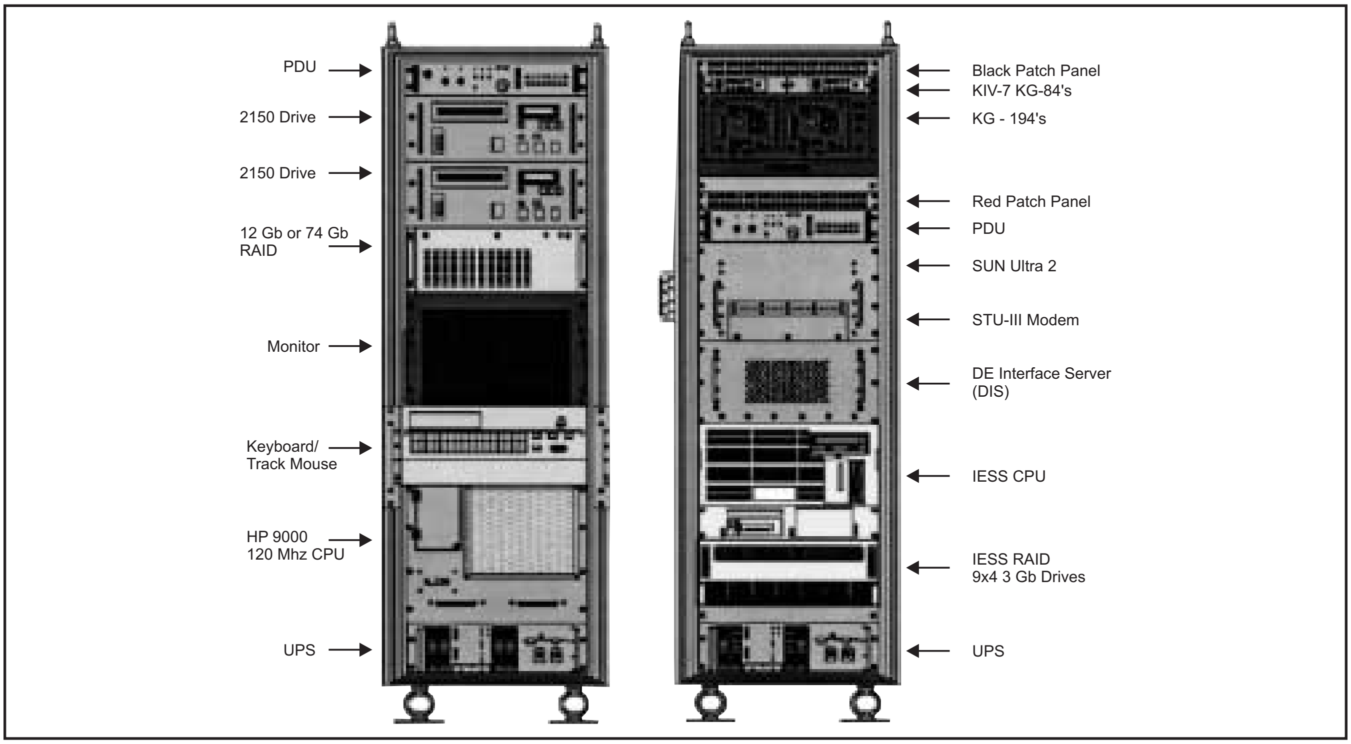

Figure A–4. JSIPS-N National Input Segment (NIS)

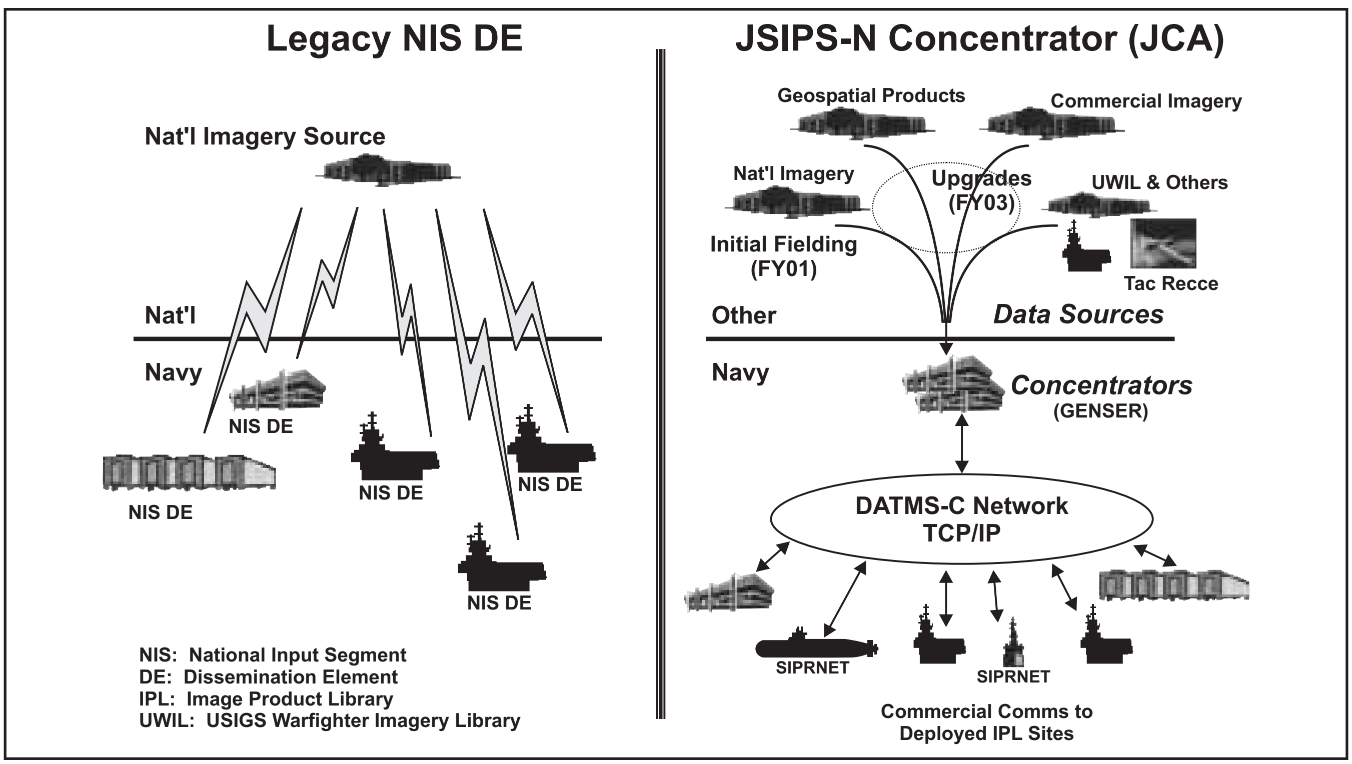

Figure A–5. JSIPS-N NIS Versus JCA

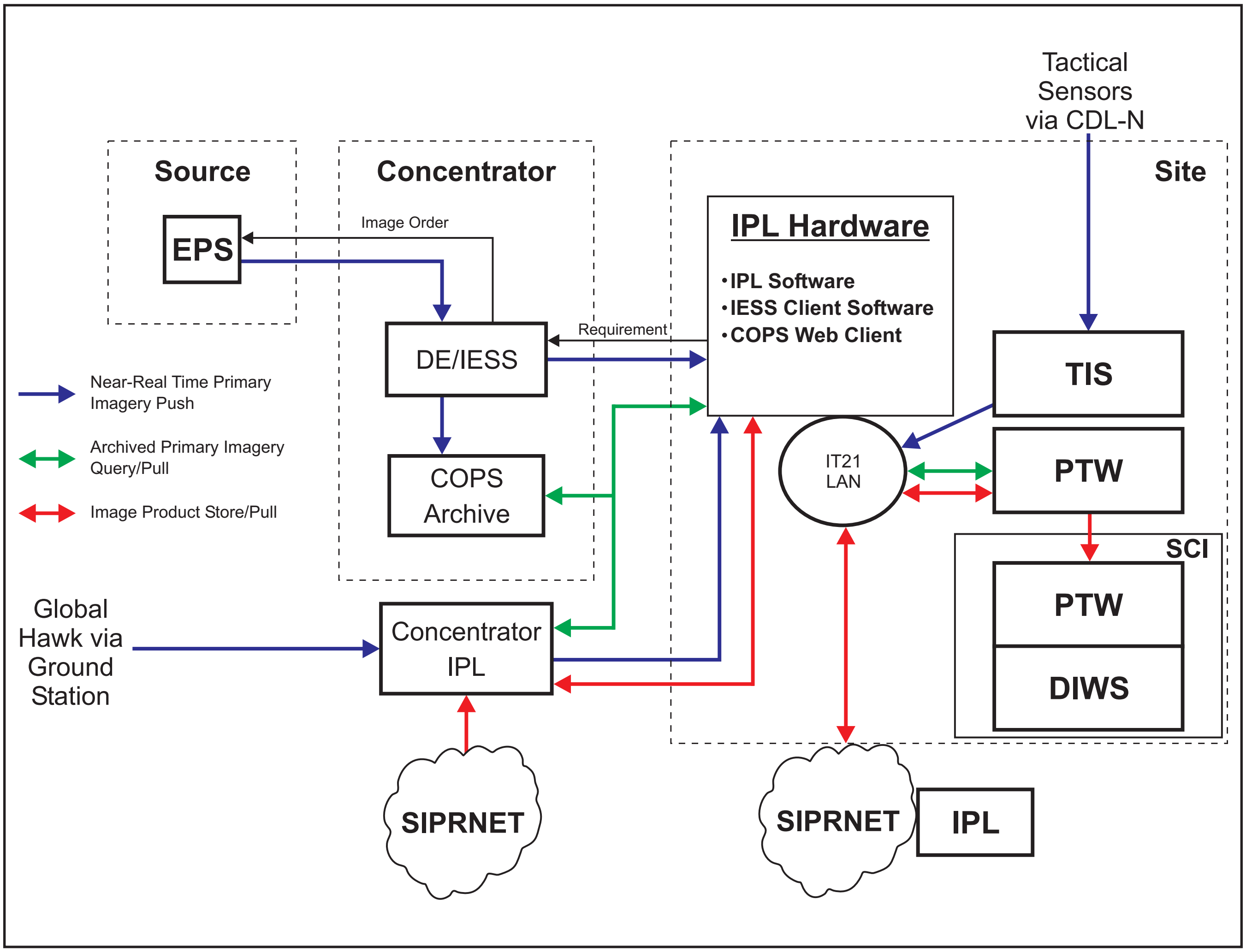

Figure A–6. JSIPS-N Data Flow

remote user site. The IESS then performs three basic functions: 1) auto disseminates the imagery (via the DE) to the requesting user's local storage on the site IPL, 2) stores a copy of the product in the JCA COPS server robotic archive for later retrieval by any user, 3) if unavailable or restricted, notifies the requesting user that dissemination will not be accomplished.

Assigning **"local targets"** to a **"local requirement"**[59] via local IESS Client software establishes a site's concentrator imagery needs for near-real-time dissemination. Managed properly, pre-defined target coverage requests result in automated near-real-time dissemination of imagery coverage to a local site IPL. Also, IESS is a target coverage archive database that can be used to perform history of coverage searches against imagery maintained in the concentrator archive and available for forwarding to a sites local IPL.

Archives are maintained for all site active requirements using COPS. COPS contains a copy of every image ordered by each site IPL. All site ordered imagery is permanently maintained within the concentrator archive, either online

[59] Targets are geographic locations with latitude, longitude, and radius as defined in the MIDB database base load or created by a local site IESS user. IESS Client users create "**local requirements**" (when, why and how) and "**local targets**" (who or what). If a target is not identified in a local requirement, imagery is "not" being requested for dissemination to your site.

within the Concentrator Redundant Array of Inexpensive Disks (RAID) or offline within a robotic tape storage system. The primary COPS functions performed by a site user are: imagery database query, imagery preview, and full frame or chipped image transfers.

A.3.1.3 Image Product Library (IPL)

The IPL (fielded in JSIPS-N versions 3.1 and later) is the primary NTM imagery dissemination management system and functions as a site's "long term" local imagery archive (1 or 4Tb RAID) and imagery server. Primary IPL software applications available to site users are:

1. **IESS Client** — the IESS Client is the site user interface to the IESS server at the JCA. The IESS Client software provides the user with the functionality to establish standing local requirements for imagery/target coverage. Additionally site users can initiate adhoc requests for imagery/target coverage when operational tempo precedes establishing a standing requirement.

2. **COPS Web Client** — the COPS Web client is the site user interface to the COPS server at the JCA. The COPS Web client provides the user with the functionality to browse the entire JCA library and either pull "as stored" or "chipped" imagery/target coverage. The files requested are transferred via FTP to the IPL and Quick Query must be used for local retrieval, pre-viewing, and further dissemination.

3. **Quick Query (Q2)** — the Q2 web based software provides the user with the functionality to browse local holdings maintained on the site IPL, preview image overviews and perform further dissemination to exploitation/mensuration workstations. All GENSER systems connected to the JSIPS-N LAN have the capability to browse and disseminate imagery from the IPL via the Q2 software.

A.3.1.4 Precision Targeting Workstation (PTW)

PTW is an integrated tool suite that supports imagery exploitation and targeting functions in both client-server and web-enabled architectures. It provides targeting workflow management to nominate targets, develop target information, derive aimpoints, and electronically distribute targeting data to mission planning and weapons systems. PTW version 4.0 (deployed with JSIPS-N version 3.2) has been further certified by National Imagery and Mapping Agency (NIMA) and PEO(W) to provide precise targeting aimpoints for precision-guided munitions (PGMs).[60] PTW's web-based application, PTWeb, provides imagery exploitation, distributed targeting, and aimpoint generation services accessed by IT-21 workstations or SIPRNET-equipped machines aboard afloat and shore-based locations.

Primary applications on the PTW are the Strike Planning Archive (SPA) and PTW software. The SPA is a strike planning imagery server for JSIPS-N. The SPA is not intended for long-term storage of imagery because of limited hard disk storage space and the large file sizes associated with imagery (the IPL is used for longer term storage). The SPA is recommended for the following types of tasks:

1. Maintaining a directory of images stored locally and at the DIWS.

2. Retrieval of images locally, from IPL or DIWS.

[60] 051132Z JUN 02 PEOSTRKWPNSUAVN PATUXENT RIVER MD. The following sources are certified for operational use in support of GPS-guided PGM to include JSOW, SLAM-ER, and JDAM (TLAM addressed separately):

1. Digital Point Positioning Data Base (DPPDB);
2. Multi-Image NTM Geopositioning (MIG) using electro-optical sensors;
3. Single NTM image registered to DPPDB using DTED Level 1; and
4. Single ray (monoscopic image) NTM using DTED Level 1.

No tactical sensor models have been validated for operational use in any service aimpoint generation system. PTW 4.0.1/4.1 ATARS, SYERS, and TAROS-CD models may be used for situational awareness but are not certified for use in PGM. Approval for operational use of these models and future sensors such as SHARP and Global Hawk will be provided separately pending collection of sufficient airborne sensor data and validation activity.

3. Providing images and products to strike planning clients, PTW, and DIWS.

4. Allowing clients to task the DIWS for product generation.

5. Providing general web browser capability for user access to classified intelligence databases.

The PTW software provides easy to use digital imagery electronic light table (ELT) and exploitation/product generation capabilities. Products include USMTF exploitation reports, NITF compliant annotated image products, and TACAIR/PGM targeting and mission planning/rehearsal materials. PTW is recommended for the following types of tasks:

1. Suitability screening of received IPL imagery

2. Imagery exploitation where absolute accuracy requirements are not stringent (non-PGM applications) (v3.x issue only)

3. Screening of imagery to be passed to DIWS where absolute accuracy requirements are stringent (v3.x issue only)

4. Creation of image display products for use in other shipboard systems

5. Downgrading digital image based products for secondary dissemination

6. Offset aimpoint development

7. Perspective scene generation

8. USMTF report generation

9. Electronic target folder creation and maintenance

10. Targeteering/Weaponeering

A.3.1.5 Digital Imagery Workstation (DIWS)

The DIWS is part of the TMPC and provides image data processing for extracting terrain and feature data to produce Digital Scene Matching Area Correlation (DSMAC) maps, precision geopositioning targeting coordinates and related navigation/route planning data in support of Tomahawk cruise missile employment activities. Also, the DIWS provides image management services, and provides for quality control and accuracy assessment functions on all products it produces. The DIWS system is divided into four subsystems:

1. The Image Data Input (IDI) subsystem performs the imagery interface functions.

2. The Image Data Storage (IDS) subsystem provides large, on-line image storage to satisfy the storage requirements of the DIWS and supply the workstations with imagery in real time to satisfy all image processing and product generation functions.

3. The Shared Resource (SR) subsystem provides centralized system management of the DIWS and performs Digital Terrain Matrix (DTM) and Terrain Comparison (TERCOM) Matrix merging functions, utility/support processing functions, external interface functions, and internal data handling functions.

4. The Workstation (WS) subsystem provides all image processing and data collection processing required for mensuration functions, processing functions, and display and control functions.

The DIWS workstation software verifies that the results of photogrammetric operations meet the required quality standards specified in the task assignment. Typically, results that do not meet the required quality standard are detected, evaluated, and corrected prior to task completion.

A.3.1.6 Tactical Input Segment (TIS)

The TIS, to be fielded on certain carriers within the next twelve months, receives and processes tactical airborne imagery. The TIS will accept and process raw imagery and auxiliary support data from multiple sensors via the CDL-N communications link[61] and/or a collection platform's magnetic media storage device. Platforms/sensors supported by the TIS include the FA-18's Airborne Tactical Air Reconnaissance System (ATARS) and SHARP; the U-2's Advanced Synthetic Aperture Radar System (ASARS-2) and Senior Year Electro-Optical Reconnaissance System (SYERS); and Global Hawk. The TIS provides a capability to screen processed imagery continuously as it is collected by an airborne platform for EO and IR sensors and in the ground plane for the SAR sensor. The TIS is capable of formatting the output data into exploitable imagery and transferring this imagery to other segments of JSIPS-N, or other shipboard systems in a variety of data formats. Target areas of particular intelligence value are identified, extracted, formatted, and transferred in near real-time to the IPL for local storage and/or the PTW for exploitation and/or precision geopositioning.

The TIS consists of three primary components: the CIP, the Screener Processor Element (SPE), and the Situational Awareness Processor (SAP). The CIP, a component of the Common Imagery Ground/Surface System (CIGSS),[62] is the primary signal processor for all sensor data, except SHARP. The SPE hosts the tactical imagery screener application. It receives data from the CDL-N or DSS (Data Storage System), processes all SHARP data, and controls CIP processing of legacy sensor data. It receives target cues from the SAP for overlay and sends image products to the SAP for archive. The SPE also interfaces to the Real-Time RAID for temporary staging of NITF image data during screening. The SAP provides interface between the TIS and GCCS-M (for MIDB and ELINT data) over the classified data LAN. The SAP performs the following primary functions:

1. **Target Cue Ingestion** — The SAP receives MIDB and ELINT data over the classified data LAN and integrates that data into the TIS displays for operator orientation.

2. **Collection Awareness** — SHARP collection plans can be received over the data LAN or entered manually through the SAP GUI. Either way, the collection plans of current and past missions are available to the operator.

3. **Mission Monitoring** — Using navigational data transmitted over the CDL, the SAP can track and overlay on a map display real-time sensor information like location, altitude, orientation, etc. If a SHARP collection plan has been entered, the operator will be able to see the "planned track" compared to the "actual track" flown.

4. **Selected Imagery Target Area (SITA) Dissemination** — The SAP controls the distribution of SITAs created during screening.

5. **Archive Management** — Using the Archive RAID and the AIT Tape Library, the SAP can archive SITAs and processed imagery from the SPE. Upon demand, the SAP can retrieve these files and make them available for dissemination or screening.

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[61] Both TIS and TES-N use the Common Imagery Processor (CIP) to process sensor data received via a CDL-N. There are three primary differences in the capabilities the two systems as they relate to CDL-N operations: 1) the TIS has an additional component that allows the receipt of FA-18 SHARP data, which cannot be processed by TES-N; 2) TES-N provides software that allows real-time user control of U-2 sensors (ROE and MOAs permitting); 3) sensor data received via a TES CIP can forwarded to an RTC (bandwidth permitting) where remote exploitation can occur.

[62] CIGSS is a family of image processing and exploitation systems that can accept unprocessed data from electronic or tape media sources, and derive imagery products for military intelligence and operations. The CIP is the primary sensor-processing element of the CIGSS. The function of the CIP is to accept imagery and support data and process it into an exploitable image and output it to other elements of the CIGSS.

6. **DII COE Hosting** — The SAP hosts the standard DII COE suite of security software. This application prevents unauthorized access to TIS files by users or other devices on the classified LAN.

A.3.1.7 VEXCEL Imaging System

The Vexcel imaging system allows hardcopy tactical reconnaissance (TACRECCE) imagery (i.e., F-14 TARPS data) to be digitized into an electronic format that can be used by the JSIPS-N system.

A.4 TES-N

A.4.1 TES-N Major Hardware Components

Basic knowledge of the components that comprise TES-N is necessary in order to understand various capabilities or limitations that may be encountered in an operational environment. Naval units may deploy with various TES-N configurations (section A.4.2). Figure A-7 provides a graphical representation of the hardware components that make up a full TES-N system.

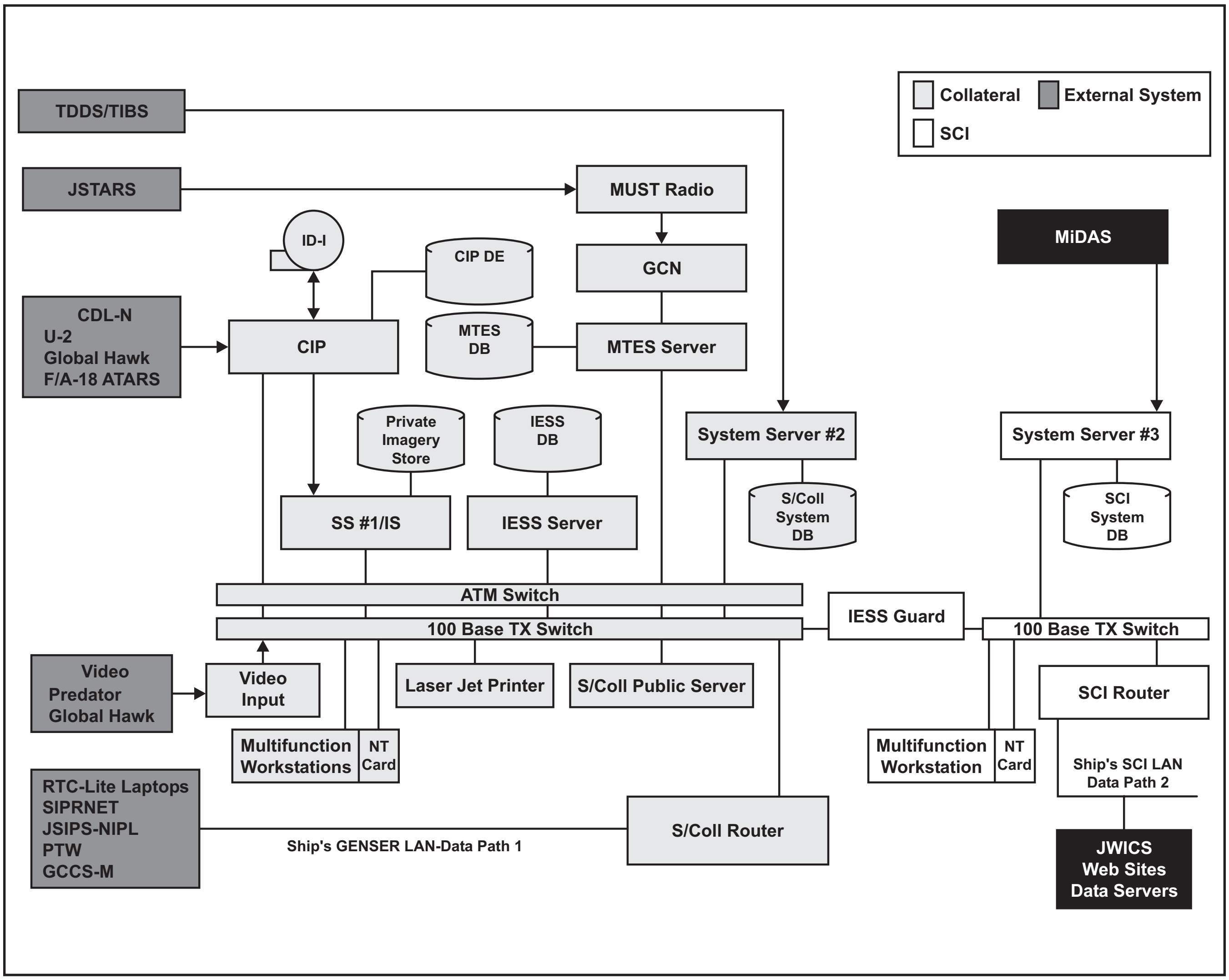

Figure A–7. TES-N Architecture and Principal Data Paths for CVN-72

A.4.1.1 Common Imagery Processor (CIP)

The CIP receives and processes raw, wide band tactical sensor data down-linked through the CDL-N antenna (described in Appendix B).[63] The CIP formats sensor data into exploitable NITF imagery that can be stored and exploited by TES-N and other systems within NFN. The CIP is currently able to process data from the U-2's ASARS/ASARS-II and SYERS sensors, the USMC F/A-18's ATARS sensor, and various Global Hawk UAV sensors.

A.4.1.2 Video Server/MPEG Decoder

Many legacy ISR platforms (particularly older UAVs like the Pioneer and Predator) transmit EO/IR sensor data in video format. TES-N includes a video server that processes this incoming EO/IR data and converts it into MPEG (Moving Picture Experts Group) format so it can be viewed at user workstations and chipped into still imagery for exploitation.

A.4.1.3 Moving Target Exploitation System (MTES)

The MTES provides a set of components and tools to capture, process, display and exploit JSTARS MTI-based data, and then disseminate resulting high value exploitable products to an operator at a TES multi-function workstation (MFWS). The MTES includes two major components. The first is the JSTARS Ground Communication Node (GCN) component, which provides UHF SATCOM communications processing upon receipt of near real-time JSTARS data. The primary function of the GCN is to provide a direct link with the JSTARS aircraft via a MUST UHF SATCOM radio, and serve as a communications channel for JSTARS MTI (and SAR) products. The system also supports post-mission JSTARS data playback mode for training and mission preparation purposes. The GCN converts the JSTARS formatted MTI, SARs, RSRs, and navigation data into a format that can be read and processed by the MTES server.

The MTES Server is the second component, which provides the near real-time processing of JSTARS MTI information along with persistent cataloging and storage. This persistent storage of MTI-based products is crucial to history playback functions that are the foundation to tracking and targeting of mobile targets.

A.4.1.4 Miniaturized Data Acquisition System (MIDAS)

MIDAS is a system that allows TES-N to receive and process national SIGINT data. See TES-N classified documentation for more detailed descriptions of the MIDAS system.

A.4.1.5 System Servers (SS)

Several servers are utilized by the full TES-N system to facilitate the flow and storage of data.

A.4.1.5.1 System Server 1 (SS1)

The CIP (described above) only produces imagery — software hosted on System Server 1 handles other CDL-N tactical operations (tape control, telemetry monitoring, datalink communications, etc.) that are not performed by the CIP itself. The EMPS is hosted on SS1 and allows users to plan and upload/download U-2 navigation and collection plans, monitor the U-2 mission as it occurs and remotely control specific sensors (ROE and MOAs permitting). Additional information on EMPS is provided in Chapter 2. Screener and Chipper utilities are available to users that are used to monitor and extract selected images from the sensor data stream. As imagery is chipped it is also transferred to the Imagery Server in NITF format.

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[63] Both TIS and TES-N use the Common Imagery Processor (CIP) to process sensor data received via a CDL-N. There are three primary differences in the capabilities of the two systems as they relate to CDL-N operations: 1) the TIS has an additional component that allows the receipt of FA-18 SHARP data, which cannot be processed by TES-N; 2) TES-N provides software that allows real-time user control of U-2 sensors (ROE and MOAs permitting); and 3) sensor data received via a TES CIP can forwarded to an RTC (bandwidth permitting) where remote exploitation can occur.

A.4.1.5.2 Imagery Server

As imagery is transferred into the Imagery Server, a database record is created for the image. The image is then sent to a local RAID database for storage. If an IESS Server (described below) is present, the Imagery Server sends image receipt messages to the IESS.

A.4.1.5.3 Imagery Exploitation Support System (IESS) Server

The IESS manages imagery targets and exploitation requirements. Exploitation requirements identify the intelligence information that is to be extracted from collected imagery, who should be sent the data, what form it should take, and when it is needed. When an imagery receipt message arrives from the Imagery Server, the IESS checks to see if the imagery fulfills a local exploitation requirement or target. If so, an active task / exploitation package is generated for manipulation by Imagery Analysts (IAs). If there is no matching requirement / target, the image is placed into a “Review Only” queue where it is temporarily stored for later review. The IESS also supports auto-registration of imagery products and report generation. The IESS does not store imagery itself — it automates many of the tasks necessary to exploit that imagery.

A.4.1.5.4 System Server 2 (SS2)

System Server 2 (SS2) is a key component of the TES-N system. It hosts the cross intelligence (CROSS-INT or XINT) database that contains data derived from multiple intelligence sources. This data can be displayed in configurable layers on the Integrated Tactical Display (ITD), allowing operators various methods of correlating and analyzing data.

SS2 also hosts the GALE-Lite server for ELINT track development and analysis. Two serial feeds, containing TRAP and Tactical Information Broadcast System (TIBS) broadcasts respectively, from the ship’s communications center are input into system server #2. The GALE-Lite server stores the ELINT messages and makes the data available to operators using GALE-Lite at a MFWS.

SS2 is also the primary communications manager for the TES-N system. The Tactical Communications Message Subsystem (TCMS) is responsible for passing released record message traffic from the RMTS to a communications link that will transmit the message to its end destination. The TCMS also receives incoming record message traffic from various communication subsystems and passes the messages to the RMTS for distribution within the TES-N. The TCMS may be accessed from any multi-functional workstation. The Data Input/Output Port (DIOP), also configured on SS2, allows real-time screening and exploitation of direct downlink tactical imagery by users without direct sensor access. DIOP provides the ability to transfer imagery from the fixed site (e.g., the TES-N) to up to three remote sites (e.g., RTCs) and conversely enables a remote site to use sensor control or uplink collection plans.

A.4.1.5.5 System Server 3 (SS3)

System Server 3 resides on the SCI LAN and contains additional GALE and XINT databases. System Server 3 also contains software that builds packages for information transfer through the ISSE guard to the secret collateral LAN.

A.4.1.6 ISSE Guard

The ISSE Guard facilitates SCI LAN to GENSER collateral LAN transfer of imagery to the Imagery Server. It also guards against malicious intrusions from the GENSER collateral LAN.

A.4.1.7 Multi-Function Workstations (MFWS)

All SUN workstations provided with TES-N are configured identically and provide user access to all network devices and to all system data via various software applications. Each workstation has a dual headed display (Figure A-8) that allows users to perform multiple activities simultaneously. Typically, one display is used for control operations and the second display is used for displaying data.

Figure A–8. MFWS

A.4.2 TES-N Configurations

Presently, there are four main configurations for TES-N: Full System, LSS, RTC and RTC-Lite. Configuration differences are due to the existence or lack of certain components (Table A-2).

A.4.2.1 Full TES-N System

A full TES-N system contains all the components necessary to conduct operations with various sensor platforms. This configuration is roughly equivalent to the Army's TES-Forward (TES-F). A full TES-N can serve multiple MFWS as well as one or more RTCs. A command ship may have up to eight workstations, while a typical carrier-based system may have up to ten workstations (see Appendix C). A full TES-N can be employed as a stand-alone system, as a server supporting multiple RTCs, or networked with other TES systems. Dependent on communication constraints (see Appendix B), a full TES-N system can use DIOP to forward sensor data received via its CDL-N/CIP to a remote TES-N unit or RTC for processing. If bandwidth is limited, the full TES-N site may process the sensor data locally and forward only required images.

A.4.2.2 Littoral Surveillance System (LSS)

Naval Reserve MIUW units provide surface and subsurface surveillance and C4I support within the inshore area in support of expeditionary warfare operations worldwide. The MIUW program provides harbor defense, coastal

	Full TES-N	LSS	RTC	RTC Lite
CIP W/ CDL-N OR MIST ANTENNA	X	X		
MTES w/ MUST Antenna	X	X		
MIDAS Antenna	X	X		
System Server 1	X	X	(Note 1)	
Imagery Server	X	X	(Note 1)	
IESS	X	X		
System Server 2	X	X	(Note 1)	
System Server 3	X	X	X	
ISSE Guard	X	X	X	
# Multifunction Workstations	8-10	8-10	(Note 2)	1
MIUW Components		X		
Notes: Functionality of SS1, SS2 and IS are combined into a single server. Each RTC server is capable of supporting 4 MFWS. Typical dual server RTC can support 8 workstations.				

Table A–2. TES-N Configurations

surveillance, and C3 services to support fleet operations. Upgraded Inshore Undersea Warfare (IUW) units include organic resources for electronic surveillance and local area active radar search in addition to the baseline system capability for local inshore acoustic surveillance and coastal surveillance roles. The LSS integrates the major functions of the MIUW system with that of the TES-N system. The beyond line-of-sight data provided by the LSS enhances situation awareness and can be used to cue local MIUW sensors onto their targets. Combining the current MIUW sensor data with the enhanced C4I Surveillance and Reconnaissance (C4ISR) information available from LSS will result in more comprehensive and relevant MIUW reporting. The LSS will serve as a server for deployed RTCs when a full TES-N node (or an Army TES-F node) is not available. Like a command ship, it is anticipated that an LSS may employ up to eight workstations (Appendix C).

A.4.2.3 Remote Terminal Component (RTC)[64]

A scalable TES configuration known as the RTC can provide multi-INT immediate access to sensor products, displays, and control functions for remote operators in all services. RTCs have a smaller equipment footprint (up to eight workstations) and cost than full systems, allowing installation aboard space constrained platforms like surface combatants and submarines.

The RTC provides the commander a capability to remote operations of the TES-N to another location. It operates in a client-server relationship with the full system creating a near-real time distributed network that shares information among geographically dispersed nodes. The RTC provides scalable functionality that is determined by available communication capability. The RTC can operate over a wide range of bandwidths to support rapid icon visualization (lower bandwidth) through real time display of imagery products (higher bandwidth).

RTC configurations allow many of the TES-N functions to be performed. When connected to various intelligence data feeds, it provides a full set of SIGINT analysis, correlation, and integration capabilities. It replicates the TES-N

[64] Several deployed RTCs have been given a specific name. The "TES-C" installed in Bahrain is one example of a specific RTC that has been deployed to date.

Cross-INT database and uses the ITD to present this information to an operator. The RTC uses the same Remote View ELT used by the full TES system. When a full TES-N node (or compatible system, e.g. TES-A or ISR Manager) is not available, the RTC can still perform basic intelligence support functions in a remote autonomous mode. Figure A-9 shows the major hardware components that comprise an RTC.

Because the RTC lacks several key components of the full TES-N system, the following limitations / constraints will be realized by units deployed with an RTC. Table A-3 also summarized differences between full TES-N and RTC operations.

1. The RTC configuration does not include a CIP and a CDL-N antenna, so RTC units are dependent on full TES systems to forward real time downlink of theater and tactical IMINT feeds from airborne collection platforms that require the CDL-N and CIP (U-2 ASARS/SYERS, FA-18 ATARS, Global Hawk UAV sensors). If a TIS equipped JSIPS-N is available, this sensor data can be processed by JSIPS-N and then imagery forwarded to the RTC. RTC units are still able to directly receive and process video from other ISR platforms (e.g., Predator) that is forwarded via SIPRNET, GBS, etc.

2. The RTC does not include MTES functionality. Data must be forwarded from a full TES system.

3. The RTC does not contain an IESS. Therefore, automatic task management features normally performed by the IESS (and accessed by the user via the Workforce Manager application) are not performed. Furthermore, this means that users will not have the ability to correlate target basic encyclopedia numbers (BE#) with national or tactical imagery loaded in the RTC's imagery database. The Database Organizer (DBO) tool must be used to manually manage exploitation tasking and imagery file manipulation.

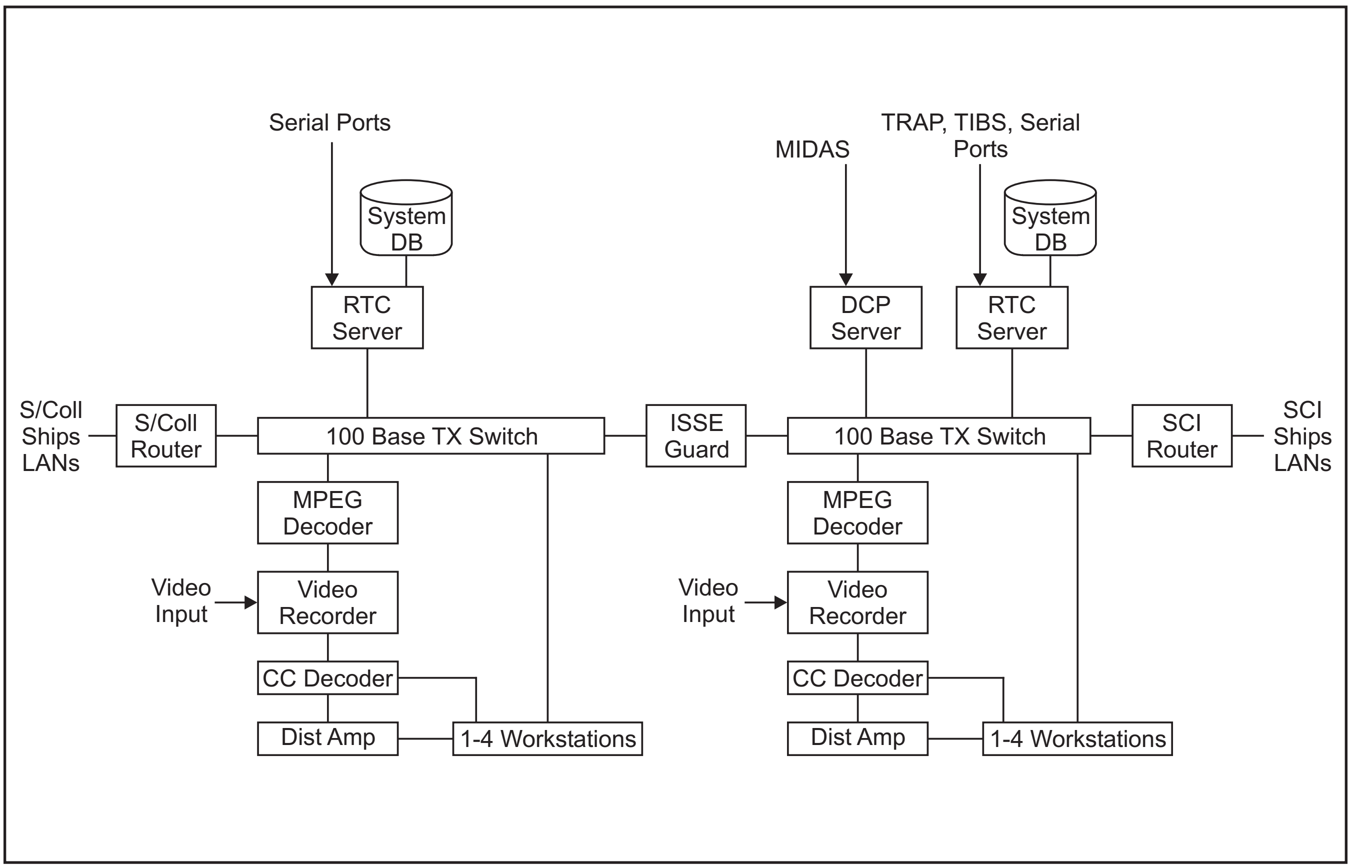

Figure A–9. RTC Component Diagram

	FULL TES-N	RTC SUPPORTED BY TES (1)	AUTONOMOUS RTC
Tactical Imagery (CDL-N) Processing & Exploitation	Yes	Yes (2)	Limited (3)
National Imagery Processing & Exploitation	Yes (3)	Yes (3)	Yes (3)
Video Screening/Capture/Registration	Yes (4)	Yes (4)	Yes (4)
NTM SIGINT	Yes	Yes	Yes (3)
Broadcast SIGINT	Yes	Yes	Yes
Target Geolocation (Non-PGM)	Yes	Yes	Yes
Target Nomination	Yes	Yes	Yes
U-2 Sensor Tasking & Control (ROE/MOA permitting)	Yes	Yes (2)	No
JSTARS SAR/MTI	Yes	Yes (5)	No
GCCS-M Track Interface (see Appendix G)	Yes	Yes	Yes
Collaborative Tools	Yes	Yes	Yes
Geo-Correlated Multi-INT Display in Near Real-Time	Yes	Yes	Limited (6)

Notes:
1. RTC requires TES support and adequate (min 512K) bandwidth for full performance.
2. Assumes 512K link; performance degraded significantly at less bandwidth.
3. Imagery/NTM SIGINT received and processed by other systems (e.g., JSIPS-N or GCCS-M). Can be forwarded to RTC/TES-N for exploitation.
4. Most video does not come with telemetry data — registration is manual.
5. RTC receives MTI tracks, not data. No onboard processing.
6. Limited to data sources and tracks able to be received by RTC.

Table A–3. RTC Versus Full TES-N Capability

4. Although current installation plans have most RTCs in a dual server configuration, it is possible that some units may deploy with a single server configuration. Single server RTC units must therefore decide whether to use the system in a Secret GENSER (connected to SIPRNET) or an SCI (connected to JWICS) mode of operation. Simultaneous high and low side operations are not possible for single server units. If an RTC can only reside at either the SCI or Secret GENSER level, it is recommended that an RTC be configured for the SCI level (connected to the JWICS LAN). This configuration has several advantages. First, because the Army's TES-F operates at the SCI level, users will be able to gain NRT access to U-2 imagery when operating in the vicinity of a TES-F. If the RTC is configured on the GENSER LAN, there can be added delays. Second, JWICS connectivity provides access to a wide range of national intelligence databases, whose information can be imported into the RTC to support analysis. Finally, JWICS connectivity allows RTC operators improved access to national level SIGINT products and analytical tools. SIGINT analysis on the Genser LAN, while possible, has many limitations that curtail its analytical value. On the other hand, while RTCs connected to the JWICS LAN streamline access to intelligence databases and resources, there is a directly relatable loss in automated capability for providing analyzed intelligence data to GENSER cleared operators.

5. The speed at which imagery can be transferred from a full TES unit will be largely dependent upon communication bandwidths available between the RTC and the TES unit. See Appendix B for more information on communication considerations.

A.4.2.4 RTC Lite

The RTC-Lite is a lightweight, man portable unit that can be deployed at any level. RTC-Lite provides a limited TENCAP communications and PAR capability where deployed. RTC-Lite is primarily used as a situational awareness tool that allows TES preprocessed data to be shared in a distributed environment. RTC-Lite will receive TDDS (IBS-S), TIBS, Imagery Intelligence (IMINT)/Measurement and Signature Intelligence (MASINT), Cross-INT reports and GCCS-M tracks from TES-N/RTC systems, but contains limited to no exploitation tools of its own. Data is retrieved from the TES system at predefined intervals.[65]

[65] The RTC-Lite system currently locks user operations during updates, so relatively long update intervals will prevent near-real time receipt of data.

APPENDIX B

Communications

B.1 INTRODUCTION

Because of the need to rapidly receive and correlate ISR data from many different tactical, theater and national sources, NFN communications requirements are demanding. Network Centric Warfare envisions that service component systems will be interconnected through a variety of communication networks and a theater-deployable communications architecture that can be easily reconfigured to support forces on the move and provide connectivity to isolated forces. In practice, the principle communications path

to affect tasking coordination will be over JWICS on area or SATCOM AUTODIN (DMS) communications. Back up communications will be via UHF SATCOM or possibly S band if that is available to all or some participants. Product data and/or report flow may be over JWICS / SIPRNET / TDDS (IBS-S)/TIBS dependent on availability and timeliness constraints. UHF SATCOM or LOS will provide back up as necessary.

However, bandwidth requirements continue to grow with the fielding of additional sensors and intelligence processing systems. Communications capabilities have not increased at the same rate as the fielding of these new sensors or systems. Deployed TPED systems often lack ready access to high-bandwidth robust communications necessary to support the warfighter. The availability and cost of this necessary communication's infrastructure continues to be a major issue.

Communication requirements will be continuously monitored as NFN deploys and evolves towards a converged architecture. Before entering an Area of Responsibility (AOR), naval forces should coordinate with the theater CINC to determine bandwidth apportionment. In those instances where competition for bandwidth arises, the appropriate theater CINC will adjudicate the request, based on operational needs. The following paragraphs discuss various communication pathways and issues that operators should be aware of as they employ NFN.

B.2 COMMUNICATION PATHS

The near-term NFN communications architecture utilizes a combination of SATCOM solutions, including super high frequency (SHF) Defense Satellite Communications Service (DSCS) X-band and extremely high frequency (EHF) MDR (medium data rate), augmented by Challenge Athena (CA-III) C-band.

B.2.1 SHF Defense Satellite Communications Service (DSCS) X-Band

The DSCS X-band solution uses existing DSCS network terrestrial and space segment infrastructure, and funds necessary upgrades to support additional bandwidth required by NFN.

The X-band solution uses the existing terrestrial infrastructure; however, it also requires expensive lease and install of an additional ground based terminal for a "backhaul" capability. Possible latency concerns associated with C-band solution(s) would be alleviated; however, C-band latency problems cannot be confirmed or quantified without planned testing. The X-band DSCS approach could support the requisite number of carrier battle groups (CVBGs) and other ships equipped with NFN components (TES-N/RTC, JSIPS-N, GCCS-M), but the Navy must obtain joint allocation of bandwidth for those ships from theater CINCs.

B.2.2 EHF Medium Data Rate (MDR)

EHF MDR transmits voice, data and imagery with an increased throughput of 4.8 Kbps up to 1.544 Mbps (T-1). The

EHF MDR solution will be utilized upon its initial operational capability (IOC) in May 02, which is currently programmed by OPNAV N61. EHF MDR will be fully integrated and will provide quality of service, the lowest possible latency, load balancing, and dynamic bandwidth allocation. It is a highly protected waveform, providing up to 14 dedicated point-to-point T1 services. It is the best and lowest cost option for meeting future NFN requirements. EHF MDR is dependent on the theater CINC's allocation of bandwidth, which may not always be allotted to naval forces in a joint arena. And, while EHF MDR is the most capable communications architecture for supporting NFN, it is also the most complex.

B.2.3 AN/WSC-8(V)X Challenge Athena (CA-III) C-Band

Challenge Athena (Commercial Wideband SATCOM Program (CWSP)) provides for low to high capacity connectivity not supported by military satellite capacity. Challenge Athena III provides full-duplex, low, medium and high data rates up to T1 (1.544 Mbps) by using a family of COTS/non-developmental item (NDI) SATCOM terminals and services. CA-III's primary objective is to use commercial wide-band satellite communication connectivity to deliver primary national imagery. In addition, CA-III supports other "limited" high data rate (HDR) communications such as video teleconference (VTC) and commercial grade DSN phone lines to multiple deployed Naval forces. Typical data services supported by CA-III network include, but are not limited to:

1. National imagery dissemination (JSIPS JCA @ 128 kbps-1.544Mbps)
2. VTC (@ 128 kbps)
3. SI Intel (SI JDISS @ 56 kbps)
4. GENSER Intel (GENSER JDISS @ 56 kbps)
5. Public Affairs Officer (PAO @ 64 kbps)
6. Afloat Personal Telephone Service (APTS @ 128 kbps)
7. Telemedicine (@ 128 kbps)
8. DSCS restoral (@ 128-256 kbps)
9. STU-III (@ 352 kbps)

Commercial SATCOM shipboard integration is a continual challenge due to the overlap in frequencies with other installed RF systems. In addition, naval usage in Continental United States (INCONUS) is extremely limited. C-band pier side operations are only authorized, on an experimental basis, at Norfolk and San Diego. Pacific and Atlantic mobile frequency assignments are available outside of 60nm / 100km from the coastline and are unauthorized within 100km of the coastline.

The CA-III/commercial C-band solution will be implemented worldwide in the near-term. In conjunction with the SHF DSCS upgrades, procurement of additional C-band space segment and terrestrial infrastructure will upgrade CA-III operations to 2 Mbps full duplex worldwide, providing sufficient commercial C-band bandwidth to facilitate shipboard processing, correlation, exploitation and precision targeting on up to 14 large deck ships.

B.2.4 Common Data Link-Navy (CDL-N)

Direct access to in-theater tactical imagery and SIGINT data from multi-Service airborne collectors requires CDL-N capability aboard the afloat platform. CDL-N is a DOD mandated interoperable, full-duplex, jam resistant spread spectrum, line of sight, high bandwidth (up to 274 Mbps), secure data link for microwave downlink and onboard processing of ISR data from U-2, Global Hawk, RC-12 Guard Rail, F/A-18 ATARS/SHARP, S-3B SSU, SH-60 LAMPS (Hawklink), and P-3C/AIP/Special Projects. The uplink operates at 200 kbps. The downlink can operate at 10.71 to 45 Mbps, 137 Mbps, or 234 Mbps. It operates in a LOS mode with one collector at a time, currently in the X and KU bands with Low Probability of Intercept (LPI). CDL-N consists of two antennas (one meter diameter) and five racks of below-deck equipment per shipboard installation. CDL-N is currently installed on 10 aircraft carriers, 1 LHD (IWO JIMA) and 1 command ship (CORONADO), and is programmed for installation on all large-deck amphibious ships. Users should be aware that the existence of a CDL-N does not ensure full compatibility will all CDL-compliant sensors. Sensor-specific cards are required within the CDL-N Network Interface Unit (NIU). Users should determine early which sensors they plan on interfacing with and ensure that they have the appropriate sensor cards available.

B.3 BANDWIDTH ISSUES

Operational experience has demonstrated that a data rate of 256 Kb/second is required (with 512 Kb/second desired) to provide the capability to receive high quality imagery from force or shore facilities. While limited NFN functionality is possible with lower bandwidths, it does not provide the robust connectivity with and among afloat platforms that is required to support time sensitive targeting. Table B–1 provides an example of various RTC capabilities that can be expected at various bandwidths.

Initial testing indicating the performance that can be expected at different data rates is presented in Table B–2.

Bandwidth capacity and latency testing with various TES system configurations and data rates will continue. The NFN communications working group will use the test results to assess impacts of latency on multi-intelligence processing and correlation at low, medium, and high data rates, using multiple scenarios with multiple satellite "hops" to test the effects. Utilizing planned exercises and real-world operations, program personnel will evaluate TES-N bandwidth usage while employing Ku-band, EHF MDR, and DSCS SATCOM paths, with a specific focus on ship-to-ship and ship-to-shore communications to facilitate RTC employment on various platforms.

B.4 COMMUNICATION PROTOCOLS

Data flow and dependency requirements are shown in Table B–3.

Capability	Functionality	Bandwidth Requirements
Minimum Capability	Correlated Multi-INT Display National & Tactical From Existing Comms: JSTARS Tracks Tracks into GCCS Uplinks to TACAIR	32K
Medium Capability	Minimum Capability + Tactical Imagery Receipt & Forwarding	160 or 256K
Maximum Capability	Medium Capability + U2 Data Receipt U2 Sensor Control Common ISR Database	256 or 512K

Table B–1. RTC Communications Requirements

		28.8 kbps	33.6 kbps	56 kbps	128 kbps	256 kbps	512 kbps	1.544 Mbps
Function	**Dial In**	**Dial In**	**Dial In**	**Dial In**	**ISDN**	**Partial T1**	**1/2 T1**	**T1**
Comms Msgs	Acceptable	Acceptable	Acceptable	Excellent	Excellent	Excellent	Excellent	Excellent
Mission Monitoring	Acceptable	Acceptable	Acceptable	Excellent	Excellent	Excellent	Excellent	Excellent
Collection Plan	Acceptable	Acceptable	Acceptable	Excellent	Excellent	Excellent	Excellent	Excellent
RTOD (Dwns mp)	Unacceptable	Unacceptable	Unacceptable	Acceptable*	Acceptable*	Acceptable	See Note 1	Excellent
Immediate Retask	Acceptable	Acceptable	Acceptable	Excellent	Excellent	Excellent	Excellent	Excellent
Pull Selected Imagery	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Excellent	Excellent
Push All Imagery	Unacceptable	Unacceptable	Unacceptable	Very Slow	Very Slow	Slow	See Note 1	Excellent
SPOT Timing (Dwns mp)	14min 24sec	4min 48sec	3min 3sec	2min 24sec	1min 5sec	36sec	18sec	6sec
SPOT Timing (Full Res)	31min 12sec	10min 24sec	8min 20sec	5min 12sec	2min 51sec	1min 18sec	39sec	13sec

	Transmission Times (seconds)						
	9.6k	28.8k	56k	128k	256k	512k	1.544M
Comm Msg (CP/NP)	208.3	69.4	35.7	15.6	7.8	3.9	1.3
Mission Monitoring (ASARS)	0.3	0.1	0.0	0.0	0.0	0.0	0.0
Collection Planning							
Screener (ASARS typical)	69	23	12	5	2.6	1.3	0.4
Adhoc Retasking	1.0	0.3	0.2	0.1	0.04	0.02	0.01
Immediate Retasking*	1.0	0.3	0.2	0.1	0.0	0.02	0.01
Pull Selected Imagery							
Push All Imagery (4:1 comp) 10 sec Collect	546	182	94	41	20	10	3

* Requires Compression
Note 1: only one of these should be active at the same time

unsatisfactory performance (shaded)

Table B–2. RTC Performance at Various Data Rates

Destination System[1]	Data Description[2]	Data Rate Usage[3]	LAN or WAN[4]	Data Transfer Protocols[5]	Additional Remarks[6]
JSIPS-N IPL	National imagery data	TBD	LAN	TCP/IP FTP	No special requirements for standard network data protocols
PTW	Targeting messages and associated imagery	TBD	LAN	TCP/IP FTP	No special requirements for standard network data protocols
GCCS-M	Track data (2-way)	TBD	LAN	UDP, TCP/IP NAT	UDP is default protocol for GCCS-M master to client configuration. TCP/IP is backup protocol used if UDP is unavailable. NAT is required for router address translation. No special requirements for standard network data protocols
SIPRNET	Web site data	TBD	WAN	TCP/IP FTP, HTTP	No special requirements for standard network data protocols
JWICS	SIGINT	TBD	LAN	TCP/IP FTP	No special requirements for standard network data protocols
JWICS	Web site data	TBD	WAN	TCP/IP FTP, HTTP	No special requirements for standard network data protocols
Network data servers	TBD data	TBD	WAN	TCP/IP FTP	No special requirements for standard network data protocols

Notes:
1. System with which information is exchanged.
2. General description of exchanged information.
3. Estimate of average data rate (not the peak data rate) over an operational timeline.
4. LAN, Wide Area Network (WAN) or both.
5. OSI layers 3-7 (e.g., TCP, IP, HTTP-Hyper Text Transfer Protocol).
6. Describes basis for bandwidth estimation. For TCP describe capability to resume transfer rather than restarting when the connection is interrupted, maximum time for tolerated interruption, and other unique TCP features.

Table B–3. Data Flow and Dependency Requirements

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APPENDIX C

TES-N Manning

C.1 INTRODUCTION

This appendix provides recommendations on how to utilize various personnel in order to operate the TES-N system. Note: this TACMEMO is not a manpower requirements document. Future NFN architecture manning will be based on a top down functional analysis (TDFA) of overall system design using established NAVMAC procedures. Final manning requirements for NFN will be evaluated through detailed analysis of operator and maintainer functions and workload associated with specific tasks necessary to operate, maintain and support NFN while executing all assigned missions.[66] In the short term, units deploying with TES-N may have supplemental manning requirements and/or may need to redistribute current personnel in order to optimize NFN operations.

TES-N has the capability to be scaled to platform space and supportability constraints. Spiral 1 is the installation of the TES-N equipment as tested on the USS CORONADO. Spiral 2 begins the convergence of TES-N with JSIPS-N and GCCS-M, leading up to a converged architecture. The following represents the "initial conditions" of staffing based upon empirical analysis of the configuration of TES-N on USS CORONADO and required operator skills. The Intelligence Specialist Technical Advisor, IS and CT Enlisted Community Managers (ECMs), ship's company intelligence and operations personnel as well as TES-N augmentees from Fleet Battle Experiment – India (FBE-I) and the Limited Objective Experiments (LOE) working up to it performed the USS CORONADO manpower analysis. Based upon this analysis, "notional" manning postures were developed for a 1) Flag Ship (USS CORONADO), 2) Littoral Surveillance System (LSS), 3) Carrier and 4) Remote Terminal Component (RTC). These manning postures are not all-inclusive, meaning some configuration dissimilarities may occur between similar platforms.

C.2 FLAG SHIP & LITTORAL SURVEILLANCE SYSTEM (LSS) MANNING

Based upon observations of the LOEs and FBE-I conducted on the USS CORONADO, Table C–1 reflects one section manning (of a two- or three-section watch) posture of a Flag Ship configured with 8 TES-N multifunction workstations (MFWS). The first column reflects the space on USS CORONADO where the TES-N MFWS was installed (the annotation "(1)" in the position column indicates the number of workstations in that workspace). The second column indicates the position title of that particular MFWS; and column three and four are the requirements for the operator's Rate/Navy Enlisted Classification (NEC) Code, and operational functions. The approximate manning for the LSS is similar to that of the Flag Ship manning requirements.

Note

> Targeting functions, collection management, database management, and watch officer functions were performed by ship's company (resident capabilities) and none of these operators were sitting at TES-N MFWS.

[66] One objective of the converged architecture (Chapter 3) is to combine functionality found among all three systems so that fewer workstations, and by extension personnel, are required.

Space	Position (MFWS)	Rate/NEC Or Rank/Desig	Operational Functions
JAOC	Watch Officer	CWO/O-3 OPINTEL	Direct the operations of the TES-N positions, interface to the Battle Watch Captain, track target list
	Mission Planner/Screener (1)	IS2/3910	Screen raw feeds, build, monitor mission plan(s), monitor link status
	Collection Manager	O-3/1630	Build Collection Plans, change plan based upon operations, perform trade-off analysis, manage the sensors
	Imagery (1)	IS2/3910	Perform imagery analysis, target ID
	COP	IS3/0000	Enter/manage air and surface tracks in GCCS-M
	Cross-INT (1)	IS2/3924	ITD, Fusion, MTES, MTE Analysis
JFE (JISE)	Cross-INT (1)	IS1/3924	Screener (alternate), perform historical analysis, fusion, IPB
SSES	SIGINT (1)	CTT2/9102	SIGINT tasking, analysis, sanitization
ECOC	Imagery (1)	IS2/3910	Ground tracking, calls for fire, coordinate tasking/ dissemination
JSC	Maint.	CTM1	Perform preventative and corrective maintenance
	Imagery (1)	IS2/3910	Imagery analysis, quality control
	Targeting Support (1)	IS2/3923	Target nomination, targeting support, BDA
	Database Manager/Dissemination Manager	IS2/3923	Perform quality control on targeting database, ensure products are delivered
	Strike Analyst	IS1/3923	Generate aimpoints, feed to weapon systems

Table C–1. TES-N Flag Ship Manning

C.3 CARRIER MANNING

The manning lessons learned from USS CORONADO were applied to the USS LINCOLN. Based upon numerous installation IPTs and discussions with operations and intelligence officers, the manning plan represented by Table C–2 was generated. It illustrates a 10-position TES-N installation with one section of a two-or three-section watch posture.

C.4 SINGLE SERVER RTC MANNING

The RTC is a “trimmed-down” version of the TES-N that can potentially deploy in a single server configuration operating either at the Secret GENSER or SCI level. Table C–3 represents the manning posture of a single section of a two-section watch for a unit with a single server RTC. The manning for a dual server RTC (with both Secret GENSER and SCI components) will be similar to that of a Flag Ship or Carrier above.

C.5 MAINTENANCE AND ADMINISTRATIVE SUPPORT

The system will be supported by a full-time maintenance contractor, a Field Service Representative (FSR). The FSR will have a journeyman, collateral duty, electronics maintenance person (CTM/ET). Additionally there is a part-time requirement for a System Administrator (Sys Admin NEC 2735) and Information System Security Officer (ISSO NEC 2779). Both the System Admin and ISSO are collateral duty responsibilities.

Space	Position (MFWS)	Rate/NEC or Rank/Desig	Operational Functions
COPS (GENSER)	Watch Officer	CWO/O-3 1630 OPINTEL	Time-Sensitive Strike Officer
STRIKE PLOT (SCI)	Watch Sup	ISC/3924	Manage the TES-N equipment suite
	Mission Planner (1)	IS2/3910	Build, monitor mission plan(s), monitor link status, manage sensors
	Screener (1)	IS2/3923	Screen raw feeds, “chip” imagery for further analysis
	Imagery (1)	IS2/3910	Perform imagery analysis, target ID
	Track Manager	IS3/0000 or OS/0000	Enter/manage tracks in GCCS-M
	Tactical Database Manager (TDM)/ Dissemination Manager (1)	IS2/3923	Perform quality control on targeting data-base, ensure products are delivered
	GALE - ELINT (1)	EW2/CTT2/9102	ELINT tasking, analysis, sanitization
Mission Planning (GENSER)	Imagery (1)	IS23910	Perform imagery analysis, target ID
	Mensuration PTW (M) (1)	IS(2/1)/3923	Generate aimpoints, feed to weapon systems
SSES (SCI)	SIGINT (1)	CTR2/0000	COMINT tasking, analysis, sanitization
SUPPLOT (SCI)	BFEA - ELINT (1)	EW2/CTT2/9102	ELINT analysis
Maintenance (SCI)	Maintenance Technician (1)	CTM1/ET1/FC1	Perform preventive and corrective maintenance

Table C–2. TES-N Carrier Manning

Space	Position (MFWS)	Rate/NEC	Operational Functions
CIC	Screener/Mission Planner (1)	IS2/3910	Screen raw feeds, Build, monitor mission plan(s), monitor link status
	Imagery (1)	IS2/3910	Perform imagery analysis, target ID
	Maint.	ET1/CTM1	Perform preventive and corrective maintenance
SSES	SIGINT/MTES (1)	CTT2/9102	ELINT tasking, analysis, sanitization

Table C–3. TES-N RTC Manning

Table C–4 shows the watch section manning for the flag ship/LSS, carrier with full TES-N, and ships with RTC only according to the respective number of MFWSs.

Positions (1 Watch Section)	Flag Ship/LSS (8 MFWS)	CV (10 MFWS)	RTC (3 MFWS)
Watch Officer	CWO/O-3 (1630)	CWO/O-3	--
Watch Sup	--	ISC/3924	--
Mission	(1) IS2/3910	(1) IS2/3910	(1) IS2/3910
Collection Mgr	O-3/1630	--	--
Imagery	(3) IS2/3910	(2) IS2/3910	(1) IS2/3910
CROSS-INT	(1) IS2/3924	IS2/3923	--
Tac Data Mgr	IS2/3923	(1) IS2/3923	--
ELINT	(1) CTT2/9102	(2) CTT2/9102	(1) CTT2/9102
Targeting	(1) IS2/3923	(1) IS(2/1)/3923	--
GCCS-M	IS3/0000	IS3/0000	--
SIGINT	--	(1) CTR2/000	--
Screener	(1) IS2/3924	1) IS2/3923	--
Fusion	IS2/3924	--	--
Mensuration	IS1/3923	(1) IS(2/1)/3923	--
Maintenance	CTM1	CTM1/ET1/FC1	ET1/CTM1

Table C–4. TES-N Watch Section Manning

APPENDIX D

Training

D.1 INTRODUCTION

Commander,Fleet Forces Command (CFFC) has established installation of NFN at selected navy training centers[67] and training curriculum development as the top priority for NFN spiral development. In the short term, NFN training will be based on this TACMEMO (to be revised annually) and existing JSIPS-N, GCCS-M and TES-N training, modified by lessons learned from rapid deployment installation operations. Mid-term converged architecture training will merge, and where necessary modify, existing training programs based upon the results of human performance oriented TDFA. An integrated training system will be designed to support all installation platforms, systems and equipment. Careful consideration will be given to training system design strategies (stimulation, simulation, etc.), to reduce life cycle costs. Facilities, equipment, personnel (military/civilian/contractor) pipelines and curricula will be defined across shore and fleet operational systems to provide an integrated training program for all NFN personnel. The results of the TDFA will be documented in an NFN Training Requirements Document (TRD), refined through training planning process methodology (TRPPM) analysis, and will lead to the development of a system-specific Navy Training Systems Plan (NTSP).[68]

This appendix reviews existing training resources and will address various training issues. It does not replace the TDFA necessary for development of the TRD and NTSP.

D.2 OPERATOR TRAINING

D.2.1 GCCS-M

Table D–1 lists current training courses related to GCCS-M.

D.2.2 JSIPS-N

Table D–2 lists current training courses related to JSIPS-N.

Individual course curriculum may need to be modified after the TDFA and TRD is completed. For example, the Intelligence Specialist Interpretation Class (NEC 3910) may need to provide more instruction on receiving imagery from the variety of sensors enabled by NFN, rapidly evaluating each image, and transferring it to the appropriate location based upon the evaluation. Greater emphasis on radar and infrared imagery interpretation may also be needed.

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[67] Training sites for the NFN Family of Systems (FoS) are being stood up in the following priority: Naval Strike and Air Warfare Center (NSAWC), Fallon, NV; Fleet Intelligence Training Center Pacific (FITCPAC), San Diego, CA; and Navy and Marine Corps Intelligence Training Center (NMITC), Norfolk, VA. Navy training facilities establishing curricula to support NFN training will require contractor support to “train the trainers” until it is determined that the resident depth of knowledge at the individual training facility is sufficient to support required training efforts without contractor support. Recision of the requirement for contractor support to the training facility will be made by CFFC on a case-by-case basis (CFFC Msg dtg 242059ZJUL02)

[68] N76, N20, CFFC, Task Force Excel and the NFN Virtual Program Office (VPO) will develop the NFN TRD. The VPO will develop and maintain the NTSP and N76 will approve it. Additionally, N76, N20, N2M and Enlisted Community Managers (ECMs) will work with CNET and the VPO to determine and validate any schoolhouse requirements.

Course ID Number (CIN)	Title	Skill Award	Length (days)	Class Type
A-150-2958	Global Command And Control System — Maritime Fleet (F) School		12	F1 Enlisted
A-243-0008	Intelligence Team Trainer Atlantic		5	T1 Enlisted
J-150-0962	Global Command And Control System Maritime OPINTEL	NEC 3924 Navy Tactical Command System-Afloat (NTCS-A) Operational Intelligence (OPINTEL) Analyst EFF DATE: 13-OCT-1995	33	C1 Enlisted NEC
J-150-2019	Intelligence Center Maintenance	NEC 1654 Intelligence Center Maintenance Technician EFF DATE: 24-JUN-1996	54	C1 Enlisted NEC
J-150-2957	Global Command And Control System Maritime Intelligence Center Manager		12	F1 Enlisted
J-243-0969	Shipboard Intelligence Analyst	NEC 3905 Independent Surface Warfare Operational Intelligence (OPINTEL) Analyst EFF DATE: 13-OCT-1995	37	C1 Enlisted NEC
K-231-0106	Battle Group Cryptologic/ Intelligence Team Training		5	T1 Enlisted

Table D–1. GCCS-M Related Training Courses

Course ID Number (CIN)	Title	Skill Award	Length (days)	Class Type
A-243-1956	Afloat Imagery Manager		12	F1 Enlisted
A-150-0991	Strike Warfare Intelligence Analyst Course	NEC 3923 Strike Planning Applications EFF DATE: 17-DEC-2001	47	C1 Enlisted NEC
J-242-0993	Intelligence Specialist Imagery Interpretation Class C (ISC IMINTERP)	NEC 3910 Naval Imagery Interpreter EFF DATE: 13-OCT-1995	82	C1 Enlisted NEC
J-243-2953	Digital Imagery Workstation Suite Afloat Operator	NEC 3925 Digital Imagery Workstation Suite Afloat (DIWSA) Operator/Analyst EFF DATE: 13-OCT-1995	75	C1 Enlisted NEC

Table D–2. JSIPS-N Related Training Courses

Although PTW version 4.x has been certified by NIMA and PEO(W) to provide precise targeting aimpoints for PGMs, personnel must be certified and proficient in using the system to that end. Historically, such an evaluation is accomplished via a Mission Planning Evaluation Team (MPET)/Operational Planning Evaluation Group (OPEG). The MPET was established under the auspices of the CJCS to provide assistance to and validation of the entire TLAM mission production process while ensuring that the operational planning/distribution capability provided by the Theater Mission Planning Center segments, wherever deployed, are standardized and optimized. The MPET accomplishes this mission through periodic visits to the operational sites consisting of Technical Assist Group (TAG) visits, which provide specialized technical training, and OPEG visits, which provide periodic evaluations of the entire TLAM mission planning process. Currently, there is no organization that parallels the MPET for non-TLAM precision geopositioning evaluation. PMA-281 has proposed a training, qualification, certification, and proficiency (TQCP) process (Figure D-1) that shall be used to certify PTW operators until a more formal PGM training and certification program is in place.[69] An evaluation team, consisting of two qualified technical experts who will combine advanced team training with certification of individual PTW operators, will provide CINCPACFLT with a certification recommendation. Certification is scheduled by CCG1 and CCG4 and normally occurs during or just after COMPTUEX.

D.2.3 TES-N

Until formal courses are developed, Mobile Training Teams (MTTs) will fulfill immediate TES-N training needs.[70] MTTs provide a tailored training curriculum, which minimizes perturbations of a ship’s Interdeployment Training Cycle (IDTC). An Installation Training Plan, coordinated with TES-N installation and the ship’s schedule, will be developed and maintained by the MTTs to address tailored training requirements. An MTT is composed of 2-4 personnel (contractor and government), whose skills cover all of TES-N’s operational functions. The training is 2 weeks long, as operator’s and ship’s schedules allow. The first half is composed of system familiarization, which includes TES-N block diagrams as well as instruction on system functions, buttons, and screens. The second half of instruction includes curriculum-based scenarios and practical assessments. The MTT will provide TES-N system stimulation through training tapes and provide battle problems to exercise the ship’s staff and TES-N operators. MTTs will also provide proficiency and replacement training as required until a comprehensive training system is in place.

TDFA of existing NECs is being conducted to determine what changes are required for TES-N (and, specifically, multi-system NFN) operations and maintenance training. Because training should be mission (imagery, strike and operational intelligence support) oriented rather than system oriented, TES-N training differences may be integrated into existing pipelines instead of being taught in separate courses of instruction. Specifically, the Global Command And Control System Maritime OPINTEL (NEC 3924) course (Table D–1) may be revised to incorporate TES-N ITD functionality and to discuss TES-N/GCCS-M interaction. The Intelligence Specialist Imagery Interpretation (NEC 3910) and Strike Warfare Intelligence Analyst (NEC 3923) courses (Table D–2) may also be revised to incorporate additional functionality provided by TES-N (and GCCS-M) such as full motion video analysis. Additional courses (e.g., Collection Planner and/or Moving Target Exploitation (MTE)/Land Track Analysis) may be necessary to address NFN functions not currently being trained. The NFN TRD will provide specific recommendations for modification of NFN related courses.

[69] Currently, there is no definitive guidance that identifies the Tactics, Techniques, and Procedures (TTP) for providing precision points ISO U.S. Navy GPS / PGM weapons employment. NSAWC has drafted an NTTP 3-03.4.1, GPS and PGM Targeting, providing a detailed overview of geodetic terms, datums, weapon planning considerations, and tactical considerations. PMA281 is coordinating the revision of the Cruise Missile Training and Operating Procedures Standardization (CTOPS) manual, updating the publication to reflect the current capabilities of the Theater Mission Planning Center (TMPC) and including a section on PGM Support.

[70] Because TES-N is based on the Army’s TES, MTTs use select portions of the Army TES training curriculum as source material for near-term training, modified to meet specific Navy needs. The MTT curriculum is refreshed based upon Fleet Lessons Learned. MTT personnel have attended the Army’s 6-week TES training and maintain contact with the Army Space Program Office (ASPO).

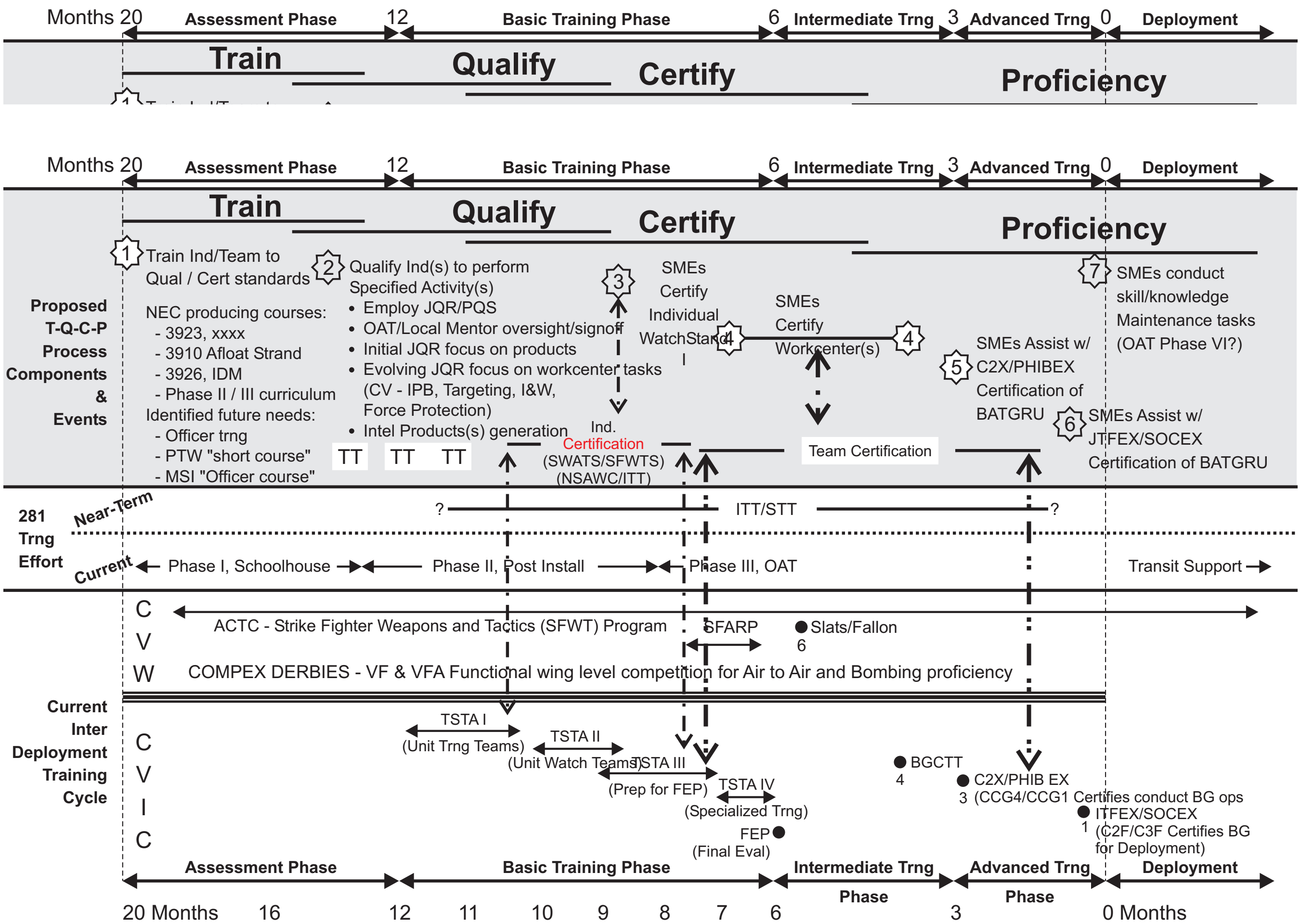

Figure D–1. PGM Training, Qualification, Certification, and Proficiency (TQCP) Process

D.3 INTELLIGENCE TEAM TRAINING

Scenario-based team training for the intelligence strike team and the intelligence expeditionary team will be developed. Intelligence team training should ultimately be available at NMITC, FITCPAC, and NSAWC. Scenario and simulation development by the NFN VPO may be required.

D.4 INTEGRATED BATTLEGROUP TRAINING

Scenario-based integrated battlegroup strike team training[71] will be provided at NSAWC. Training will be at the "postgraduate" level and will emphasize planning and asset integration. Training should leverage and complement existing CVW training (live theater/tactical sensors (UAV, SHARP, U-2, etc.) participate and will stimulate NFN systems) and should culminate with live sensor-to-weapon execution.

[71] It must be recognized that NFN will ultimately be a "Sensor-to-Shooter" system that integrates operations and intelligence systems. Along with NFN-trained Intelligence and Cryptologic Officers, ISs, and CTs, the end-to-end system will require trained Surface Warfare and Aviation Officers, OSs, FCs, etc. Functional analyses must give significant treatment to prospective manning compositions and subsequent training curricula that include those officers and enlisted personnel who will be involved in the planning and executions of weapons engagements.

D.5 MAINTENANCE/ADMINISTRATOR TRAINING

For TES-N rapid deployment installations, the vendor will provide a qualified Field Service Representative (FSR) who is responsible for the corrective and preventive maintenance of the TES-N system. The FSR will deploy with the ship and provide underway maintenance support. Ship's company personnel will maintain peripherals and interfaces (e.g., GCCS-M interface). A ship's company maintenance technician will support the FSR. This technician will be under instruction to learn FSR responsibilities through on the job training (OJT). A collateral duty System Administrator (nominally an IT/CT) will be trained in parallel with the operators (during MTT availability) by the vendor. The ISSO (collateral duty) will normally be a TES-N operator with an additional week of security training provided by the MTT. Army TES maintenance and trouble shooting manuals will be used as Navy training curricula in the short term. The long-term maintenance training goal is to extend Army TES maintenance training curriculum to Navy requirements.

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APPENDIX E

Integrated Logistics Support (ILS)

E.1 INTRODUCTION

Integrated Logistics Support (ILS) will be developed as an integrated part of the NFN acquisition program in coordination with system engineering efforts. Tradeoff studies are being conducted between elements to ensure system affordability (lowest life cycle cost), operability, supportability, sustainability, transportability, and compliance with environmental policies within the resources available.

NFN systems are comprised mostly of Commercial Off-the-Shelf (COTS) components and the lead-time for procurement of replacement items is minimal. The intent is to have support infrastructure transparent to the fleet sailor by incorporating procedures, documentation, training, tools, test equipment, and spares support for operation and maintenance support into organic and/or contractor processes. Best contractor practices will be utilized for packaging, handling, storage, and transportation. High failure rate items will be identified and depending on cost and availability will be stocked onboard NFN equipped units or prestaged for rapid delivery.

E.2 GCCS-M

SPAWAR provides FSET (Fleet Service Engineering Team) representatives on every CVBG and Amphibious Readiness Group (ARG). They are provided to support GCCS-M, Integrated Shipboard Network System (ISNS}, TBMCS, and other IT-21 systems. Should additional GCCS-M support be required, the following points of contact and web sites are available:

Email:	jmcishipa@spawar.navy.mil
Phone:	800-838-1816 (Worldwide)
DSN:	588-5665
Web:	GCCS-M Fleet Support Websites
	https://gccs-m.spawar.navy.mil (NIPRNET)
	https://gccs-m.spawar.navy.smil.mil (SIPRNET)

E.3 JSIPS-N

PMA281 provides lifecycle support for each site receiving a JSIPS-N installation. Lifecycle support consists of operator and maintenance training, technical documentation (hardware/software and vendor manuals), operational user guides (sailors gouge), a pack-up kit of spare parts/consumables and 24/7 help desk. A ship rider is normally provided for the first two weeks of deployment.

Lifecycle support responsiveness is greatly enhanced by pre-positioning spare parts with Federal Express logistics support and the existence of a 24/7 help desk. The PMA281 24/7 help desk can field calls encompassing the entire spectrum of troublecalls, from operating procedures to commercial vendor support.

Email: jsipsn@spawar.navy.mil (NIPRNET)
c4ihd@spawar.navy.smil.mil (SIPRNET)
Phone: 800-759-1263 (Worldwide)
Web: JSIPS-N Fleet Support Websites
https://lifeline.spawar.navy.mil — (NIPRNET)
http://catalog.tci.navy.mil/cgi-bin/fedex.storefront — (NIPRNET Fedex supplies)
www.tci.navy.smil.mil — (SIPRNET)
https://lifeline.spawar.navy.smil.mil (requires user account & certificate)

E.4 TES-N

In the short term, contractor Fleet Support Representatives (FSRs) will provide organizational-level and depot-level maintenance for TES-N systems. In the near term, On-Board Repair Parts (OBRPs) will be provided as a spares kit and replenished by Northrop Grumman as part of the FSR support. Northrop Grumman will also satisfy requirements and coordinate for replacement spare parts. The FSR is also responsible for providing and maintaining support and test equipment. The long-term spares support will be provided by either contractor support or from the Naval Inventory Control Point (NAVICP) and Port Hueneme Division, Naval Surface Warfare Center or some combination of organic/contractor support. Performance Based Logistics (PBL) is being considered.

In the near term, Northrop Grumman will provide operator and maintenance manuals in contractor format for each installation. Technical data will be maintained by the contractor and/or Port Hueneme Division, Naval Surface Warfare Center. Manuals will be converted to fleet-ready structure and format.

Northrop Grumman will provide near-term computer resources support. The FSR will be on board to support the software and computer hardware/firmware. In the long term, either Northrop Grumman or a software support agent designated by PMS 454 will provide computer resources and software support.

Phone: 1-800-PHD-NSWC (Worldwide)
Web: https://help.phdnswc.navy.mil/ (Sailor to Engineer Support)

APPENDIX F

TES-N/GCCS-M INTERFACE

F.1 INTRODUCTION

The goal of the TES-N/GCCS-M interface is to support controlled track data exchange between the two systems. The current capability is a one-way feed of 3 types of data (MTI, manual contacts, reference points) from TES-N and a one-way feed of platform tracks from GCCS-M to TES-N. While data transfer between the systems provides improved situational awareness on TES-N and the ability to view near real time ISR data on GCCS-M, users should perform their primary warfighting functions on the systems that were designed for that purpose per established tools and procedures. The integration of data between TES-N and GCCS-M also allows ships that have not been upgraded with TES-N the capability to benefit from the intelligence data TES-N can provide via existing COP and OTCIXS communications paths. The information provided by TES-N is displayed on all GCCS-M workstations, including C2PC clients (section A.2.1.7). The information provided by GCCS-M to TES-N can be displayed as track data on the ITD.

Spiral 1A of the converged architecture (discussed in Chapter 3) uses an adjunct processor provided by TES-N that is connected to the GCCS-M TDBM (JOTS1) server using the MDX protocol (Figure F-1). The adjunct processor is necessary to provide enhanced contact reports (XCTC) to the TES system. This adjunct processor is required until GCCS-M updates to Unified Build version P12 or later.

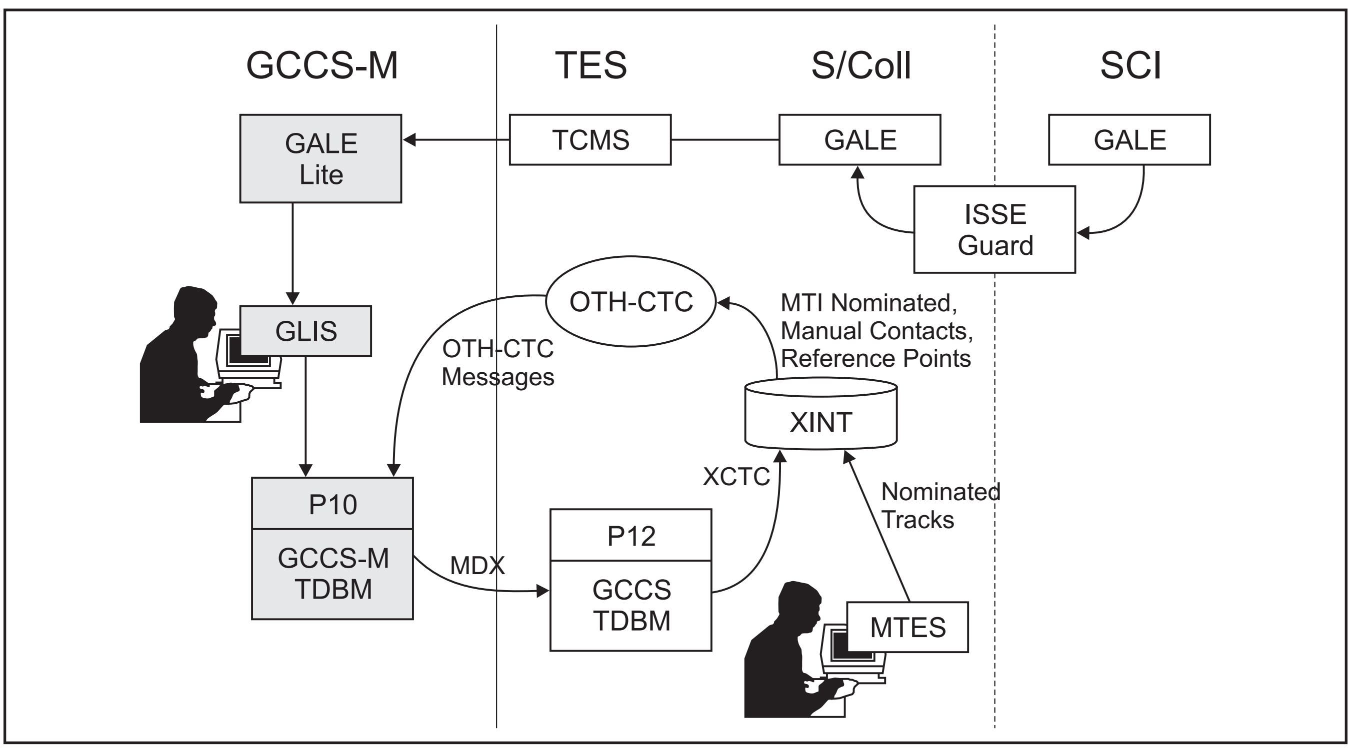

Figure F–1. TES-N/GCCS-M Spiral 1A Interface

Due to the rapid development and fielding of TES-N, the capability of the TES-N/GCCS-M interface varies greatly, depending on when it was installed. The following table outlines the current status of installations as of 01Aug02.

SHIP/SITE	INTERFACE ENABLED	NOTES
USS Belleau Wood	No	No adjunct processor installed with RTC.
USS Lincoln	Yes- via adjunct processor	Full TES-N
USS Coronado	Yes- via adjunct processor	Full TES-N
USS Blue Ridge	Yes- via adjunct processor	Full TES-N
USS John C. Stennis	No	No adjunct processor installed with RTC
COMUSNAVCENT	No	No adjunct processor installed with TES-C
USS Essex	No	

Table F–1. TES-N/GCCS-M Interface Status

F.2 CONFIGURING COMMUNICATIONS BETWEEN TES-N AND GCCS-M

On the TES-N MFWS main menu bar, select **COMMS ->Comms Management**. In the TCMS window select **Resources**, the **Configure Resources** Window appears. In the **Configure Resources** window click on the **GCCS-M** list item and select the **Modify** button. In the **Modify Resources** window set the Name to GCCS-M, the Security Level to S, the Remote Host to xxx.xxx.xxx.xxx (the IP address of the JOTS1 system), the Local Port to 2020 and the Remote Port to 2020. Select **Cancel** to close the Modify Resources window.

In the TCMS window select **Destinations**, the **Configure Destination** window appears. In the **Configure Destination** window click on the **GCCS** list item and select the **Modify** button. In the **Modify Destination** window, set the Name to GCCS and the Resource to GCCS-M. Select **Cancel** to close the Configure Destination window.

In the TCMS window select **Application->Exit** to exit the **Comms Management** application.

The only configuration required on GCCS-M is to ensure the NETPREC channel in the comms window is set to auto-start to receive the broadcast from TES-N

F.3 SENDING GCCS-M TRACKS TO TES-N ADJUNCT PROCESSOR

Sending data from GCCS-M to TES-N is a 3 step process.

1. Set up the NETPREC channel on the TES-N adjunct processor to autostart.

2. Setting up the Network channel on GCCS-M per the steps below.

    a. From the Comms menu: select **Communications**

The COMMUNICATIONS window displays (Figure F–2).

Figure F–2. COMMUNICATIONS Window

b. In the COMMUNICATIONS window, click **ADD**

The ADD CHANNEL window displays (Figure F–3).

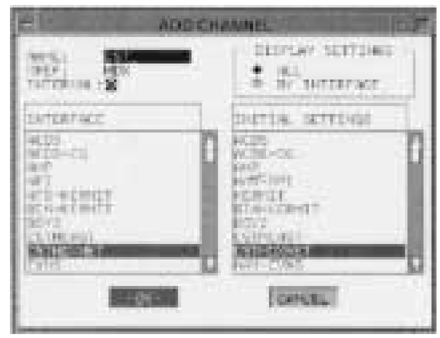

Figure F–3. ADD CHANNEL Window

c. In the NAME field: enter (channel name), such as TES_MDX

Name is restricted to alphanumeric, underline (_), and hyphen (-) characters. In the XREF field, enter the unique three-character communications cross-reference code for the channel I.E, TES.

d. Activate the MDX channel.

If the MDX channel is active, editing the MDX window and then clicking OK automatically deactivates the channel and restarts it with the edited settings. This action can cause messages that are en route, to be lost.

e. From the list of channels in the COMMUNICATIONS window (Figure F–4), select the TES_MDX channel, then right click to bring up a pop-up menu, then select start. The status in the comms window should change to on. The outgoing data stream can me monitored by selecting the channel, then right-clicking to bring up the pop-up window and selecting window which will display the traffic on the outgoing MDX channel.

Figure F–4. COMMUNICATIONS Window

f. EDIT the /etc/hosts file to identify the IP address of the TES-N adjunct processor.

3. Set up the broadcast mechanism from the adjunct processor to the TES-N XINT database.

KNOWN LIMITATIONS: Since MDX only sends changes received to the existing track database, there is no way to provide all existing tracks from GCCS-M to the TES-N adjunct processor. The differences between the GCCS-M and the TES-N track database will be reduced over time, based on the update rate on data in the track database.

The preferred method of transferring data between GCCS-M and the TES-N adjunct processor is to install COP synch tools on both systems, since that is a synchronizing protocol that will ensure both sides of the interface have the same track data. When GCCS-M updates to UB patch 12 or later, it can generate the XCTC gold reports required by TES-N, and the adjunct processor is no longer required.

F.4 SENDING TES-N TRACKS TO GCCS-M

A TES-N database search filter determines what data (MTI, manual contacts[72] or reference points) is provided from TES-N to GCCS-M. Data is sent as OTH-Gold messages to the GCCS-M system for processing. Since only manually generated tracks will be generated and transferred by TES-N, the interface should be configured to cover the expected geographic area and at the fastest possible update rate of one minute. To send TES-N tracks to GCCS-M:

Note

The GCCS-M side of the interface must be configured in advance of starting the TES-N side of the interface. This is done by ensuring the NETPREC channel in GCCS-M comms window is set to autostart.)

1. On the TES-N main menu bar, select **COMMS** -> **GCCS Interface** to start up the GCCS processes. GCCS Interface window (Figure F–5) opens.

2. In GCCS Interface window, GCCS to TES section, verify that Input Status reads **GCCS_INPUT_DISABLED**.

3. In GCCS to TES section, press **Enable** button to start the receipt of messages from GCCS-M. Input Status should change to **GCCS_INPUT_REQUESTED**, and then **GCCS_INPUT_RUNNING**.

4. In TES to GCCS section, verify that Output Status reads **QUERY _OUTPUT_DISABLED**.

5. In TES to GCCS section, press **Enable** button to start sending data from TES to GCCS-M. Output Status should change to **QUERY_OUTPUT_REQUESTED**, and then **QUERY_OUTPUT_RUNNING**.

6. In the Data Types section, select the appropriate data types to be sent to GCCS-M. All types should normally be selected for transfer.

7. In the AOI area, enter coordinates of northwest and southeast boundaries of the area of interest (ddmmssH for latitude and dddmmssH for longitude, where dd or ddd = degrees, mm = minutes, ss = seconds, and H = the hemisphere, N or S for latitude, E or W for longitude).

[72] Target nominations, which generate ATI.ATR messages for dissemination to AFATDS and other weapon C2 systems, are not automatically sent to GCCS-M where they will appear in the COP as a track/contact. The TES-N operator must make a manual contact for the nominated target, thus sending the data to GCCS-M.

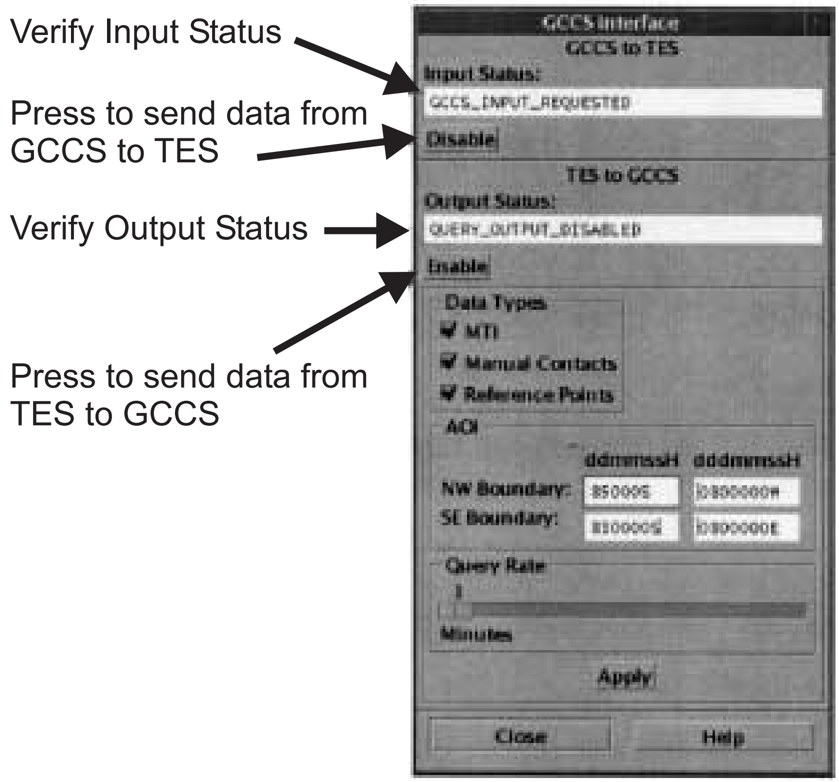

Figure F–5. TES-N to GCCS-M Interface Status

8. In the Query Rate area, move the slide bar over to the desired update rate. Note: the Query Rate only affects the update rate that tracks are sent to GCCS-M. The input data rate of tracks sent from GCCS-M to TES-N is controlled by the adjunct processor. This input rate should be set to the fastest possible setting of once per minute.

9. Press the **Apply** button to activate changes.

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APPENDIX G

CHECKLISTS

G.1 INTRODUCTION

This appendix provides checklists for several Naval Fires Network (NFN) operations that cross system boundaries. Procedures for operations that can be accomplished within a single system (Global Command & Control System-Maritime (GCCS-M), Joint Service Imagery Processing System-Navy (JSIPS-N) or Tactical Exploitation System-Navy (TES-N)) can be found in that system's respective Operators Manual. Units are encouraged to submit additional checklists that they may develop as they exercise the NFN architecture. Procedures for submitting additional checklists are provided in Chapter 4.

G.2 THEATER COORDINATION AND PREPARATION

When operating in a joint environment or in an area where other NFN assets are operating, you should coordinate before arrival into the theater Area of Responsibility (AOR). Following is a list of items that should be considered:

1. Determine the theater communication architecture established to support NFN operations (see Appendix B for more information).

   a. If necessary, make arrangements for adjustment of bandwidth availability.

   b. Determine internet protocol (IP) addresses used by theater NFN components.

   c. Set up chat and determine established standard operating procedures (SOP) for communication links.

2. Verify compatibility of other service TES systems (see section 2.9).

3. Determine/establish theater Military Operations Area (MOAs) and Tactics, Techniques, & Procedures (TTPs) for mission interaction (developing collection requirements, direct downlink, sensor control, etc.) with CDL/tactical common datalink (TCDL) equipped aircraft.

4. Engage with theater collection management to state Naval requirements for sharing of airborne collection in NRT.

5. Determine currently established target decks/ Equipment-to Equipment Interfaces (EEIs).

6. Import TES-N shape files used by other units deployed in theater.

7. Determine theater reporting procedures/formats to support joint missions and joint IPL standards.

8. If able, send a liaison officer (LNO) to visit other service Tactical Exploitation System (TES) nodes to establish a working relationship with operators and leadership, and to better facilitate sharing of intelligence information from U-2, Miniaturized Data Acquisition System (MIDAS), etc.

9. Test NFN component systems to verify connectivity with other systems in theater.

G.3 CREATING TES-N SHAPE FILES FROM IMPORTED SPREADSHEET DATA

Operators can export Modernized Integrated Database (MIDB) and Graphic Area Limitation Environment-Lite (GALE-Lite) data from GCCS-M and import that data into TES-N to be used as themes and shape files on the Integrated Tactical Display (ITD). The process involves creating a comma delimited text file that can then be imported into and converted by TES-N.

1. Display the desired data in Excel (part of GCCS-M Intel Office) or in the GALE-Lite List Tool.

2. If able, change the data format so that it displays degrees with decimals.

   <u>In GALE-Lite:</u>

   a. Select Utilities > User Defaults > View > Lat/Long Format.

   b. Select ODD.MMSSc format then select OK.

   c. Ensure the format change was effective on the List Tool.

   d. Exit User Defaults.

3. Select the data to be exported and create a comma delimited text file.

   <u>In Excel:</u>

   a. Select File > Save As

   b. Select the Comma Delimited format and enter the new file name with a .txt extension, then select OK.

   <u>In GALE-Lite:</u>

   a. In the List window select File > Export to Text File.

   b. Select the Comma Delimited format and enter the new file name with a .txt extension, then select OK.

4. Transfer the file to TES-N. Save the file in following directory: /h/itd/username/itd/tables/filename.txt

5. Reformat the data in the text file so that it is compatible with the ITD.

   a. Open Star Office in TES-N and select the New Text Document icon. Select File > Open and find the imported file placed in the above directory.

   b. Once the file is opened up in Star Office as a text document, select Edit > Find and Replace.

Note

These next steps will take you through the process of removing the N or S or E or W's and replacing them with just commas. Data within the western and southern hemispheres must also be given a negative flag for the ITD to read the coordinate correctly. Use only the letters (N, S, E, W) that apply to the data you have collected.

(1) For N and W data:

Search for "N," and replace with ",". Then select Replace All and Accept All Changes (OK).

Search for "W," and replace with ",-". Then select Replace All and Accept All Changes (OK).

Close Find and Replace.

(2) For N and E data:

Search for "N," and replace with ",". Then select Replace All and Accept All Changes (OK).

Search for "E," and replace with ",". Then select Replace All and Accept All Changes (OK).

Close Find and Replace.

(3) For S and W data:

Search for "S," and replace with ",-". Then select Replace All and Accept All Changes (OK).

Search for "W," and replace with ",-". Then select Replace All and Accept All Changes (OK).

Close Find and Replace.

(4) For S and E data:

Search for "S," and replace with ",-". Then select Replace All and Accept All Changes (OK).

Search for "E," and replace with ",". Then select Replace All and Accept All Changes (OK).

Close Find and Replace.

c. In Star Office select File > Exit and answer Yes to the closing Star Office prompt.

6. Open ITD.

7. Convert the text file into a Theme.

a. Move the Tracking View Window to the right and select the ITD.APR window.

b. Verify the file data format.

(1) Select Project > Add Table and change the directory to the path of the file saved in step 4.

(2) Change the File Type to Delimited Text (.txt) and Highlight the file then select OK. The table will appear.

(3) Look at the Latitude and Longitude fields to verify the degrees decimals format is displayed.

(4) Close the table window.

c. Select the Tracking View Window then from the top ITD Main Menu Bar select View > Add Event Theme. Select the Table (File Name) and ensure the X Field is set to Longitude and the Y Field is set to Latitude, then select OK.

d. Open up the Icon Bar in the Tracking View Window (Left click on the left side bar, the cursor will show a bar with arrows on both sides. Once seen, click and pull to the right). Left click on the Newly Created Icon set box (at top) and select icons to display on the Tracking View Map.

e. To change the Icon and Color, double click on the Icon Name. Then double click on the symbol. Select the symbol size, shape, and angle desired, then select the Apply button for the new changes to take effect on the map. Left click on the label field to add a name to the legend, then select the apply button to see the changes.

8. Convert the Theme to a Shape File.

   a. Select Theme > Convert to a Shape File.

   b. Choose the directory and change the filename to the appropriate name with a .shp extension and select OK.

   c. Answer YES to the “Add Shape file as Theme to the View?” prompt, if appropriate.

The theme is now added to your legend and is now retrievable via the View > Add Theme choice in the ITD Main Menu Bar.

G.4 CONFIGURING IPL AUTO-DISSEMINATION TO TES-N AND GCCS-M

The below steps are used to create an automatic imagery dissemination profile within the JSIPS-N IPL that will convert Concentrator disseminated 1.29bpp TFRD products (default Concentrator dissemination format) to NITF v2.0 Uncompressed 11bpp format and then forward all received files to a remote system / exploitation workstation.

This procedure should only be used in support of a high operational temp and should be deactivated when the operational tempo decreases. The negative potential impact is that you will fill up the disks on your remote system / workstation and cause inadvertent system crashes.

Create A New Profile Account:

1. From the main panel, select the **“Profiles”** tab. In the “Tools Panel” select **“Profile Account”**. Profiles Panel displays.

2. Select **“New”** and a dialog window opens. For your intended remote workstation, enter the following:

   a. Host name or IP address

   b. Valid Username

   c. Valid Password

   d. Valid Password confirmation

3. Now select **“Ok”**.

Change Sleep Setting:

1. From the top of the main panel, select the **“Policy”** tab. Now choose “+” next to the menu item “**<Configuration>baseConfig**”, then choose the “+” next to the menu item “<**DataSources>baseConfig**”, then choose the “+” next to the menu item “**<ProfileServerBasePolicy>baseConfig**”, then select “**<Profile MonitorSleepSeconds>baseConfig**”. From the panel on the right side of the window, select the “**Instance**” tab and choose the “**Min Value**” “**60**” and enter “**60**” in the lower window area, then hit

the keyboard "tab" button once — (required to save entry). Now select "**Accept**" and the Policy window displays "**PolicyElementinstance Update Completed**" in the lowest portion of the window.

2. Now select the "**-**" next to each item opened in step 1 to close them.

3. Now select the "**Logoff**" button and select "**Yes**" to confirm and exit IPLAC and finalize the settings.

4. Select the computer icon on the HP CDE bar to open an xterm window. Log in as root:

   Type: **su** (press Enter)

   Type: a valid root password (press Enter)

   Type: **su – ipl** (press Enter)

   Type: **ipl_shutdown** (press Enter) (wait for shutdown to complete)

   Type: **ipl_startup** (press Enter) (wait for startup to complete)

5. Close the xterm window: Type: **exit** (press Enter)

   Type: **exit** (press Enter)

Create Standing Orders:

1. On the IPLAC window, with the "**Profiles**" tab selected, choose the "**Notifications**" button in the "Tools Panel". The Notifications Panel displays.

2. Now select "**New**" under the Notification panel, and the "Selection Frame" window displays. Choose "**Standing Order**" from the window and then select "**Ok**", the "Selection Frame" closes.

3. In the Editing Panel, type in a description for this notification, then select the "Edit Notification DAG" button.

4. A "Dialog" window now displays. Leave "Package ID" blank, otherwise your files to be ftp'd will be renamed with this entry.

5. Enter a descriptive note for the originator (free text).

6. Leave the "Packaging Format and Compression" defaulted to "NoPackagingUncompressed".

7. Enter additional descriptions desired under the notes section.

8. Now select the "**Destination**" tab and enter a description (free text) in the "Receiver" window — i.e. an identification of the intended receiver.

9. Now select the "**Path Name**" window and enter the "FULL" path/directory for the receiving workstation. (IPL must have FTP authorization to this workstation)

10. Now select "**Host Name**" from the dropdown menu and choose your destination host. If you want to send these files to more than one host, select the "**New**" button and enter appropriate data for the additional workstation host.

11. Now select the "**Product**" tab and then the "**New**" button. Choose the "**Reduced Resolution Sets**" you want disseminated. **HIGHLY RECOMMENDED TO SELECT ONLY THE R0 FILE**. (The R0 file contains all the lower resolution data sets making zoom in and out and overview file creation possible and faster).

12. TES-N and GCCS-M currently require NITF 2.0 Uncompressed format. Choose the “Delivery Format” drop down menu and select from the list:

    a. Delivery Format: **NITF 2.0**

    b. Compression: **Uncompressed**

13. Now select “**Save**” and the “Dialog” window closes. Now select “**Accept**” and the “Notifications” panel is updated with your “Standing Order” entry.

G.5 TRANSFERRING IMAGERY FROM PTW TO GCCS-M IMAGERY TRANSFER SERVER

1. In MATRIX, select “**File**”. Under the File pull-down menu, select “**Load**” then “**File Selection**”. Go to the default directory and select the image you want to transfer then select “**Load**”.

2. Annotate the image as appropriate (zoom level, labeling, annotation, etc.). Be sure to copy the geo coordinates from all four corners of the image (Upper Left, Upper Right, Lower Right, Lower Left). These will be needed to register the image in Imagery Transfer Server (ITS).

3. Once the image is ready to be saved, Select “**File**”. Under the File pull down menu, select “**Save Window**”. In the “**Save Image**” window, ensure that it states that the image will be saved with graphics and enhancements (this option is in the lower left corner of the window. This should already be selected as the default).

4. Select “**NITF**” as the format.

5. Select the following directory: **/disk_2/imagery/images/jmcis** (or GCCS-M – this is site specific).

6. Click on “**Save**”. The image now resides in the correct directory to be put into ITS. GCCS will automatically check the PTW and pull any images in the above directory every 2 hours, or as often as the AIIM job is set to run. (At some sites this has been set to run at midnight every day.)

G.6 TRANSFERRING IMAGERY TO THE JSIPS-N IPL

The Auto Ingest function of IPL provides the means for image products to be added to the IPL catalog. There are four ways to place products in the auto ingest directory.

1. Using UNIX command line entries a user can copy imagery products to the Auto Ingest directory. These images can come from any source as long as they are fully NITF 2.0 compliant or Tape Format Requirements Document (TFRD) 1.3.

2. To place an image into the IPL, use the UNIX copy (cp) or move (mv) command to put the image into the /ingest/raw directory of the IPL. The IPL software and supplied scripts will automatically attempt to ingest and catalogue the image.

3. Images sent from the Concentrator to the Site IPL for NRT dissemination will automatically go into the site IPL auto ingest directory (/ingest/raw). No user action is required for ingesting and cataloguing Near Real Time (NRT) disseminated images.

4. Imagery pulled via the COPS web client to the site IPL will automatically go into the site IPL auto ingest directory (/ingest/raw). No user action is required for the ingest and cataloguing of imagery disseminated via COPS.

This section focuses on manually placing files into the auto ingest directory using UNIX command line entries. This allows either single file copy or bulk file coping procedures to the auto ingest directory. The auto ingest directory has two (2) sub-directories within it. They are named “Working” and “Problems”. The auto ingest directory moves and deletes files depending on whether it was successfully ingested or if a problem was detected. Files that meet the required IPL naming convention and are a recognized image format, (NITF 2.0 compliant) will be moved automatically to the auto ingest working subdirectory where they will be processed for entry into the IPL catalog. After successfully cataloging the product it will be deleted from the working directory. If a problem is found during processing the product will be moved to the auto ingest Problem directory.

Problem Products are those products that meet the naming convention and supported image file format but a problem either with metadata or the image file was detected during auto ingest processing. These files are retained in the Problems subdirectory until the IPL administrator purges them using IPLAC. (see procedure 11.8.4.1 Purging Problem Products from IPL)

CAUTION

> These files should not be deleted using UNIX command line entries, the file will be deleted from the IPL but not the IPL "CATALOG". The IPL CATALOG will still have a pointer to the file creating an error in the IPL database causing users to be provided with conflicting query results. Files that do not meet the required naming convention will not be processed and will remain in the auto ingest directory until deleted using UNIX file delete commands.

Copy Files into the Auto Ingest Directory:

1. Select the xterm (computer) icon on the HP workbench at the bottom of your screen. An xterm window now displays.
2. Type: **cd /(directory where you placed the files)** (press Enter).
3. Type: **cp (filename) /ingest/raw/(hostname)** (press Enter).
4. All files placed in the IPL auto ingest directory will be cataloged and ingested into IPL within 2 minutes.
5. Procedure complete.

Move Files into the Auto Ingest Directory:

1. Select the xterm (computer) icon on the HP workbench at the bottom of your screen. An xterm window now displays.
2. Type: **cd /(directory where you placed the files)** (press Enter).
3. Type: **mv (filename) /ingest/raw/(hostname)** (press Enter).
4. All files placed in the IPL auto ingest directory will be cataloged and ingested into IPL within 2 minutes.

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