JTLS-GO

Version Description Document

June 2024

DEPARTMENT OF DEFENSE
JOINT STAFF J7
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**JOINT THEATER LEVEL SIMULATION - GLOBAL OPERATIONS
(JTLS-GO 6.3.0.0)**

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ABSTRACT

The Joint Theater Level Simulation - Global Operations (JTLS-GO®) is an interactive, computer-based, multi-sided wargaming system that models air, land, naval, Special Forces, and Non-Governmental Organization (NGO) functions within a combine joint and coalition environment.

This *JTLS-GO Version Description Document (VDD)* describes the new features of the Version 6.3.0.0 delivery of the configuration-managed JTLS-GO software suite.

JTLS-GO 6.3.0.0 is a Major release of the JTLS-GO 6.3 series that includes an updated repository of standard data, a demonstration scenario based in the western Pacific, as well as major model functionality improvements implemented as Engineering Change Proposals (ECPs), These ECPs are summarized in Chapter 2. Code modifications that represent corrections to known Software Trouble Reports (STRs) are described in Chapter 3. Remaining and outstanding STRs are described in Chapter 4.

This publication is updated and revised as required for each Major or Maintenance version release of the JTLS-GO model. Corrections, additions, or recommendations for improvement must reference specific sections, pages, and paragraphs with appropriate justification and be forwarded to:

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1.0 INTRODUCTION

1.1 SCOPE

This *JTLS-GO Version Description Document* (VDD) describes Version 6.3.0.0 of the configuration managed Joint Theater Level Simulation - Global Operations (JTLS-GO®) software suite. JTLS-GO 6.3.0.0 is a Major delivery for the JTLS-GO 6.3 series of releases.

JTLS-GO 6.3.0.0 includes the entire JTLS-GO suite of software, a repository of engineering level data, and a realistic demonstration scenario based on the Western Pacific theater of operations called "wespac63". Database modifications that were accomplished to upgrade the previous JTLS-GO database format to this current version are summarized in this chapter, as well as APPENDIX B. Detailed descriptions of the Engineering Change Proposals (ECPs) implemented for this release are provided in Chapter 2.0.

JTLS-GO 6.3.0.0 executes on the Red Hat Enterprise Linux Version 9.4 and Oracle Linux 9.4 64-bit operating systems. The Web-Hosted Interface Program (WHIP®) user workstation interface can be executed on any 64-bit operating system from any Java-compatible Web browser.

1.2 INVENTORY OF MATERIALS

This section lists documents and software that are relevant to JTLS-GO. All JTLS-GO documents included in this delivery are provided in PDF format within a documents subdirectory.

1.2.1 Obsolete/Outdated Documents

No documents have been deleted or become outdated as a result of this release.

1.2.2 Unchanged Documents

JTLS-GO 6.3.0.0 does not include a major redesign of the JTLS-GO system, but does include several extensive engineering change proposals. All of the documentation has been updated to reflect these functional capability changes.

1.2.3 Updated Documents

- *JTLS-GO Analyst Guide* (JTLS-GO Document 01, Version 6.3.0.0)

- *JTLS-GO Air Services User Guide (*JTLS-GO Document 03, Version 6.3.0.0)

- *JTLS-GO Configuration Management Plan* (JTLS-GO Document 03, Version 6.3.0.0)

- *JTLS-GO Controller Guide* (JTLS-GO Document 04, Version 6.3.0.0)

- *JTLS-GO Data Requirements Manual* (JTLS-GO Document 05, Version 6.3.0.0)

- *JTLS-GO DDS User Guide* (JTLS-GO Document 06, Version 6.3.0.0)

- *JTLS-GO Director Guide* (JTLS-GO Document 07, Version 6.3.0.0)

- *JTLS-GO Executive Overview* (JTLS-GO Document 08, Version 6.3.0.0)

- *JTLS-GO Installation Manual* (JTLS-GO Document 09, Version 6.3.0.0)

- *JTLS-GO WHIP Training Manual* (JTLS-GO Document 10, Version 6.3.0.0)

- *JTLS-GO Player Guide* (JTLS-GO Document 12, Version 6.3.0.0)

- *JTLS-GO Standard Database Description* (JTLS-GO Document 14, Version 6.3.0.0)

- *JTLS-GO Software Maintenance Manual* (JTLS-GO Document 15, Version 6.3.0.0)

- *JTLS-GO Technical Coordinator Guide* (JTLS-GO Document 16, Version 6.3.0.0)

- *JTLS-GO Version Description Document* (JTLS-GO Document 17, Version 6.3.0.0)

- *JTLS-GO Entity Level Server User Guide* (JTLS-GO Document 19, Version 6.3.0.0)

- *JTLS-GO Federation User Guide* (JTLS-GO Document 20, Version 6.3.0.0)

- *JTLS-GO C4I Interface Manual* (JTLS-GO Document 21, Version 6.3.0.0)

- *JTLS-GO DoD Architecture Framework* (JTLS-GO Document 22, Version 6.3.0.0)

1.2.4 New Documents

No new documents are required for this version of the software.

1.2.5 Delivered Software Components

JTLS-GO 6.3.0.0 may be delivered either on a CD or as a set of compressed TAR files to be downloaded. Either method includes the complete suite of software executable code and command procedures. The following software components are included with this release:

- Combat Events Program (CEP)

- Scenario Initialization Program (SIP)

- Interface Configuration Program (ICP)

- Reformat Spreadsheet Program (RSP)

- JTLS Symbols Application (JSYMS)

- Database Development System (DDS)

    Database Configuration Program (DCP)

    DDS Client User Interface (DDSC)

- ATO Translator Service (ATOT)

- ATO Generator Service (ATOG)

- ATO Retrieval Program (ATORET)

- JTLS Convert Location Program (JCONVERT)

- Count Critical Order Program (CCO)

- JTLS HLA Interface Program (JHIP)

- After Action Review Client (AARC)

- Scenario Data Client (SDC)

- Order Entry Client (OEC)

- Order Verification Tool (OVT)

- JTLS Object Distribution Authority (JODA)

    The current JODA build number is 211.

- Web Services Manager (WSM)

- Web-Hosted Interface Program (WHIP) and its component programs:

    Apache Server (APACHE)

    JTLS XML Serial Repository (JXSR)

    Order Management Authority (OMA)

    Synchronized Authentication and Preferences Service (SYNAPSE)

    XML Message Service (XMS)

    Total Recall Interactive Playback Program (TRIPP)

- Entity Level Server (ELS)

- JTLS Operational Interface (JOI) for both OTH-Gold and Link-16 generation

- Tactical Electronic Intelligence (TACELINT) Message Service

- Keyhole Markup Language (KML) Operational Interface (KOI)

- JTLS Transaction Interface Program (JTOI)

- JTLS Interface Network Navigator (JINN)

- JTLS Order of Battle Editor (JOBE)

- JTLS Geographic Information System (GIS) Terrain Building Program

- JTLS Master Integrated Database (MIDB) Tool

- JTLS Version Conversion Program (VCP)

    VCP60 - Converts a JTLS-GO 5.1 database to a JTLS-GO 6.0 formatted database.

    VCP61 - Converts a JTLS-GO 6.0 database to a JTLS-GO 6.1 formatted database.

    VCP62 - Converts a JTLS-GO 6.1 database to a JTLS-GO 6.2 formatted database.

    VCP63 - Converts a JTLS-GO 6.2 database to a JTLS-GO 6.3 formatted database.

Instructions for installing JTLS-GO 6.3.0.0 are provided in the *JTLS-GO Installation Manual*. Installing a previous version of JTLS-GO prior to installing JTLS-GO 6.3.0.0 is not necessary. No other upgrade beyond installation of the compressed TAR files or CD is required. The software provided with this delivery is a complete release that includes all files and code required to execute JTLS-GO.

1.2.6 Released Databases

This release includes the following sample unclassified databases:

- The scenario that serves as a repository of engineering level data called "repository63". Although not useful as a scenario, it does follow all of the database requirements for a scenario, and should be loaded into your PostgreSQL scenario table-space.

- The scenario "wespac63", which is suitable for training and demonstrations.

1.3 INTERFACE COMPATIBILITY

1.3.1 Support Software

JTLS-GO 6.3.0.0 requires the following versions of support software, including operating systems, compilers, scripting utilities, database tools, transfer protocols, and display managers.

- Operating system for the model: Red Hat Linux Enterprise Server (ES) Edition Version 9.4, 64-bit architecture.

  JTLS-GO 6.3 has been tested with the following versions of Linux 9:

  RedHat Linux 9.4 - this operating system license must be purchased.

  Oracle Linux 9.4 - This operating system is free to download, use, and distribute, and is provided in a variety of installation and deployment methods. It has been approved by Defense Information System Agency (DISA) for use by U.S. Government Agencies.

- There are no restrictions on the operating system for client workstations, except that the operating system must be a 64-bit architecture with a Java-enabled web browser. JTLS-GO 6.3.0.0 has been tested on the following operating systems:

  Red Hat Linux Enterprise Edition Version 9.4

  Oracle Linux 9.4

  Windows 10, which can be used only if the workstation is an external HTTP client of the simulation network.

- JTLS-GO 6.3.0.0 is delivered with the Adoptium project Temurin Java Development Kit (JDK) 1.8 Update 412 package. Both the ICP and DCP have the option for an organization to increase the maximum memory heap for the WHIP and DDSC. For large scenarios and databases, an organization should consider increasing the maximum heap size.

- JTLS-GO uses IcedTea to provide the Java Web Start capability that implements the web-enabled JTLS-GO functionality. JTLS-GO supports IcedTea version 1.8.4.

- JTLS-GO database tools require a certified PostgreSQL 15.7 database server and the full PostgreSQL installation. PostgreSQL 15.7 that has been compiled under Linux 9.4 is bundled with the JTLS-GO 6.3 release tar files. It is not necessary to use the delivered solution, but it is the easiest method to meet the requirements of JTLS-GO 6.3.0.0. There are several alternative methods available for obtaining the PostgreSQL 15.7 software. Refer to Chapter 6 of the *JTLS-GO Installation Manual* for additional installation details.

- Windows software, X11R5 server, Motif 1.2 Library, Motif Window Manager: These items are included as part of the supported versions of Red Hat Linux ES.

- TCP/IP is required for inter-process communication between the JODA data server and all user interface programs. The version of TCP/IP included with the supported versions of Red Hat Linux ES is sufficient.

- The Perl script language is used by the JTLS-GO system and game setup scripts. The version of Perl included with the supported versions of Red Hat Linux ES is sufficient. The Perl program is typically located in the /usr/bin directory. If Perl is installed in a another location, a link should be created from the /usr/bin directory to this program.

- SIMSCRIPT III (SIMSCRIPT to C) translator/compiler: SIMSCRIPT is required for recompiling JTLS-GO code. It is not necessary to have a SIMSCRIPT compiler to execute JTLS-GO, because all JTLS-GO software executables are statically linked with the SIMSCRIPT libraries. The compiler is needed only if you are a U.S. Government organization that can obtain source code and plan to re-compile JTLS-GO SIMSCRIPT code.

- ANSI C Compiler: It is not necessary to use a C compiler to execute JTLS-GO. This compiler is used only by U.S. Government organizations that can obtain source code and intend to re-compile any of the JTLS-GO component programs. The C Compiler version delivered with the supported versions of Red Hat Linux ES is sufficient.

- C++ Compiler: It is not necessary to use a C++ compiler to execute JTLS-GO. This compiler is used only by U.S. Government organizations that can obtain source code and intend to re-compile any of the JTLS-GO HLA component programs. The C++ Compiler version delivered with the supported versions of Red Hat Linux ES is sufficient.

- The JTLS-GO DDS application uses these open source libraries:

  JFreeChart, licensed under a GNU Lesser General Public License (LGPL) by Object Refinery Limited, http://www.object-refinery.com

  JCommon, licensed under LGPL2.1 (GNU Lesser General Public License version 2.1 or later) by Object Refinery Limited, http://www.object-refinery.com

  Commons-math3-3.0.jar, licensed under Apache Software Foundation (Apache License, Version 2.0) http://www.apache.org/licenses/LICENSE-2.0HLA Compliance

- KML Operational Interface (KOI)

  The Keyhole Markup Language (KML) Operational Interface (KOI) server utility enables the model to feed operational simulation data to any version of Google Earth™. The display capabilities and data transfer features of this terrain viewer are sufficiently robust to be used as a base-level operational interface. Operational Players who may be restricted from using an operational Command, Control, Communication, Computer Information (C4I) systems may be able to install and use Google Earth and configure the KOI to provide a capability that resembles C4I for observing perception Force Side data.

  Chapter 3 of the *JTLS-GO C4I Interface Manual* describes requirements and procedures for using the KOI capabilities.

1.3.2 JTLS-GO Cybersecurity Compliance

Because of recent incidents of intrusions into software systems, the United States Department of Defense (DoD) has implemented a strong and strictly enforced Cybersecurity program. JTLS-GO, as software that executes on DoD systems, must comply to the mandates of the program, along with all of the third party software used by JTLS-GO, such as PostgreSQL and Java.

One of the DoD requirements is that the software must implement a methodology that ensures that the end user keep the software up-to-date and all security patches are properly installed. In previous versions of JTLS-GO, Java 8, as delivered by Oracle, fulfilled this mandate by implementing an expiration date for its software. The concept of an expiration date has been removed from the DoD requirement, but the concept of always using the latest version of third-party software remains a strong component of DoD Cybersecurity requirements.

The following procedure has been established and approved by the JS/J7 Cybersecurity branch to meet the software update requirement:

- Within days of an Oracle Java security release, AdoptOpenJDK produces an equivalent version using infrastructure, build and test scripts to produce pre-built binaries of the OpenJDK class libraries. All AdoptOpenJDK binaries and scripts are open source licensed and available for free.

- Within two-weeks of the AdoptOpenJDK release, JTLS-GO provides a bug release version (JTLS-GO 6.3.n.0) including a full Version Description Document (VDD) for download to all authorized agencies. All DoD agencies using JTLS-GO will be in full compliance with this specific Cybersecurity mandate as long as they download and use the bug released versions when distributed.

Please contact the U.S. Government Program Manager, Ms. Jessica Camacho (jessica.l.camacho.civ@mail.mil) to obtain the completed Cybersecurity paperwork. It is expected that a current Gate completion certificate will be available with four to five weeks of this initial release. Due to time and funding considerations, the JTLS-GO 6.3.0.0 project has not obtained a Checkpoint Gate certificate.

1.3.3 JTLS-GO High Level Architecture Compliance

The JTLS-GO 6.3.0.0 release is fully High Level Architecture (HLA) compliant, and includes all the programs required to run JTLS-GO in an HLA mode. JTLS-GO currently belongs to one federation known as GlobalSim. GlobalSim is a comprehensive constructive simulation solution for joint training and wargaming that helps commanders and all levels of staff prepare for a range of operational scenarios.

The solution combines JTLS-GO with CAE's GESI constructive tactical entity-level simulation system. CAE's GESI constructive simulation system is designed to run complex and

comprehensive exercises from the company level up to division level. The GESI system is used to represent a virtual battlefield, including weapons, vehicles, aircrafts, ground forces and more.

Combining JTLS-GO and GESI brings together operational and tactical level constructive simulations to prepare commanders and staff to make timely, informed and intelligent decisions across the full spectrum of operations, including conventional combat, disaster relief, and operations other than war.

From the JTLS-GO perspective, all software needed to run GlobalSim is included in this delivery. JTLS-GO uses the Federation Object Model (FOM) located in the $JGAME/data/hla directory. Federation testing of JTLS-GO with CAE's GESI model has been accomplished. The reader should note that the JTLS-GO Development Team, to date, has not been able to test this federation. If there is interest in running this federation, please contact the JTLS-GO Help desk at jtlsgo@valkyrie.com.

The HLA RTI (Run Time Infrastructure) executive program (rtiexec) recommended for use with this release is Pitch pRTI Evolved 4.4.2.0. However, this program is not included in the JTLS-GO 6.3.0.0 delivery. Users may obtain a full installation package of the RTI software from Pitch Corporation (www.pitch.se). For information about executing the HLA RTI Executive and other HLA-related software, refer to the appropriate HLA documentation and user guides.

1.4 DATABASE MODIFICATIONS

Significant database structure differences exist between JTLS-GO 6.3.0.0 and the previous JTLS-GO 6.2 series database structure. APPENDIX B. VERSION 6.3.0.0 DATABASE CHANGES has a summary of all database changes.

To upgrade your JTLS 6.2 scenario to JTLS-GO 6.3 compatibility, see instructions listed in the *JTLS-GO DDS User Guide*, Chapter 3.1.

1.4.1 JTLS-GO Using Legacy Default Symbol Set

If a user organization is still using the pre-JTLS-GO 5.0.0.0 legacy default symbol set, prior to unloading your JTLS-GO 6.3.0.0 formatted data from your PostgreSQL database server into the JTLS-GO 6.3.0.0 scenario American Standard Code for Information Interchange (ASCII) text files, you must execute the JSYMS program using the procedure outlined in the *JTLS-GO DDS User Guide*, Appendix B.11. This procedure will reorganize the structure of the <scenario_name>.gs and databases symbol.scf file.

1.4.2 JTLS-GO Using New Default Symbol Set

You should not make any modifications to the Default Symbol Set delivered with JTLS-GO 6.3.0.0, but end-user organizations are free to use the Default Symbol Set in their scenarios and alter the scenario symbol set to meet specific organizational needs. Some new symbols have been

created to meet end-user requirements. No previously existing symbols were deleted nor were any of the preexisting symbol names changed.

This means that the user can easily move in this new symbol set. Please follow the steps outlined in the *JTLS-GO DDS Users Guide*, Section B.13, Updating Scenario Symbol Set.

1.4.3 Standard Repository Changes

R&A has continued to improve and expand the unclassified data repository, which has been renamed to "repository63". The DDS comparison and synchronization function can be used to determine if any of the changes delivered are of use to a JTLS-GO user organization. Specifically, significant effort has been applied to ensuring that all important Targetable Weapons have a unique Supply Category from the weapon should be drawn. This results in the model managing a detailed weapon count of all used weapons.

1.5 INSTALLATION

The *JTLS-GO Installation Manual,* a Portable Document Format (pdf) file available for direct download, is part of this JTLS-GO delivery, It provides detailed instructions for installing the new version of JTLS-GO and the installation of PostgreSQL 15.7 required to operate JTLS-GO 6.3.0.0.

2.0 ENGINEERING CHANGE PROPOSALS

This chapter summarizes model capabilities added to JTLS-GO 6.3.0.0 as a result of implementing authorized Engineering Change Proposals (ECPs).

2.1 JTLS-2006-1945 Roll-up Unit Strength

Summary of Model Change Request

A user can request a Situation Report (SITREP) for a Unit, with or without all of its subordinates included. When the option to include a Unit's subordinates is selected, there is currently no way to measure the weighted (percentage) strength of the Unit and its subordinates together. The report provides individual Unit strengths, but it is desired to also include a rolled-up version of the Unit strength.

Design Summary

Note this ECP is related to ECP JTLS-2023-16188 SITREP For Unit Group.

The current Situation Report order format is obsolete, and does not use any of the newer order capabilities that have been developed over the years. This enhancement upgrades the current Situation Report order. The new order panel allows the user to select various options of information that should be included in the resulting SITREP.

The SITREP message was redesigned. Both the English and the US Message Text Format (USMTF) versions of the message were reviewed and redesigned to make the message easier to understand.

When the Unit with subordinates option is selected, the resulting message includes not only the Unit's individual weighted strength, but also the combined weighted strength of the Unit and its subordinates. This combined unit additional information is always available in the resulting message. It does not appear as an option on the Situation Report order panel.

2.2 JTLS-2009-10163 Target Supply IMT Screen

Summary of Model Change Request

The WHIP "Target Information" Information Management Tool (IMT) table provides current status information for all Targets owned by the Player's Force Side.The "Target Supplies" quick retrieval button is used to retrieve current supply information for selected Targets displayed in the IMT.

When this button is clicked, a new "Unit Supply Data" IMT table is displayed. This table lists the types and amounts of each Supply Category held by the Target. Because this IMT table is designed to provide current status information for Unit-held supplies, it includes information such

as "Reorder Level" and "Stockage Objective". These data do not apply to Target supplies, because only Units go through the requisitioning process and would need this type of data.

This enhancement adds an IMT table that has no extraneous data fields and is suitable to list the supplies for a Target.

Design Summary

A new "Inventory Status" IMT table was created to display the supplies held by Targets and by Supply Run convoys. The new IMT table displays the following data:

- The name of the object that is holding the supplies. This table will be used to display the supplies held by Targets and by Supply Run convoys.

- The name of the Supply Category held by the object.

- The amount of the Supply Category that is currently held by the object.

2.3 JTLS-2010-10634 OPM Passwords

Summary of Model Change Request

Users can easily access Online Player Manual (OPM) pages for other Force Sides by opening an OPM and navigating to an enemy Side. A password system is required for security.

Design Summary

OPMs are now password-protected on a WHIP-by-WHIP basis. When players attempt to access the OPM, they are prompted for a username and password - the username is their WHIP's name, and the password is their WHIP's current password. Players are only able to access OPM pages corresponding to the Force Side (or Sides, in the case of a Super WHIP) to which their WHIP belongs.

When no password has been assigned to the WHIP, players are still prompted for a username and password, but should leave the password field blank.

2.4 JTLS-2010-10637 Add AAR Database Repair Times

Summary of Model Change Request

Several important destruction and repair events are not recorded in the After Action Report (AAR) database. These data should be added to the AAR database, and orders should be created to easily access this data.

Design Summary

Each time damage from Lanchestrian combat or the emplacement of a weapon occurs, an Engagement Record is created in the AAR database. Each Engagement Record has a child table

of Engagement Items that list all of the combat systems, supplies, and Targets that were damaged by the engagement.

Previously, no AAR data was maintained for:

- Systems damaged but not killed during a combat action.

- Systems that entered maintenance whether damaged through combat action or simple usage.

- Systems that were repaired and could again be used to fulfill their function.

A new AAR table was created to hold this missing information.

Three reports were developed to view this new saved AAR information:

- The current existing AAR Object Event Report was expanded. The user can select whether Maintenance and Repair object events should be included in the report.

- A new Maintenance and Repair Report was created. This report allows the user to obtain summary information concerning maintenance and repair events for a specific unit, or a specific object type.

- A new Disease/Failure Report was created. This report allows the user to obtain summary information concerning the diseases and failure categories represented in a JTLS-GO database.

2.5 JTLS-2015-12498 Add IMT Column For Sheltered Targets

Summary of Model Change Request

Equipment Shelter Targets can hold and protect:

- A entire ship.
- An ground-based aggregate unit's combat systems.
- An HRU's combat systems.
- A "Mobile" or "Deploy On Move" Target.

The "Combat System" IMT table has a column indicating the number of Combat Systems of each type are being sheltered. The "Target" IMT screen has a column indicating whether the Target is currently held within an Equipment Shelter. To determine if a Unit is utilizing an Equipment Shelter, the user must either bring up the Unit's "Combat System" IMT table or the Unit's "Owned Target" IMT table to see if any of the Unit's assets are being sheltered.

Information indicating whether any of the Unit's owned assets are being sheltered should be displayed on the "Unit Information" IMT table.

Design Summary

The "Unit Information" and the "Naval Unit Information" IMT tables were both changed as a result of this enhancement. The following two new columns were added to these IMT tables:

- The number of Combat Systems currently sheltered.

- The number of Owned Targets currently sheltered.

The "Naval Unit Information" IMT table had one additional new column added indicating whether the ship is currently occupying a shelter. In the real world, this is typically done for submarines when they are in port, to hide the fact that the submarine is there.

2.6 JTLS-2019-14241 Manage DSA Order For Use With JSAT Program

Summary of Model Change Request

A Directed Search Area (DSA) is an area created by a Player to direct certain intelligence assets to collect and report on intelligence data within the area. Tactical DSAs are used to direct aircraft to gather intelligence on that area, while National DSAs direct satellites to gather intelligence on that area.

During exercises, as many as 1200 new Tactical DSAs might be created every day. In addition, as many as 120 National DSAs might be used for satellite asset search assignments.

The Manage DSA order option to describe existing DSAs does not separate the DSAs by type, or allow the user to request information only on a certain type of DSA. This makes the report difficult to use for Intelligence Players. The user should be able to request descriptions of a specific type of DSA.

Design Summary

There are two orders that provide a report of existing DSAs:

- The Player Manage DSAs order - Two new options, called "Describe National DSAs" and "Describe Tactical DSAs", were added to the to the existing "Describe Options" section of the order when a Player requests a description of existing DSAs on their Force Side.

- The Controller Show Directed Search Area order - This order can only be used to describe DSAs. The Controller is not allowed to change DSA information. Two new options, called "Describe National DSAs" and "Describe Tactical DSAs", were added to this order. For these two new options, the Controller order is able to specify whether all Force Side DSAs should be listed in the resulting message, or only the DSAs from a specific Force Side.

The format of the resulting message did not change. Only the specific types of DSAs requested are now listed in the resulting message.

2.7 JTLS-2019-14277 Issues Setting NATO Special Mission Flag

Summary of Model Change Request

JTLS-GO represents the setting of a Special Flag for Link 16 tracks. Normally there is no way to set this flag for Self Reporter missions, because these missions send out J2.2 PPLI messages - they do not send out J2.3 Link 16 track messages for themselves. The special flag is only on the J2.3 track message.

Air Mission detectors, such as AWACS, are considered a node in the Link 16 network. The Common Operational Picture (COP) Manager and the Air Operations Center (AOC) have the ability to merge the PPLI J2.2 messages for the AWACS node and any J3.2 messages that the AWACS mission sends out for itself. In JTLS-GO 6.2, self-reporter Air Missions were given the ability to generate both a PPLI J2.2 message and a J2.3 message using one of their track block numbers. Given this capability, the Special Flag could be manually set via an order; thus resulting in a more realistic AOC COP.

A user has requested an expansion to this capability. The desire is to create geographic rule-based automatic Special Flag assignment. The plan is to link these rules to existing Operation Areas (OPAREAs).

Design Summary

An OPAREA, whether created as part of the database or during the game can be assigned two types of special-flag decisions rules:

- Own Side Missions - The rule is based on the type of Mission. Thus the user can indicate that all AWACS and Air Refueling missions that enter the OPAREA should automatically have their Track's Special Flag set. When the mission leaves the OPAREA, the Special Flag is turned off.

- Foreign Missions - The rule is based on the side of the mission. Thus a User can indicate if any Red or Orange missions enter the OPAREA, the mission's Track Special Fla should be set. There are some additional effects associated with the Special Flag but theses operational details are of no interest to non-NATO users.

The ability for the Player to override the OPAREA geographical rules has not been removed. This capability remains in this version of JTLS-GO.

2.8 JTLS-2019-14350 AAR Detailed Engagement Report

Summary of Model Change Request

It should be possible to generate a Combat Report after an engagement.

Design Summary

A new Combat Report has been created that details the name and position of the firing Unit, the name and position of the victim Unit, the sensors used to acquire the victim, the weapons fired, and an initial Battle Damage Assessment (BDA). The time period for the report is also selectable.

2.9 JTLS-2021-15299 Represent Hypersonic Weapons

Summary of Model Change Request

Hypersonic boost-glide weapons do not follow the two weapon flight profiles that were previously represented in JTLS-GO. A hypersonic boost-glide weapon can have multiple boost phases followed by a glide phase in which the weapon slowly descends.

Design Summary

To implement this capability, the following logic was added to the model:

- Missiles have always had a maximum allowable firing range. A minimum firing range has been added to the model, because it makes no sense to fire a Boost-Glide Weapon for short distances.

- The number of boost phases is used to determine the type of missile that is being fired, and has the following impact on the logic used to interdict the missile. Table 2.1 outlines this logic:

Table 2.1 Boost Phase Determines Missile Type

NUMBER BOOST PHASE	TYPE MISSILE	INTERDICTION RULES
0	CRUISE MISSILE	An Air Defense Site's Range Vs Missile is no longer accessed. Cruise missiles use the same altitude-based ranges used against aircraft.
		Although not delivered in this version of JTLS-GO, the plan is to deliver as part of a JTLS-GO 6.3 maintenance release the ability to intercept a CRUISE Missile in the same manner that Aircraft are intercepted.
1	BALLISTIC MISSILE	The Air Defense parameter AD.MAX.RANGE.VS MISSILE only applies to Ballistic Missiles. If the Ballistic Missile is withing this range and the Air Defense site's Probability of Hit (PH) and Probability of Kill (PK) data indicates a kill is possible, the site fires on and may possibly kill the Ballistic Missile.

Table 2.1 Boost Phase Determines Missile Type

NUMBER BOOST PHASE	TYPE MISSILE	INTERDICTION RULES
1 (Con't)	CRUISE MISSILE (Con't)	Air Missions do not intercept Ballistic Missiles, but they are allowed to fire on Ballistic missiles with air-to-air weapons that have a positive PH and PK. A new database parameter indicates whether the weapon is effective against the missile while it is in its Boost Phase or after the Boost Phase is complete.
>1	BOOST.GLIDE.MISSILE	An Air Defense Type has a new database parameter, AD MAX.RANGE.VS.HYPERSONIC which is applies to Boost Glide missiles. If the Boost Glide Missile is withing this range and the Air Defense site's Probability of Hit (PH) and Probability of Kill (PK) data indicates a kill is possible, the site fires on and may possibly kill the Boost Glide Missile.
		Air Missions do not intercept Boost Glide Missiles, but they are allowed to fire on Ballistic missiles with air-to-air weapons that have a positive PH and PK. As with Ballistic Missiles. the new database parameter indicating whether the weapon is effective against the missile while it is in its Boost Phase is accessed prior to firing

- The best method to describe the flight profile for a Boost Glide Missile is by providing a simple example. Table 2.2 describes the flight profile for a Boost Glide Weapon that has three Boost phases and is traveling 300 KM. Although not realistic, the missile flies at the weapon's specified speed throughout this flight path. JTLS-GO does not consider atmospheric friction or deceleration of the weapon at low altitudes. This is left to be a function of the PH and PK data based on the range the weapon is from the firing object.

Table 2.2 Boost Glide Weapon Flight Profile Example

PHASE	
Boost Phase 1	Computed to get the missile from its launch point to a location that is 1/3 of the way (100 KM down range) and glides to an altitude that is 1/3 of the way down from the ballistic apex. During the Boost Phase, it is interdictable by air-to-air weapons that indicate they are designed to be used against the missile during its boost phase.
	The user needs to remember that if no such weapon exists, then appropriate PH and PK data should be developed.
Glide Phase 1	The missile flies a glide flight path after the boost phase. When it gets to the proper altitude, the next boost phase starts.
Boost Phase 2	Again the model computes the time of the boost phase to get the missile from its current altitude to a point 2/3 of the way (200 KM) to the impact location, and an altitude 2/3 of the way down from the missile's maximum achieved altitude. During this phase, the missile is subjected to possible interdiction by boost-phase capable air-to-air weapons.

Table 2.2 Boost Glide Weapon Flight Profile Example

PHASE	
Glide Phase 2	The missile flies a glide flight path after the boost phase. When it gets to the proper altitude, the next boost phase starts.
Boost Phase 3	Again the model computes the time of the boost phase to get the missile from its current altitude to the impact location. During this phase, the missile is subjected to possible interdiction by boost-phase capable air-to-air weapons.
	The missile flies a glide flight path after the boost phase to the target.

2.10 JTLS-2021-15417 RIC Codes Available In Logistics Reports

Summary of Model Change Request

NATO LOGFAS Reportable Item Codes (RICs) should be available by every Combat System in the Logistics Report.

Design Summary

RICs are now included in all Logistics Reports, including individual, rollup, and HRU reports. Combat system aircraft use the RIC code for the matching Aircraft Class.

2.11 JTLS-2021-15429 Expand ICAO Search Of IMT Screens

Summary of Model Change Request

The "Ground Unit" IMT table includes a column for airport identification codes (known as ICAO codes). However, this capability does not exist on the "Airbase" IMT table, where it would be logical to search by ICAO. The "Airbase" IMT table also does not show the long name of the Airbase Unit, which makes it difficult to find specific Airbases when the user uses the ICAO code for the airport as the Airbase Unit short name.

Design Summary

For consistency all Unit IMT tables now include Unit Short Name, Long Name, and ICAO code fields,

2.12 JTLS-2021-15432 Target Ranges From Unit Icons

Summary of Model Change Request

The WHIP has the ability to display range rings around certain object icons. In order to display range rings, for an object, the object's icon must be displayed on the WHIP's map component. For example, if a user wants to see the range ring of a Surface-to-Surface Missile (SSM) owned

bu a Unit, the user must display all SSM Targets on the WHIP Map. This is a nuisance when the user just wants to see what enemy objects are within missile range of a given Unit.

Design Summary

This enhancement allows the user to select the range rings associated with a Unit's Owned Targets from the Unit Icon's context-sensitive menu. Table 2.3 summarizes the ranging options that are available from the various range appropriate icons:

Table 2.3 Summary Of New Range Ring Options

OBJECT	RANGE RING OPTIONS
General Range Rings	**Lookout Range:** All Aggregate Units and HRUs - The unit's lookout range. This is the combination of the unit's radius plus the maximum of the unit's: • Tactical collection area • Visual Sensor which is always assumed to be operational and • Its longest range functioning Surface Search capable sensor.
	Unit Radius: All Aggregate Units and HRUs
	Truck Convoy Capable Distance: Support Units only. The minimum allowable truck convoy distance and the maximum allowable truck convoy distance.
	Replenishment Distance: Naval Units only. The distance at which under-way replenishment can start.
Combat System Range Rings	**Combat System Ranges:** All Aggregate Units - Range rings for each Manned Combat System with attrition capability. The longest range Direct Fire System and the longest range Indirect Fire System is marked.
Artillery Range Rings:	**Artillery Weapon Ranges:** All Aggregate Units - For each Manned Indirect Fire Combat System, the weapons that can be fired by that Combat System are listed as long as the unit has supplies to support the weapon. The longest range weapon is marked.
Target Summary Ranges	**Sensor Ranges:** All Aggregate Units and HRUs - The maximum search radius of all owned sensors by sensor type that are currently not destroyed. A Range Ring exists for each sensor use type: Air Search, Surface Search, Active Sonar, Passive Sonar, and Counter-Battery radars.
	Jammer Ranges: All Aggregate Units and HRUs - The maximum coverage radius of all owned jammers by jammer type that are currently not destroyed. A Range Ring exists for each jammer type, such as sensor jammers, communication jammers, Psychological Operations Broadcast (PSYOPS) capabilities, and the various weapon guidance jammers.

Table 2.3 Summary Of New Range Ring Options

OBJECT	RANGE RING OPTIONS
Target Summary Ranges (Con't)	**SSM Ranges:** All Aggregate Units and HRUs - The maximum surface and sub-surface weapon range that the object is allowed to fire given it owns an SSM target capable of firing the weapon and has the supplies needed to fire the weapon.
	Air Defense Ranges: All Aggregate Units and HRUs - The maximum range altitude zone and minimum range altitude zone at which the unit is allowed to fire.
	Communication Ranges: All Aggregate Units and HRUs - The maximum Air Defense communications range and maximum satellite communications range of owned non-destroyed communication targets.
Sensor Ranges	**Feasible Ranges:** Target - The range for each use of the sensor. The ranges rings are available whether the target is functioning or not. This allows to view the differences between operational sensors and all sensors by filtering the icons on and off.
Sensor Load Ranges	**Feasible Ranges** - Air Missions and Satellites. A range ring for each sensor that is held by the object. There is a range ring for each sensor usage type.
Jammer Ranges	**Feasible Range:** Target - The range for the jammer. The range ring is available whether the target is functioning or not. This allows to view the differences between operational jammers and all jammers by filtering the icons on and off.
Jammer Load Ranges	**Feasible Range** - Air Missions and Satellites. A range ring for each jammer that is held by the object.
Air Defense Ranges	**Feasible Range:** Target - The range of the air defense target in each altitude zone for which there is a range. The range ring is available whether the target is functioning or not. The longest range altitude zone is marked.
Targetable Weapon Ranges	**Feasible Range:** Target - The ranges of all weapons that can be fired by the SSM target. The weapon supplies must be available.. The longest range weapon is marked.
Targetable Weapon Load Ranges	**Feasible Range** - Air Missions and Satellites. A range ring for each weapon held by the object.
Communication Range	**Feasible Ranges:** Target - Limited to Air Defense Communication targets and Satellite Communication targets. Command Communication targets do not have range rings produced since Command Communication targets currently have no function.
Communication Load Ranges	**Feasible Ranges** - Air Missions and Satellites. A range ring for each communication capability loaded on the object.

2.13 JTLS-2022-15537 Develop Web Enabled Exercise Log

Summary of Model Change Request

During large and complex exercises, it can be difficult to keep all participants up to date and informed of the status of the model, and provide information on the exercise's execution status. JTLS-GO needs a more formal process to keep remote users informed of the status of various problems, requests, and questions.

Design Summary

This enhancement creates a web-enabled tool to record information in an exercise log. As a web-based tool, all exercise participants, including Technical Control and Players, will be able to view and contribute information to the log, with each item recorded as an individual entry, and the identity of each contributing user recorded. The Exercise Log can be searched and sorted as desired.

This is different from a "Chat" capability, in that search constraints are feasible and any user able to query the Exercise Log database to obtain status information at any time.

2.14 JTLS-2022-15594 Copy / Paste WHIP DDS Locations Into Orders

Summary of Model Change Request

There are many times during an exercise that a user needs to inform other players or the exercise audience of some type of location information. The location desired is easy to find on the WHIP map, but there is no easy method to get that location other than manually typing in the location coordinates into either an e-mail or chat capability. It would be useful to copy a WHIP map location into the clip board so it can be pasted into any other application running on the client machine.

Design Summary

Users are now able to copy coordinates from any point on the WHIP or DDS Map, by right-clicking on the Map and selecting the "Copy Location" option in the context-sensitive menu. Coordinates can be copied in degrees of latitude and longitude, decimal latitude and longitude, and Military Grid Reference System (MGRS) formats.

Users can then paste coordinates into the WHIP and DDS, in any location coordinates might be found (such as order panels or the Map search field).

2.15 JTLS-2022-15826 Improve Set Load Assignment Array Order

Summary of Model Change Request

In order for a User to alter the Load Assignment Array data as the model is running, a separate order must be submitted for each load alternative. If the order allowed the user to change multiple load alternatives at one time, it would be easier to copy the load assignment array from one aircraft to another.

Design Summary

The Set Load Assignment Array order has been modified to allow Users to change multiple load alternatives simultaneously. The user can now add or change multiple load alternatives for multiple mission types under day, night, or both light conditions, all in one order.

2.16 JTLS-2022-15976 WHIP Encrypted Passwords

Summary of Model Change Request

The WHIP requires a password to log on, but this password is a generic password used by all WHIPs on their initial login. Users are required to change this generic password when they first open each WHIP. Since there is only one single initial password, users can theoretically open WHIPs belonging to Force Sides they are not supposed to access by simply trying the default password on enemy Force Side WHIPs to see if they will open.

Design Summary

WHIP default passwords can now be assigned by Force Side, so that the default WHIP password for Side A can be different than that of Side B. This side-specific default password takes precedence over the generic default password, and prevents users assigned exclusively to Side A from opening WHIPs belonging to Side B.

2.17 JTLS-2023-16182 Air Mission Remaining Fuel Improvement

Summary of Model Change Request

In a busy air-to-air combat environment, air missions sometimes head to a tanker to refuel at inopportune moments (for example, breaking off during an intercept).

Currently, the model determines if an air mission needs fuel every time the mission moves. The model considers the distance to the next refuel location, fuel consumption rate, and fuel remaining. If the mission's remaining fuel is insufficient to reach the next refuel location, the model concludes the mission needs to refuel now. The model then creates a refuel chit with the current time, so that the mission will immediately begin to head toward the nearest available tanker. This logic is handled behind-the-scenes by the model, without Player involvement.

In addition to the automatic refueling handled by the model, the Player can create, delete, or modify existing refuel chits using the Manage Air Refueling order. In this order, the Player can specify or alter the refueling tanker mission, the receiving mission, the total amount of fuel to receive for the mission aircraft, and the desired refuel time (the rendezvous time at the refuel location). Unlike the refuel chit automatically generated by the model, the mission begins moving toward the refuel location in advance of the Player-specified desired refuel time.

The Player can monitor refuel chits for a mission using the "Refuel Chit" IMT table. The WHIP also displays the current remaining fuel in each aircraft by percentage and quantity. Other than that information, there is no specific indication that a mission is nearing the time when it must seek fuel, based on the model's automatic calculations. Players need advance indication, beyond what is currently provided in the WHIP, to improve their management of air refueling operations, and a quick method to request refueling.

Design Summary

This enhancement added two new columns to the "Air Mission" IMT table, named "Estimated Refuel Time" and "Estimated Fuel Exhaustion Time".

The "Estimated Refuel Time" is continually updated, and holds the time that the mission will start heading for fuel according to the model's automatic calculation. The calculated time is based on the next refuel location (tanker or airbase) and the current speed of the mission. The estimated time is recalculated and updated after every mission movement event, if the mission currently does not require fuel.

The "Estimated Fuel Exhaustion Time" is also continually updated, and holds the time that the mission is projected to consume all on-board fuel, including the mandatory spare fuel amount. The time is based on the consumption rate of the aircraft and the amount of fuel remaining. The estimated time is recalculated and updated after every mission movement event, whether the mission requires fuel or not.

2.18 JTLS-2023-16185 Quick Mission Refuel Capability

Summary of Model Change Request

Recent exercises have revealed the need for an expeditious means to request air-to-air refueling. The existing Manage Air Refueling order, although very useful for scheduling air refueling operations, requires multiple inputs which can impede a player during a high ops tempo air battle. Often, a mission simply needs an immediate top-off between intercepts.

Design Summary

A new Refuel Mission quick order has been added to the WHIP. This new order allows the player to request an immediate refuel of a specified mission from a specified aerial refueling mission.

The model automatically calculates the amount of fuel necessary to top-off the specified mission and create a refuel chit. The mission immediately heads toward the tanker to refuel.

2.19 JTLS-2023-16187 Formalize AAR Linux Scripts

Summary of Model Change Request

JTLS-GO has two available methods for creating AAR summary reports:

1. The WHIP AAR Report Request Forms.

2. A series of scripts that can only be submitted by Technical Control from a Linux command line.

The command line scripts should be translated into AAR Report Requests Forms, so they can be execute by all Response Cells.

Design Summary

All of the AAR command line scripts have been translated into AAR Report Requests Forms. Because some JTLS-GO clients have asked about writing custom-made AAR scripts, the existing scripts have been maintained as examples for clients reference purposes to. The JTLS-GO Development Team will continue to develop the command-line script on an ad hoc basis for quick turn-around reports. The intention is that the script capability, once implemented, will be maintained until the more formal AAR request form can be developed for each access by all Response Cells.

2.20 JTLS-2023-16188 SITREP For Unit Group

Summary of Model Change Request

The Situation Report order is used to request a SITREP for a Unit with or without all of its subordinates included. The Unit can be selected from the map, an IMT table, a message, or the order panel's drop-down list. The Situation Report order has no "Reference" field; thus, it cannot be saved and accessed from the WHIP's Order Group Editor. This is as desired - the Situation Report order is used often, and requiring the user to fill a Reference would impede the user's ability to submit the order quickly.

However, during a recent exercise. the Response Cell requested that a SITREP be generated periodically for a fairly large group of units. Because the Situation Report order cannot be saved and placed in an Order Group, there was no easy way to fulfill the Response Cell's request. Periodically, a Player needed to manually recreate the Situation Report order for the desired units. There should be a capability to allow a Player to create a reusable methodology to request a SITREP for a group of units.

Design Summary

This enhancement adds an option to the Situation Report order to input a Utility Directive list of Units. Utility Directives must have an identifying name, and are always saved and available in the Order Group Editor. If a Player wants to request a SITREP for a group of units, the Player should now create a Utility Directive list that contains the names of the desired Units. If, at a future time, the user wants a current SITREP for the same group of Units, the Situation Report order can be opened, the name of the saved Utility Directive can be selected, and the order can be submitted.

2.21 JTLS-2023-16213 Improve Remove Ship From Formation

Summary of Model Change Request

Players should be able to quickly order ships to leave naval formations.

Ships in formations are sometimes ordered to perform other tasks, which causes them to leave their current formation without a Player directive to do so.

Design Summary

This enhancement adds a new "Leave Formation" order to remove a ship from a naval formation.

This enhancement also adds option to other existing orders to instruct the ship to leave the formation before executing the order. A ship no longer automatically leaves a formation if order to accomplish an independent task without explicit player direction to do so. This prevents Players from inadvertently removing ships from formations using individual orders.

2.22 JTLS-2023-16228 Move To PostgreSQL 15

Summary of Model Change Request

Previous versions of JTLS-GO used PostgreSQL 11, whose life cycle ended in November 2023, Postgres no longer supports PostgreSQL 11 with security updates. This is in direct violation of the Cybersecurity mandates under which JTLS-GO operates.

Design Summary

JTLS-GO 6.3.0.0 has been updated to use PostgreSQL 15.7. New installation instructions have been provided in the *JTLS-GO Installation Manual.*

2.23 JTLS-2023-16269 Finalize Order Delay Message

Summary of Model Change Request

As part of a JTLS 6.2 maintenance release, a message was generated if unit was experiencing jamming that significantly delayed the delivery messages or the receipt of orders. The definition

of what is consider a significant delay time was hard coded, which is contrary to a basic premise of JTLS-GO model development. A database parameter is needed to properly define the value that an end user wants to use for the definition of a "significant" delay.

Design Summary

A general modeling database parameter was added to the database. This parameter documented as MAX.ORDER.DELAY.MESSAGE.TIME.

2.24 JTLS-2023-16271 Improve ELS Event Handling

Summary of Model Change Request

The Entity Level Server (ELS) processes the internal updates and external modifications of objects in a manner which can result in significant delays in their publication. The computational methods require modification to improve the fidelity of time stepping. This is critical in the simulation of the smooth movement of entities.

Design Summary

The ELS currently uses two discrete events to process attribute updates for objects. One event is for internal updates on all aggregate objects from the model. The second event handles the entity modifications received from connected external models. The ELS flags the external updates, modifies the entity states, and then processes changes to all externally-controlled objects. Both the internal and external actions are accomplished using just two regularly scheduled, repeating events.

When many game objects and entities are undergoing changes, these events may iterate through large collections of objects. Because they may involve extensive looping, the event processing can lead to delays in ELS execution. This can result in the non-uniform publication of time-sensitive data on the ELS Object Distribution Authority (EODA). Specifically, if many objects are moving, the dead-reckoning of the entities may not appear to move smoothly along their route. If there is an update lag, then the entities may fall behind from their expected position, and then jump to the next location.

This enhancement overhauls the ELS, such that many individual events are used. Instead of looping over all affected objects, there will be one or more existing events for each object. This allow for more consistent timing of the repeating events. The resulting movement of entities is expected to appear smoother as their locations are dead-reckoned to new positions.

2.25 JTLS-2023-16298 Improve Satellite Representation

Summary of Model Change Request

JTLS-GO does not currently represent maneuverable satellites, the realistic destruction of satellites, or the use of directed energy weapons by satellites.

Design Summary

In previous versions of JTLS-GO, all satellites follow orbits according to their specified Two-Line Entry (TLE) data used compute the satellite's orbiting route. For realistic orbital paths, these locations are computed using the JTLS-GO Satellite Program (JSAT) based on parameters in Two-Line Element (TLE) data. In previous versions of JTLS-GO, the locations only include latitude and longitude positions. This enhancement includes altitude to further define the orbital position.

Furthermore, this enhancement adds a capability where the Controller can use JSAT to maneuver a satellite to a completely new orbital path. To maneuver a satellite, the user must build a new set of route points using JSAT. Once these data are generated from the parameters specified in the new TLE file, then JSAT submits the CEP order to replace the existing satellite route.

Rerouting a satellite using locations from the old and the new TLE files will likely result in an orbital discontinuity. At the junction where the new points will replace the old (existing) points there may be a significant jump in location. To avoid seeing this discontinuity on the map, the display of the satellite is hidden for a specified period of time while it transitions from one orbital path to the new orbit. This is called the black-out period due to maneuvering.

Additionally, satellites can now be interdicted and destroyed by air defense assets. To facilitate this, satellite route points now receive an altitude (represented by the database parameter RTP.ALTITUDE, which is generated and assigned by the JSAT from TLE data), which determines whether air defense assets can attack the satellite. Satellites now receive an Aircraft Target Class, which determines the Probability of Hit and Probability of Kill air defense assets will use to determine whether they have damaged the satellite they have engaged.

When satellites are destroyed, a debris field will be created that prevents satellites that enter the debris field from functioning. This debris field is represented by the database parameter ATC.DEBRIS.RADIUS. Satellites will not be destroyed by entering a debris field using the current logic.

Finally, directed energy weapons have been incorporated into JTLS-GO for use by satellites. Directed energy weapons are represented as Targetable Weapons that have a database parameter TW.REGENERATION.TIME, which represents the time the weapon needs to regenerate its energy supply for another shot (the "cooldown" time between shots). JTLS-GO does not currently represent the need for an energy source - that is currently assumed to exist on the satellite. In a future enhancement, directed energy weapons will be implemented on aircraft, but are currently only available on satellites.

2.26 JTLS-2023-16335 Automatic WHIP Exercise Log Entries

Summary of Model Change Request

The new Exercise Log developed for JTLS-2022-15537 Develop Web Enabled Exercise Log needs to be expanded to automate the logging of certain types of events.

Design Summary

An Exercise Log issue is automatically submitted under the following situations:

- When the Controller changes a database parameter using a "Set…" order, and that change should be moved permanently into the database repository, an Exercise Log entry can be created to remind the database team to accomplish the change post-exercise. All database change Orders have been given a new "Log" button at the bottom of the order panel. If this "Log" button is clicked, the WHIP automatically creates an Exercise Log issue with the changed database parameter information.

- It is not unusual that a daily Air Tasking Order (ATO) arrives late and the translation team cannot complete the translation procedure prior to leaving for the night. Under this circumstance, the ATO Translation (ATO-T) team ensures the early missions are properly translated and submitted to the model, An easy method is needed to inform the day shift, which mission need further evaluation prior to being submitted to the model.

    A new checkbox has been added to the WHIP's ATO-T module's mission summary screen. When checked, the ATO-T user can request that the mission information, along with its USMTF snippet, be sent to the Exercise Log. When the Day shift arrives, the Exercise Log can be quickly reviewed and work on the non-verified missions can be started.

2.27 JTLS-2023-16368 C4I Naming Flexibility

Summary of Model Change Request

Units have several different names: their short name, long name, UIC, and so on. Users should be allowed to define which name should be used in C4I messages.

Design Summary

An additional data parameter, the "C4I Name", has been created and added to the database for each unit. The JTLS-GO Operational Interfaces (JOI) for OTHGold, LOGFAS, and LC2IS have been modified to allow the user to configure which name to send to those systems.

2.28 JTLS-2023-16372 Range Rings For Artillery

Summary of Model Change Request

There are two ways that a user can utilize a Unit's artillery:

- **Lanchestrian Combat Method:** The model will automatically allocate existing "Indirect" and "Long Indirect" attrition-type Combat Systems against enemy Units within range of the Combat System. The entire concept of an artillery Unit being placed in Direct Support of another Unit in combat is represented. This includes placing an off-shore Naval Unit in Direct Support of a land battle.

- **Explicit Fire Artillery Method:** The user can submit explicit "Fire Artillery" orders. The user selects a Unit and a weapon to fire. The Fire Mission will be executed as long as:

  1. The Unit has an operational "Indirect" and "Long Indirect" Combat System capable of firing the specified weapon.

  2. The supplies that represent the weapon are available at the Unit.

  3. The targeted object is within the range of the selected weapon.

  4. The Unit has permission to fire based on its assigned Rules of Engagement.

The model ensures that there is no double counting, and that both types of artillery support are not used simultaneously by a specific Unit.

Different database range information is used to determine if artillery fire is feasible:

- **Lanchestrian Combat Method:** Feasibility is based on the database parameter Combat System Range (CS RANGE).

- **Explicit Fire Artillery Method:** Feasibility is based on the individual weapon's database range (TW RANGE). Each weapon that can be fired from a specific Combat System can have its own range capability.

The WHIP has the ability to display range rings around certain object icons. The display of Range Rings around a Unit icon includes the capability to display the range rings of the Unit's Owned Combat Systems. From the Unit's context-sensitive menu, the user can select the specific Combat System for which a range ring should be displayed. This range ring is based on the CS RANGE database parameter.

There is currently no way to visualize the range of weapons that the user can fire using the Explicit Fire method.

Design Summary

Implementation of this enhancement is closely related to ECP JTLS-2021-15432 Target Ranges From Unit Icons.

Two new Artillery Range options have added to the WHIP:

- A new option, named Artillery, has been added to a Unit's context-sensitive menu. This option is a sub-menu that contains all of the Targetable Weapons for which the unit has Combat Systems capable of firing the weapon. Selecting any one of the listed weapons result in the display of the weapon's range ring around the unit.

- The longest range Targetable Weapon that can be fired using the Unit's artillery Combat Systems is one of the General Unit range rings that can be manipulated from the General Tab on the Range Ring Control Panel of the WHIP Map.

For consistency, the following range rings have also been added to the General Tab of the Range Ring Control Panel:

- Maximum range Direct Fire Combat System.

- Maximum range Indirect and Long Indirect Combat System.

2.29 JTLS-2023-16374 Create TPFDD IMT Screen

Summary of Model Change Request

The current "Manage TPFDD" order is a complicated order because it allows the user to change any aspect of the planned arrival of a Unit or the planned redeployment of a Unit out of the theater of operations. This enhancement creates a simpler alternative method to submit a "Manage TPFDD" order.

Design Summary

A new "TPFDD Event" IMT table has been created, which allows the user to create an Order Spreadsheet from that IMT table to submit orders to TPFDD for the selected Units.

Additionally, a TPFDD Out capability has been added to the "Ground Unit" IMT table, to allow the user to create an Order Spreadsheet from that IMT table.

2.30 JTLS-2023-16448 WHIP And DDS Customized Shape File

Summary of Model Change Request

The Interface Configuration Program (ICP) and Database Configuration Program (DCP) should be modified to automate the process of configuring the display of customized shape files for the world map in the WHIP and DDS.

Design Summary

Both the ICP and DCP allow the user to easily configure which shape files should be displayed as the world map in the WHIP and DDS, respectively.

The JTLS Order of Battle Editor (JOBE) Map's shape file is customized according to how the DDS's shape file is configured. If the DCP customizes the DDS to use an alternative shape file, then the JTLS Interface Network Navigator (JINN) specifies the same alternative shape file to be used when creating a package for JOBE users.

2.31 JTLS-2023-16450 Artillery and SSM Have Minimum Range

Summary of Model Change Request

JTLS-GO only represents the maximum range at which a weapon (either artillery or SSM) can be fired. However, weapons systems in the real world usually also have a minimum range.

Design Summary

A new data parameter was added to indicate the minimum range of a selected Targetable Weapon. Weapons will not fire at a victim closer than the minimum range.

2.32 JTLS-2023-16457 Multiple ACMID Routes

Summary of Model Change Request

Currently, Air Control Mean Areas (ACM) can be generated from Air Control Orders (ACO), and are usable for area tasks and routing. However, the Air Tasking Order Translator (ATOT) and the model are restricted to using only a single ACM for ingress and egress routes, along with the entry and exist coordinates. In the real world, ingress and egress routes are often comprised of any combination of multiple ACMs, which cannot be translated or built properly in JTLS-GO. Both the ATOT and the model need to be improved to handle multiple ACM ingress and egress routes.

Design Summary

Each Air Mission Order and the model have been modified to allow the entry of multiple ACMs within a given mission route. This capability applies to ingress routes, egress routes, and orbit path routes.

The ATOT has been improved to use these new order and model capabilities.

2.33 JTLS-2023-16458 Range Rings Based On Unit Status

Summary of Model Change Request

Displayed range rings for Air Defense Targets, Sensor Targets, and weapons should consider the status of the respective units.

Design Summary

Users are now able to filter the displayed range rings according to whether the object is active, not active, or destroyed.

2.34 JTLS-2023-16460 IMT Filter By COMAO ID

Summary of Model Change Request

The "Air Mission" IMT table should allow the user to filter by COMAO ID, Package, and ATO ID.

Design Summary

Quick retrieval buttons for COMAO, Package, and ATO ID have been added to the "Air Mission" IMT table.

3.0 SOFTWARE TROUBLE REPORTS

Software Trouble Reports (STRs) describe software code errors that have been discovered by JTLS-GO users or developers and have been corrected. Because this is the first release of JTLS-GO Version 6.3.0.0, no STRs have been reported.

4.0 REMAINING ERRORS

Every effort has been made to correct known model errors. All reproducible errors that resulted in CEP catastrophic software failures (crashes) have been corrected. Other corrections were prioritized and completed according to their resource cost-to-benefit relationship.

As JTLS-GO 6.3.0.0 represents a major release of new functionality, all outstanding errors have been reviewed. If the error could not be reproduced, it was considered obsolete and no longer relevant to JTLS-GO. These errors have been removed from consideration for correction at this time.

In future maintenance releases, newly uncovered outstanding errors related to JTLS-GO will be listed in this chapter, along with information regarding the extent of the error, as well as suggestions to avoid or minimize the effects of the problem.

APPENDIX A. ABBREVIATIONS AND ACRONYMS

Terms are included in this Appendix to define their usage in JTLS-GO design, functionality, and documentation.

AAA	Anti-Aircraft Artillery
AADC	Area Air Defense Commander
AAL	Air-to-Air Lethality
A/C	Aircraft
ACP	Air Control Prototype
ADA	Air Defense Artillery
AEW	Airborne Early Warning
AFB	Air Force Base
AG	Air-Ground (Air-to-Ground)
AI	Air Interdiction
AIM	Air Intercept Missile
AIREF	Air Refueling
AKL	Area Kill Lethality
AMMO	Ammunition
AO	Area of Operations
AOC	Air Operations Center
APC	Armored Personnel Carrier
ARECCE	Armed Reconnaissance
ARTE	Air Route
ARTY	Artillery
ASC	Automatic Supply Calculation
ASCII	American Standard Code for Information Interchange
ASW	Anti-Submarine Warfare
ATC	Aircraft Target Category
ATGM	Anti-Tank Guided Missile
ATK	Attack
ATO	Air Tasking Order
ATORET	Air Tasking Order Retrieve Program
ATOT	Air Tasking Order Translator
AWACS	Airborne Warning And Control System
AZ	Altitude Zone

BADGE	Bilateral Air Defense Ground Environment (used by Japan Defense Agency)
BAI	Battlefield Air Interdiction
BDA	Battle Damage Assessment
BDE	Brigade
BN	Battalion
C3	Command, Control, and Communications
C3I	Command, Control, Communications, and Intelligence
C4I	Command, Control, Communications, Computers, and Intelligence
CA	Civil Affairs
CADRG	Compressed ARC Digitized Raster Graphics
CAP	Combat Air Patrol
CAS	Close Air Support
CAT	Category
CCF	Central Control Facility
CCP	Command Control Prototype
CCU	Controller Change Unit
CEP	Combat Events Program
CMDR	Commander
COP	Common Operational Picture
CP	Combat Power
CS	Combat System
CSP	Combat System Prototype
CTAPS	Contingency Tactical Air Planning System
CTG	Commander Task Group
CTRL	Control keyboard command
DCA	Defense Counter Air
DCL	Digital Command Language
DDS	Database Development System
DEMSDB	Demonstration Standard Database
DISA	Defense Information Systems Agency
DIV	Division
DMA	Defense Mapping Agency
DoD	Department of Defense
DOS	Days of Supply

DPICM	Dual Purpose Improved Conventional Munitions
DS	Direct Support
DSA	Directed Search Area
DTG	Date Time Group
EC	Electronic Combat
ECM	Electronic Counter Measure
ECP	Engineering Change Proposal
EEI	Essential Elements of Information
ELINT	Electronic Intelligence
ELS	Entity Level Server
EODA	Entity Level JTLS Object Data Authority
ETA	Estimated Time of Arrival
FARP	Forward Arming and Refueling Point
FLP	Fire Lethality Prototype
FLOT	Forward Location of Troops
FOL	Forward Operating Location
FWL	Frederick W. Lanchester (originated a differential equation model of attrition)
GAL	Gallon
GCCS	Global Command and Control System
GRTE	Ground Route
GS	General Support
GSR	General Support Reinforcing
GUI	Graphical User Interface
HARM	High-speed Anti-radiation Missile
HE	High Explosive
HELO	Helicopter
HMMWV	High Mobility Multipurpose Wheeled Vehicle
HQ	Headquarters
HRU	High Resolution Unit
HTML	Hypertext Markup Language
HTT	High resolution unit Target Type
HUP	High resolution Unit Prototype
ICM	Improved Conventional Munitions
ICP	Interface Configuration Program

ICPLogin	Interface Login Program
ID	Identifier
IFF	Identification Friend or Foe
IIP	Intelligence Information Prototype
IMT	Information Management Tool
INFO	Information
INTEL	Intelligence
JCATS	Joint Conflict And Tactical Simulation
JDA	Japan Defense Agency
JDPI	Joint Desired Point of Impact (formerly DMPI: Desired Mean Point of Impact)
JDS	JTLS Data System
JDSP	JTLS Data System Protocol
JEDI	JODA Entity Data Identifier
JMCIS	Joint Maritime Combat Information System
JMEM	Joint Munitions Effectiveness Manuals
JODA	JTLS Object Distribution Authority
JOI	JTLS Operational Interface
JPL	Jet Propulsion Laboratory
JRSG	Joint Rapid Scenario Generation (formerly JIDPS: Joint Integrated Database Preparation System)
JSDF	Japanese Self-Defense Force
JTLS	Joint Theater Level Simulation
JTLS-GO	Joint Theater Level Simulation - Global Operations
JTOI	JTLS Transaction Operational Interface
JXSR	JTLS XML Serial Repository
KIA	Killed In Action
KM	Kilometer
KNOTS	Nautical miles per hour
LA	Lethal Area
LAN	Local Area Network
LAT	Latitude
LB	Login Build (JTLS order type)
LDAP	Lightweight Directory Access Protocol
LDT	Lanchester coefficient Development Tool
LOG	Logistics

LOGIN	Logistics Input
LOGREP	Logistics Report
LONG	Longitude
LOTS	Logistics Over The Shore
LR	Long Range
M&S	Modeling and Simulation
MAPP	Modern Aids to Planning Program
MB	Megabyte
MCP	Mobility Counter-mobility Prototype
MCR	Model Change Request
MG	Machine Gun
MHE	Material Handling Equipment
MIP	Model Interface Program
MOGAS	Motor Gasoline
MOPP	Mission-Oriented Protective Posture
MOSAIC	NCSA user interface software
MOTIF	X Window System graphical interface
MP	Maneuver Prototype
MPP	Message Processor Program
MSC	Major Subordinate Command
MSG	Message
MTF	Message Text Formats
MUREP	Munitions Report
MUSE	Multiple Unified Simulation Environment
NCSA	National Center for Supercomputing Applications (University of Illinois)
NEO	Noncombatant Evacuation Operations
NFS	Network File Server
NGO	Non-Governmental Organization
NIS	Network Information Service or Network Information System
NM	Nautical Mile
NTSC	Naval Telecommunications System Center
OAS	Offensive Air Support
OBS	Order of Battle Service (formerly UGU: Unit Generation Utility)
OCA	Offensive Counter-Air

OJCS	Organization of the Joint Chiefs of Staff
OMA	Order Management Authority
ONC	Operational Navigation Chart
OPM	Online Player Manual
OPP	Order Preprocessing Program
OTH	Over The Horizon
OTH Gold	Over The Horizon message specification
OTH-T	Over The Horizon-Targeting
pD	Probability of Detection
pE	Probability of Engage
pH	Probability of Hit
pK	Probability of Kill
PKL	Point Kill Lethality
POL	Petroleum, Oil, and Lubricants
POSIX	International operating system standard based on System V and BSD
PPS	Postprocessor System
PSYOPS	Psychological Operations
RAM	Random Access Memory
RDMS	Relational Database Management System
RECCE	Reconnaissance (air missions)
RECON	Reconnaissance (ground missions)
REGT	Regiment
RNS	Random Number Seed
ROE	Rules Of Engagement
RPT	Report
RSP	Reformat Spreadsheet Program
SAL	Surface-to-Air Lethality
SAM	Surface-to-Air Missile
SAM/AAA	Surface-to-Air Missile/Anti-Aircraft Artillery
SC	Supply Category
SCP	Simulation Control Plan
SDB	Standard Database
SEAD	Suppression of Enemy Air Defense
SIMSCRIPT	Simulation programming language (product of CACI, Inc.)

SIP	Scenario Initialization Program
SITREP	Situation Report
SLP	Sustainment Log Prototype
SOF	Special Operations Forces
SP	Survivability Prototype
SQL	Structured Query Language
SR	Short Range
SRP	Start/Restart Program (a JTLS component)
SRTE	Sea Route
SSM	Surface-to-Surface Missile
STR	Software Trouble Report
SUP	Ship Unit Prototype
SVP	Scenario Verification Program
SYNAPSE	Synchronized Authentication and Preferences Service
TADIL	Tactical Digital Interface Link
TCP/IP	Transmission Control Protocol/Internet Protocol
TEL	Transporter Erector Launcher
TG	Target entity attribute prefix
TGS	Terrain Generation Service (formerly TPS:Terrain Preparation System)
TGT	Target
TMU	Terrain Modification Utility
TOE	Table of Organization and Equipment
TOT	Time Over Target
TOW	Tube-launched Optically-tracked Wire-guided missile
TPFDD	Time-Phased Force Deployment Data
TTG	Target Type Group
TTL	Target Types List
TUP	Tactical Unit Prototype
TW	Targetable Weapon
UBL	Unit Basic Load
UIM/X	GUI builder tool
UNIX	POSIX-compliant operating system
UNK	Unknown
UOM	Unit Of Measure

USA	United States Army (U.S. and U.S.A. refer to United States and United States of America)
USAF	United States Air Force
USCG	United States Coast Guard
USMC	United States Marine Corps
USMTF	United States Message Text Format
USN	United States Navy
UT	Unit entity attribute prefix
UTM	Universal Transverse Mercator
VIFRED	Visual Forms Editor
VMS	Virtual Memory System
VTOL	Vertical Take-Off and Landing aircraft
WAN	Wide Area Network
WDRAW	Withdraw
WEJ	Web Enabled JTLS
WHIP	Web Hosted Interface Program
WIA	Wounded In Action
WPC	Warrior Preparation Center
WPN	Weapon
WT	Weight
WW	Wild Weasel
XMS	XML Message Service

APPENDIX B. VERSION 6.3.0.0 DATABASE CHANGES

The following changes were made to the JTLS-GO 6.3 database:

- AD.RANGE.VS.HYPERSONIC was added as a result of JTLS-2021-15299 Represent Hypersonic Weapons, Section 2.9. It holds the maximum range at which the Air Defense Site can fire on a Hypersonic Boost Glide missile.

- ATC.DEBRIS.RADIUS was added as a result of JTLS-2023-16298 Improve Satellite Representation, Section 2.25. If a satellite is destroyed by Air Defense, this is the radius of the three-dimensional sphere that represents the debris field of the destroyed satellite. Any other satellite that enters the debris field is not allowed to do its job while in the debris field. There is no possibility that the debris field will damage other satellites.

- CC.CAPABILITY was added as a result of JTLS-2023-16298 Improve Satellite Representation, Section 2.25. It indicates whether the communication center type can receive data, send data, or do both. It is used to link satellites with ground receiving stations.

- HRU.C4I.NAME was added as a result of JTLS-2023-16368 C4I Naming Flexibility, Section 2.27. It holds a second name for the HRU that is preferred to be used by some, but not all, C4I systems.

- MAX.ORDER.DELAY.MESSAGE.TIME was added as a result of JTLS-2023-16269 Finalize Order Delay Message, Section 2.23. In JTLS 6.2, a message was generated if unit was experiencing jamming that significantly delayed the delivery messages or the receipt of orders. The definition of what is considered a significant delay time database parameter was added to JTLS-GO 6.3.

- RTP.ALTITUDE was added as a result of JTLS-2023-16298 Improve Satellite Representation, Section 2.25. The altitude of the satellite is now a part of its route information. This information is automatically generated by the JSAT program. It is used to determine if an Air Defense Site can interdict the satellite.

- ST.ACTIVE.SONAR.RANGE was added as a result of JTLS-2021-15432 Target Ranges From Unit Icons, Section 2.12. Each sensor can now have multiple uses. A single sensor can have a capability to both detect surface objects and air objects. The single Sensor type range was replaced with a separate range for each possible sensor use. This parameter represents the range for the sensor when used as an Active Sonar.

- ST.AIR.RANGE was added as a result of JTLS-2021-15432 Target Ranges From Unit Icons, Section 2.12. Each sensor can now have multiple uses. A single sensor can have a capability to both detect surface objects and air objects. The single Sensor type range was replaced with a separate range for each possible sensor use. This parameter represents the range for the sensor when used as an Air Search radar.

- ST.COUNTER.BATTERY.RANGE was added as a result of JTLS-2021-15432 Target Ranges From Unit Icons, Section 2.12. Each sensor can now have multiple uses. A single sensor can have a capability to both detect surface objects and air objects. The single Sensor type range was replaced with a separate range for each possible sensor use. This parameter represents the range for the sensor when used as a Counter Battery radar.

- ST.PASSIVE.SONAR.RANGE was added as a result of JTLS-2021-15432 Target Ranges From Unit Icons, Section 2.12. Each sensor can now have multiple uses. A single sensor can have a capability to both detect surface objects and air objects. The single Sensor type range was replaced with a separate range for each possible sensor use. This parameter represents the range for the sensor when used as a Passive Sonar.

- ST.SURFACE.RANGE was added as a result of JTLS-2021-15432 Target Ranges From Unit Icons, Section 2.12. Each sensor can now have multiple uses. A single sensor can have a capability to both detect surface objects and air objects. The single Sensor type range was replaced with a separate range for each possible sensor use. This parameter represents the range for the sensor when used as a Surface Search radar.

- STA.ATC was added as a result of JTLS-2023-16298 Improve Satellite Representation, Section 2.25. Satellites can now be damaged by Air Defense Sites. The Probability of Hit (PH) and Probability of Kill (PK) data requires the Aircraft Target Class of the object being fired at. Because Air Defense Sites can now fire on satellites, the satellite needs to be assigned an Aircraft Target Class. This database parameter holds that information.

- TW.BOOST.PHASE.INTERDICTION was added as a result of JTLS-2021-15299 Represent Hypersonic Weapons, Section 2.9. The probability that an air-to-air weapon can hit a ballistic or hypersonic missile depends greatly on the type of weapon. There is a distinct difference between a weapon that can fire on a missile during its boost phase or at other times during it ballistic or glide flight profile. This flag indicates whether the weapon and its associated PH and PK data are designed to be fired on a missile during its boost phase or other times during its flight profile.

- TW.MIN.RANGE was added as a result of JTLS-2023-16450 Artillery and SSM Have Minimum Range, Section 2.31. Using a high-cost long-range weapon against targets that are extremely close are no longer allowed. This database parameter limits firing of these weapons at close range. It is especially important for hypersonic boost glide weapons.

- TW.NUMBER.BOOST.PHASES was added as a result of JTLS-2021-15299 Represent Hypersonic Weapons, Section 2.9. This database parameter only applies to weapons that have a TW MISSILE CAPABLE of Yes. If this database parameter holds a value of 0, then the missile is a Cruise Missile. If this database parameter holds a value of 1, then the missile is a Ballistic Missile. If this database parameter holds a value greater than 1, then the missile represents a Boost Glide Weapon.

- TW.REGENERATION.TIME was added as a result of JTLS-2023-16298 Improve Satellite Representation, Section 2.25. Energy weapons can now be represented in JTLS-GO. Once fired, an energy weapon can be regenerated in this database specified amount of time. Currently implemented only on satellites, it will be implemented on aircraft for an upcoming maintenance release. No energy source is required for this regeneration. The energy source is assumed to exist.

- TW.SELF.DEFENSE.ONLY was added for a future improvement. This improvement is scheduled to be delivered in a future maintenance release of JTLS-GO 6.3. It is used to stop a mission from continuing into the assigned target area with only short-range self-defense guns. The logic was not approved prior to release and will be fully documented when the improvement is released.

- UT.C4I.NAME was added as a result of JTLS-2023-16368 C4I Naming Flexibility, Section 2.27 - It holds a second name for the unit that is preferred to be used by some but not all C4I systems.

- OP.MISSION.TYPE.ARRAY.PTR was added as a result of JTLS-2019-14277 Issues Setting NATO Special Mission Flag, Section 2.7. It holds the mission types for which the own-side mission's special flag should be set when entering the Operations Area (OPAREA) and should be turned off when leaving the OPAREA.

- OP.SIDE.SPECIAL.ARRAY.PTR was added as a result of JTLS-2019-14277 Issues Setting NATO Special Mission Flag, Section 2.7. It holds the sides for which the foreign-side mission's special flag should be set when entering the Operations Area (OPAREA) and should be turned off when leaving the OPAREA.

- AC.MAX.DOWNLINK.DISTANCE was removed. This range is now represented as an Air Defense Communication Center Type placed in the mission's load.

- ST.RANGE was removed as a result of JTLS-2021-15432 Target Ranges From Unit Icons, Section 2.12 It was replaced by the multiple sensor ranges for each use capability of the sensor.

- ST.USE was removed as a result of JTLS-2021-15432 Target Ranges From Unit Icons, Section 2.12. It is replaced by the ST USE MASK created by entering ranges for each sensor use that applies to the sensor.

- TW.BOOST.PHASE.TIME was removed as a result of JTLS-2021-15299 Represent Hypersonic Weapons, Section 2.9. It is now automatically computed by the model.

APPENDIX C. VERSION 6.3.0.0 REPOSITORY CHANGES

Significant changes were made to the JTLS-GO 6.3 repository - in particular, related to the pairing of important Targetable Weapons with unique Supply Categories.