JTLS-GO Intelligence Capability Summary

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1.1 Introduction

The Joint Theater Level Simulation - Global Operations (JTLS-GO®) is a large and complex constructive simulation that supports:

- Wargaming,
- Staff training,
- Doctrine evaluation, and
- The analysis of combat operations and contingency plans.

JTLS-GO is developed, delivered and supported by ROLANDS & ASSOCIATES Corporation (R&A) under contract with Joint Staff/J7 (JS/J7). This program is additionally funded by R&A through the US INDOPACOM, and the North Atlantic Treaty Organization (NATO) Joint Warfare Centre (JWC). Coalition partner licensing fees through direct contract are also used to help maintain JTLS-GO and develop an on-line training plan.

JTLS-GO is widely distributed to numerous Department of Defense (DoD) users and international coalition partners. The purpose of this paper is to briefly describe in intelligence capability represented with the Simulation.

2.1 Background And Term Definition

2.2 Background

A basic premise of the JTLS-GO intelligence module is that all collected information is 100% accurate at the time of collection. This is obfuscated by two modeling concepts associated with the characteristics of the asset that collects the data:

- Partial information about a detected object will be provided.
- There is a delay in the delivery of the collected data.

Each of these limitations is based on database characteristic.

2.3 Term Definition

The following information should make it easier to understand the concepts presented in this paper.

- Unit - a unit is an object that consists of combat systems and supplies. It can accomplish tasks as ordered by the JTLS-GO player.
- Target - a target is defined as any militarily significant object that is not represented as a unit. Examples of targets include: SAM Sites, Bridges, Equipment Shelters, and Radars. Each type of target impacts the combat scenario. If a Target is destroyed, its capability is not available to the owner of the Target. For example, when an Equipment Shelter is destroyed, no combat assets can occupy the shelter and the assets will be visible to overhead sensors and more susceptible to damage.

  There is one target type, called a Facility, which represents a militarily significant object, but when destroyed has no impact on the model. For example, the Nuclear Research Laboratory at the local university is represented as a Facility target. It is a possible target for attack, but if killed there is no direct impact on the capabilities of other represented scenario assets.
- Detection Level - Within JTLS-GO each detection has a detection level. The levels represented are:

  1. Localization - the sensor knows there is something there, but other than the object existence and the location of the object, nothing else is known about the object.
  2. Classification - the sensor has classified the object. The basic type of the object is known. Typically, classification information is obtained if the object is detected, but the detector is so far away only some basic information is known. For example, there is a large ship at the detected location.
  3. Recognition - the sensor recognizes the exact type of the object. Again, as the sensor gets close enough to the object, more information becomes known about the object. For example, there is a Burke Class ship at the location.
  4. Identification - the sensor recognizes the object by name. I have detected DDG-51 at the location.
- Observation Level - Within JTLS-GO long term contact with an object results in collecting more detailed information. The following levels of information are represented:

  1. Level 1 - the sensor just detected the object and basic information about the object is known based on the detection level of the sensor.
  2. Level 2 - the sensor has been in contact with the object for an amount of time greater than the database parameter called IIP MIN TIME LEVEL TWO DATA. For example, assume one of your units has been in contact with a foreign unit for this period of time; your intelligence information includes the weighted strength of the foreign unit.
  3. Level 3 - the sensor has been in contract with the object for an amount of time greater than the database parameter called IIP MIN TIME LEVEL THREE DATA. For example, assume one of your units has been in contact with a foreign unit for this period of time, your intelligence information include the support unit for the foreign unit. The idea is your asset has had time to evaluate the daily operations of the foreign unit.
- ST USE Sensor Attribute - Indicates the basic type of the sensor. It can hold values of:

1. SURFACE.SEARCH meaning that the sensor can detect objects that are on the surface. This includes land units, surface naval units, non-submerged submarine naval units, HRUs, targets, and convoys.
2. AIR.SEARCH meaning that the sensor can detect Air Missions, Cruise Missiles, and Theater Ballistic Missiles (TBMs).
3. ACTIVE.SONAR meaning that the sensor can detect all Naval Units using an active sound signal.
4. PASSIVE.SONAR meaning that the sensor can detect all Naval Units that make some type of noise as long as the noise is not blocked by other ambient noise in the area.

- ST COLLECTION METHOD Sensor Attribute - indicates how the sensor collects data.

1. OBSERVED - meaning that the sensor observes everything within range of the sensor. The sensor does not automatically pickup everything; instead, there is a probability associated with detecting each object within range of the sensor. The probability is based on the baseline probability assigned to the sensor, the type of object being detected, and the ephemeral characteristics such as the light condition, weather condition, and jamming environment.

   This collection method is commonly referred to as the “vacuum cleaner” approach to collection. The sensor “sucks” up all observed and detected information. Depending on the range of the sensor, this can be an extremely large amount of data.
2. INSTANTANEOUS - meaning that the sensor takes an instantaneous look at a specific area to determine what is detected. The user must enter a collection deck or a set of Directed Search Areas (DSAs) to tell the sensor where to point and collect information. Any information collected from this one-time instantaneous look results in the generation of an Initial Imagery Report (IIR).
3. ACTIIVITY-BASED - meaning that the sensor is used to detect things other than objects. The two most widely used activities are an Electronic Intelligence (ELINT) sensor and a Communication Intelligence (COMINT) collection sensor. An ELINT sensor will detect electronic emissions. A COMINT sensor will detect and interpret order communications between the exercise audience (in other words JTLS-GO Orders), and the simulated objects.

- ST COLLECTION MODE Sensor Attribute - indicates the method used by the sensor to collect data.

1. IMAGERY - meaning that the sensor uses some type imagery to detect objects. An example of this type of sensor is a full motion video camera that is capable of detecting objects. This sensor can detect objects on land and on water. Submerged submarines cannot be detected by this sensor collection mode, but snorkeling or surfaced submarines can be detected.
2. ELINT - meaning that the sensor detects electronic emissions coming from an active SAM/AAA Site, Sensor Site or Jammer Site. The sensor does not specifically go through a detection algorithm. The area covered by the ELINT sensor is placed on the game board and when an electronic emissions starts, stops, or moves, the detection algorithm is instantiated.
3. VISUAL - meaning that the sensor uses human or human enhanced (binoculars) detection capability. The detection algorithm uses the same rules as IMAGERY sensors.

4. RADAR - meaning that the sensor produces an electronic signal and if a return signal is obtained, then the reflected signal can lead to a detection. Within JTLS-GO the assumption is that this type of sensor cannot detect objects on land. The terrain clutter interferes with any ability for the sensor to detect an object. This means that this sensor mode is limited to detecting surface naval units. Submarines that are submerged are not subject to detection, but surfaced submarines and snorkeling submarines are subject to detection with some modified probabilities of detection.
5. IR - meaning the sensor detects heat emitting objects. The detection algorithm uses the same rules as IMAGERY sensors.
6. ACOUSTIC - meaning the sensor detects objects based on the noise produced by the objects. Sensors that have an ST USE of ACTIVE SONAR or PASSIVE SONAR are expected to have this ST COLLECTION MODE. The detection algorithm is allowed to consider all naval units, regardless of their type or submerged status in the case of submarines.
7. COMINT - meaning the sensor collects communications intelligence. As such it does not detect objects, only the communications (orders) sent to objects,

- ST REAL TIME FLAG Sensor Attribute - indicating whether the reporting process starts immediately or not.
  1. YES - meaning that as the sensor collects information, the raw data are immediately passed to the intelligence fusion center to be integrated into the perceived Common Operational Picture (COP).
  2. NO - meaning that the collecting object holds all collected data until downloaded to an intelligence fusion center.
- Data Driven Model - JTLS-GO is a data driven model. There are no data held within the computer code. The Simulation reads in the database that includes the data needed to determine the outcome of every aspect of the simulated combat situations. All data that exist in the initialization database, except for the names of entities, can be changed during game play. If the detected information is considered too heavy or too light, the data responsible for determining if a detection is made can be altered during exercise execution.

3.1 Summary Of Intelligence Collection

JTLS-GO represents three types of intelligence collection:

- National Collection - intelligence collection capabilities that are not under the direct command of the exercise audience.
- Theater Collection - intelligence collection capabilities directly under the command of the exercise audience and for which the exercise audience must specifically plan to allocate Intelligence, Surveillance, Reconnaissance (ISR) assets to collect data.
- Tactical Collection - intelligence collected by command levels lower than the exercise audience. This intelligence information is collected and reported automatically and requires no user input. The scenario database describes the lower command level collection capabilities and limitations.

These collection types are described in the following sections.

3.2 National Collection

Within the National Collection realm are two different capabilities represented in JTLS-GO: satellites and what is referred to in all unclassified documentation as “collection from other available assets”. These two capabilities are discussed in the following sections.

3.1.1 Satellite Representation

Any number of satellites can be represented in JTLS-GO. The database builder obtains what is known as “Two-Line Entry” data for each desired satellite. There is a tool delivered with JTLS- GO that takes the Two-Line Entry data and creates the location of the satellite above the surface of the earth every minute for the desired period.

Each satellite can hold only one sensor. The R&A Design Team realizes this is not realistic, but duplicating a satellite and putting a different sensor on each version of the satellite can overcome the issue.

Each satellite that has a sensor labeled with an ST COLLECTION METHOD of INSTANTANEOUS is allowed to collect on DSAs that are within range. The exercise director can decide how many collection missions, representing by what JTLS-GO DSA can be allocated to the exercise audience. It is up to the intelligence staff within the exercise audience, to create the DSA missions and provide the following data:

- The DSA Collection area. JTLS-GO represents the following types of DSA collection areas:
  1. Circle - defined by a location and a radius of collection.
  2. Corridor - defined by a start and end location and a collection width.
  3. Polygonal Area - defined by the user-entered polygon.
  4. Target Area - defined by the name of a JTLS-GO scenario target.
  5. BE Facility - defined by the name of a JTLS-GO scenario Basic Encyclopedia (BE) Facility made up of a collection of units and targets.
- The priority of the mission
- The type of sensor collection mode, such as SAR, EO, Imagery etc. to use. More than one sensor collection mode can be specified.
- The repeat time interval for collection.

The Intelligence module determines which DSAs will be fulfilled based on the location of the satellites, the range of the sensor on-board the satellite, the collection mode of the sensor on board the satellites, the priority of the DSA as provided by the exercise audience, and the time since last

collection on the DSA. Each fulfilled DSA produces an IIR message after the computed report delay time.

It should be noted that the USINDOPACOM depends on the National Wargaming System (NWARS) to represent their satellite national collection. NWARS receives data from JTLS-GO and the DSAs from the exercise audience to create their own IIR messages. NWARS represents satellite collection in more detail than JTLS-GO. As implied above, JTLS-GO simply draws a circle around the current location of the satellite to determine which object could possible be detected with the covered DSA.

On the other hand, NWARS considers numerous other more complicated factors, such as the angle of satellite and the sensor when the collection was conducted.

3.1.2 Other National Collection Capabilities

All other national intelligence asset collection is accomplished magically within the module. The exercise audience coordinates the request for the use of a national capability and the exercise director decides if the request for national support should or should not be granted. If granted, the following capabilities exist in JTLS to magically simulate the collection of the intelligence information from a non-modeled, nationally controlled, capability.

- Unit Report - the controller can indicate the unit or units on which intelligence information should be magically collected. There is no probability associated with detecting the unit, but the distribution of the detection level is part of the controller order. If the controller includes the unit name in the order, the unit is detected. The level of detection information is determined randomly based on the detection level distribution as specified on the order.
- Target Report - the controller can indicate the target or targets on which intelligence information should be magically collected. As with the Unit Report, the listed targets are automatically detected. Again, the level of detection information is determined randomly based on the detection level distribution specified on the order.
- Area Report - the controller can specify a polygonal area in which intelligence information should be collected. The controller provides the baseline probability of detection and the distribution of detection levels. The objects within the polygonal area are subject to random detection and if detected a random detection level.

The result of all three capabilities is an Initial Imagery Report (IIR) that can be sent to the exercise audience, but depending on the number of units, targets, or the size of the selected polygon the results are usually not appropriate for the exercise audience.

3.3 Theater Collection

Theater Collection is represented within JTLS-GO by the following capabilities

- Reconnaissance and Patrol Air Missions.
- Human Intelligence (HUMINT).

- Coalition Support.

These capabilities are described in the following sections.

3.2.1 Reconnaissance and Patrol Air Mission Collection

An Air Mission will collect information using two different methods depending on the type of sensors that are on board the mission. These two methods are:

- DSA Collection, which requires a sensor with an INSTANTANEOUS collection method.
- Observed Collection, which requires a sensor with an OBSERVED collection method.

These methods are described in the following sections.

3.2.1.1 DSA Collection

It is the responsibility of the exercise audience to coordinate their intelligence collection needs with the availability of aerial, air-breathing collection assets.

- The air staff creates an Air Tasking Order (ATO), which is automatically entered into JTLS- GO.
- The intelligence staff should be creating a collection deck and this too, if provided in the proper format, is automatically entered into JTLS-GO.

If a reconnaissance asset mission is carrying INSTANTANEOUS sensors, which require DSAs to collect intelligence information, the mission needs to know which DSAs it has been assigned. There are two ways to link an air mission with DSAs.

- The response cell can link DSAs from the exercise audience provided collection deck to a specific ATO mission by using a JTLS-GO order.
- The response cell can leave the mission's assigned DSA list empty, and then the model will automatically collect intelligence from the DSA collection deck submitted to the game. If the mission's INSTANTANEOUS sensor covers the complete DSA, the mission will automatically collect on the DSA.

The result of collecting on a DSA is an IIR message.

3.2.1.2 Observed Collection

Any Reconnaissance, Patrol, or AWACS mission that has an OBSERVED collection method sensor on-board will collect information of what that sensor can see, each time the mission moves. Depending on the range of the sensor this can be a huge amount of data. The collected information is not provided in message format, but is recorded. There are three sensor attributes that impact this capability. These are:

- ST REAL TIME FLAG

1. If this attribute is set to NO, then the recorded information is held until the mission lands. Once it lands the recorded data are processed and the perception of the air mission's side is updated with the collected data.
2. If this attribute is set to YES, then after each air mission move, newly obtained information is processed and the perception of the air mission's side is updated with the collected data.

- ST INITIAL REPORT TIME - This attribute determines how long it takes for the simulated intelligence fusion center to obtain the data and make use of it. When the newly collected data are sent out, whether on a real-time basis or not, the information becomes available to the air mission's side after this period of time.
- ST COP CAPABILITY - This attribute determines if the collected information should not only update the Force Side's perception, but should be sent on to the Common Operational Picture (COP). Obviously, if set to YES, the data are passed to the COP, while a NO indicates the updated information should not be sent to the COP.

Note: In JTLS-GO Version 6.0, there will be the ability to obtain a message concerning detected naval assets with OBSERVED sensors. This is a NATO funded Engineering Change Proposal (ECP) and the design for the ECP is near completion.

3.2.2 Human Intelligence (HUMINT) Collection

Within JTLS-GO, a HUMINT Team is represented by a High Resolution Unit (HRU). The database can contain HUMINT team HRUs or the player can create them during game play. An HRU can be given many tasks, but one of the tasks is a Patrol task. The HRU will covertly patrol the area assigned and collect information.

As the HRU patrols and is placed on the game surface at a new location, the HRU deploys what JTLS-GO calls Lookout Tags in each grid that is covered the sensors owned by the HRU. As other objects move in and move out of grids, if there is a lookout tag in the grid, a movement note is added to the HRU's tactical information set.

Periodically, the HRU will generate a Tactical Report (TACREP) that contains the collected movement information since the last report. The periodicity of this report is controlled by two different factors:

- The HRU's Intelligence Information Prototype (IIP). From the HRU's IIP, the model uses the database parameter IIP.HUMINT.TIME.BETWEEN.REPORTS. This database parameter indicates how often the HRU should report on its collected data. Since patrolling HRUs are normally operating covertly, they do not report information as it is obtained. Instead, they actively communication with their parent unit based on this database parameter to avoid detection.

- When the user gives an HRU the patrol task, the response cell can provide what JTLS-GO refers to as Essential Elements of Information (EEIs). An EEI contains the identification of important unit types and target types. If the patrolling HRU detects the movement of an object that matches one of its assigned EEIs, the HRU immediately break silence and reports the information to its parent unit.

  As an example, it is possible for the user to tell an HRU, that one of its EEIs is an enemy Surface-to-Surface Missile (SSM) target. An HRU detecting such a target will immediately break silence and report all of its current collected movement information.

When a HUMINT HRU reports, whether it is part of its normal reporting cycle or due to the detection of an EEI object the generated report is a Tactical Report (TACREP).

3.2.3 Coalition Support

The third and final theater method available to obtain intelligence information is to receive the intelligence updates from a coalition partner. Every Force Side can submit an order indicating how often an intelligence update should be provided to another Force Side. This intelligence update can be for their own forces and/or forces detected on other Force Sides.

The coalition partner has the ability to decide what type of information should be sent. For example, covert HRUs and submarines can be explicitly excluded from the provided information. In addition, the following information can be sent or withheld by expressing those desires in the Pass Intelligence Order:

- Object’s Force Side.
- Object’s strength.
- Object’s location.
- Object’s posture.
- Object’s owner.

When passing this information, the time at which the information was collected is passed. The receiving side will refuse the passed information, if the information it holds is more current than what has been provided by the coalition partner.

No report is generated when receiving information from a coalition partner. The data are immediately fused with the receiving side’s current perception and the COP is updated.

3.4 Tactical Collection

Tactical collection happens automatically and is not controlled by the response cell. The controller can alter the collection ability if desired, but given the database settings, this

intelligence information is collected without the requirements to control the collecting asset. There are two types of tactical collection represented in JTLS-GO:

- Unit Tactical Collection which represents the situational awareness of A JTLS-GO unit concerning the around the unit.HRU Coalition Support which represents the information that an HRU will know when it is providing support to a foreign unit.

These collection options are described in the following sections.

3.3.1 Unit Tactical Collection

Every JTLS-GO Unit obtains much of its standard operating capabilities from what is known as its prototype. Ground-based units, which are Ground Combat Units, Airbases, Squadrons, Support Units, and Forward Arm and Refuel Points (FARPs), point to a Tactical Unit Prototype (TUP). A Naval unit points to a Ship Unit Prototype (SUP).

Each TUP and SUP has two database parameters:

- Organic Report Distance (TUP ORGANIC REPORT DISTANCE and SUP ORGANIC REPORT DISTANCE), and
- Organic Report Time (TUP ORGANIC REPORT TIME and SUP ORGANIC REPORT TIME).

As with HRUs, whenever a unit is placed on the game surface at a new location, the unit deploys Lookout Tags in each grid that is covered by the unit's Organic Report Distance. As other objects move in and move out of grids, if there is a lookout tag in the grid two actions are taken:

- A movement note is added to the Lookout Tag owner's tactical information set.
- An update to the detecting Force Side's perception is made. This is different than the process already described for HRUs. Since aggregate units, other than submarines, cannot go covert the collected information is immediately known to the unit's Force Side.

Periodically, as defined by the Organic Report Time, each unit will generate a Tactical Report (TACREP) that contains all of the stored movement information the unit's tactical information set. After the report is generated, the tactical information set is emptied. Thus after each Organic Report Time, a new TACREP is generated with all observed movement data since the last report.

It should be noted, that it is R&A's experience that JS/J7 runs their exercises with this organic movement report TACREP turned off. The data are still collected and side perception is updated, but no report is generated. The R&A Design Team believes that the report is suppressed because there are too many units and too many messages to process by the Response cell.

That is only a hypothesis. If the R&A Design Team understood the exact reasons JS/J7 Interface Controllers (ICs) prefer not to generate these TACREPs, it could be possible to make some quick alterations to the design that would result in the generation of fewer such messages.

3.3.2 HRU Coalition Support

If an HRU is given a task of Coalition Support to a foreign unit, it is considered to be embedded with that unit. While embedded, the HRU has numerous capabilities. The most important from the intelligence collection point of view, is the automatic passing of the foreign unit's Tactical Collection information. Whenever the foreign unit detects movement within its Organic Report Distance, the information is used to update its Force Side's perception, but it is also used to update the Force Side's perception of any Coalition Support HRUs.

No report is generated for this type of intelligence update.

4.1 Summary Of Intelligence Reporting

Section 3.0 described the various methods available to collect intelligence data within JTL-GO. The purpose of this section is to briefly describe the JTLS-GO generated reports that are of interest to the exercise audience's intelligence staff.

4.2 Initial Imagery Report (IIR)

The Initial Imagery Report (IIR) is generated by:

- Satellite collection on DSAs,
- Magically provided intelligence as a result of the Controller submitting a Unit Report, a Target Report or an Area Report.
- Air Mission collection on DSAs.

These reports follow the USMTF IIR message format. The messages have been reviewed by various COCOM Intelligence staff members, but to date have not been successfully passed by an official UMTF message format checker. This test was supposed to be conducted during the JTLS 6.0 Beta test, but due to travel restrictions that test was held remotely and the ACE-IOS USMTF checker was not available. The plan is for the IIR to be officially checked as part of the JTLS-GO Version 6.0 Acceptance Test currently scheduled for mid July 2020 at the J7, Suffolk, VA.

Passing the official UMTF message format checker is only a portion of what needs to be considered. The contents of the IIR message, specifically many of the free-format remarks provided as part of the message, need to look realistic to the intelligence staff of the exercise audience. This has proven to be a major source of concern for JTLS-GO. Each COCOM and in fact each intelligence staff officer appears to have different opinions of the information that should be included in the IIR remarks.

Each exercise test in which the R&A Development Team is allowed to attend normally results in requested information format changes. This is probably the biggest issue with the IIR message. If the R&A Development Team is not allowed at one of these exercise tests, it is possible that the COCOM for which the exercise is being run may not be happy with the IIR. Normally the requested changes are not code changes, but message format changes which can be easily fixed by altering the IIR Message Definition File, which is an Extended Markup Language (XML) data file.

4.3 Tactical Report (TACREP)

The TACREP message is the most diverse intelligence message that is produced by JTLS-GO. There are numerous circumstances under which TACREPs are generated. The exercise audience or the JS/J7 exercise director can individually determine which of these TACREPs should be forwarded on to the exercise audience. The following situations will generated a TACREP:

- A Controller magically alters a unit to represent some Master Scenario Event List (MSEL) exercise input. For example, a terrorist bomb impacting a squadron can be played through entering orders or can be represented by the Controller submitting a magic order to represent the effects of the terrorist bomb. If accomplished magically, the unit that is damaged generates a TACREP outlining the damage and the reason for the damage.
- If a unit is destroyed to the point it no longer is part of the game, the unit generates a TACREP indicating that it has been removed from the game. If any foreign units are in the area, they too will generate a TACREP reporting the destruction of the unit.
- If an HRU is captured or destroyed, the parent unit will generate a TACREP indicating the loss of contact with the HRU.
- If a unit encounters a minefield, Psychological Operations (PYSOP) leaflets, a chemical environment or a nuclear environment a TACREP is generated.
- If an asset distributes PYSOP leaflets, it generates a TACREP.
- If an HRU with an Ambush task encounters an object that is on its allowable ambush type list, the HRU will notify its parent unit of the initiation of combat, which results in the generation of a TACREP.
- If a Close Air Support (CAS) request is fulfilled, a TACREP is generated.
- If a squadron decides to self-lift itself out of a combat situation, a TACREP is generated.
- If a covert HRU is compromised, the HRU’s parent unit generates a TACREP.
- If a unit detects a covert HRU, the unit generates a TACREP.
- If an asset detects the preparation for an SSM launch or an actual SSM launch, a TACREP is generated.
- As mentioned in **Section 3.0**, a TACREP is generated each time a unit executes its Organic Intelligence Report event or a patrolling HRU executes its periodic report or urgent report based on detecting an EEI object.

- If a collection asset picks up a submarine contact, a TACREP is generated.
- If an air defense site fires on a TBM, Cruise Missile or Aircraft a TACREP is generated.
- If a moving unit can no longer protect an owned stationary a TACREP is generated.
- If a pipeline is damaged, the owner of the pipeline generates a TACREP.
- If a unit detects nearby incoming fire from any source, it generates a TACREP.
- If a unit realizes its communications are being jammed, it generates a TACREP.
- If a unit enters combat due to an amphibious operation, the unit generates a TACREP.

4.4 Mission Report

Every air mission that flies will generate a MISREP when it completes its mission or is destroyed. The MISREP follows the 2008 USMTF format, which has been verified by several message checker systems including the JTLS-GO link to the Theater Battle Management System (TBMCS) and NATO's Interactive Command and Control (ICC) system.

The biggest issue with the MISREP is that JTLS-GO does not follow the newest 2012 USMTF format, which has changed drastically. There is a real issue with this situation. Some exercise personnel in the Air Operations Center (AOC) are used to seeing 2012 formatted USMTF messages, but systems such as TBMCS have not been updated and do not accept the ingestion of a 2012-formatted MISREP.

The R&A Design Team feels that at least two-weeks of development time is needed to generate both message formats to support the various expectations of the AOC, exercise audience, NATO, and real-world air mission track Command, Control, Communication, Computer, and Information (C4I) systems.

5.1 Summary Of Real World C4I System Feeds

JTLS-GO links to several real-world systems for both the United States and NATO. This linkage is accomplished in one of two ways:

- Sending real-world messages to the C4I system. The JTLS-GO Operational Interfaces (JOIs) accomplish this task.
- Updating the real-world system's internal database. The JTLS-GO Transaction Operational Interfaces (JTOIs) accomplish this task.

The following sections describe each of these links.

5.2 JTLS-GO Operational Interfaces (JOIs)

JTLS-GO supports the following three message types:

- Over The Horizon Gold (OTH-Gold).
- Link-16 Message.
- Tactical Electronic Intelligence Information (TACELINT).

Each of these message types is discussed in the following sections.

5.1.1 OTH-Gold Messages

Over The Horizon Gold (OTH-Gold) messages are typically passed to Global Command and Control System (GCCS), Maritime Command and Control System (MCCS), and Tactical Data Analysis and Connectivity System (TDACS). The OTH-Gold Message Server takes the current perception of a force side, formats the required messages and sends them directly to the C4I system. The OTH-Gold Message Server has the ability to filter the data that should go out via the OTH- Gold message based on:

- Object Basic Type (Ground, Airbase, Squadron, etc.).
- Object Force Side.
- Object Prototype.
- Object Posture.

5.1.2 Link-16 Message

Link-16 messages are typically passed to GCCS, ADSI, and TDACS. JTLS-GO does not automatically ingest an OPTASKLINK that contains the exercise audience developed Link-16 plan, but the information from this message is represented in the database and can be changed if necessary during game play. The module assigns Link-16 track numbers and maintains the entire Link-16 network requirements.

JTLS-GO Link-16 Message Server supports the following Link-16 messages:

- Air PPLI (Precision Participant Location and Identification), J2.2 - This message is sent out for self-reporting Link 16 capable Air Missions and includes data such as; altitude, speed, course, location, activity, mode1, mode 2 mode 3, call sign, etc.
- Surface PPLI, J2.3 - This message is sent out for Link-16 capable naval based units and targets. The following data are included in the message; speed, course, location, platform, mode2, etc.
- Subsurface PPLI, J2.4 - This message is sent out for Link-16 capable subsurface naval-based units. The following data are included in the message: speed, location, activity, platform, depth, mode 2, etc.
- Land Point PPLI, J2.5 - This message is sent out for Link-16 capable ground based units and targets, and provides the following data; location, activity, and platform.
- Reference Point, J3.0 - This message is generated upon the detection of a Ballistic Missile (TBM) launch and provides the launch point, impact point, and expected impact ellipse data.

As previously stated, a separated update interval time is provided for the Reference Point messages during the setup process.

- Emergency Point, J3.1 - This message is sent out to report an emergency situation, such as DOWN AIRCRAFT.
- Air Track, J3.2 - This message is sent out for air tracks that are detected by Link-16 capable sources and provides the following data; relationship, altitude, strength, speed, course, location, mode 1, mode 2, mode 3, mode 4 indicator, etc.
- Surface Track, J3.3 - This message is sent out for surface tracks that are detected by Link- 16 resources and provides the following data; identity, speed, course, and location.
- Subsurface Track, J3.4 - This message is sent out for subsurface tracks that are detected by Link-16 capable resources and provides the following data: depth state, location, mode 2, activity, platform, etc.
- Space Track, J3.6 - This message is sent to report continuous location updates for a Ballistic Missile object. The frequency of updates is based on the database parameter, MISSILE.UPDATE.INTERVAL. The updates are sent more frequently with smaller value.
- Drop Track, J7.0 - This message is sent when a PPLI or track is dropped.
- Engagement Status, J10.2 - This message is sent to report engagement status between participating Link-16 tracks.
- Air Platform and Status, J13.2 - This message is sent out to inform changes in current air PPLI. The message includes the following data; fuel, operational capability, weapon loads, etc. The Aircraft Class attribute AC.Link 16.CAPABLE must be set to “SEND_AIR_INFO” to generate this message.
- Surface Platform and Status, J13.3 - This message is sent out to provide weapon status information on current surface PPLI. The message is generated to report any on board SAM/SSM targets if their Link 16 Missile Types are defined.
- Subsurface Platform Status, J13.4 - This message is sent out to provide weapon status information on a current subsurface PPLI. The message is generated to report any on board missile or torpedo systems if their Link 16 Missile Types are defined.
- Land Platform and Status, J13.5 - This message is sent out to provide the platform status information on current land point PPLI. The message is generated for the ground based targets if their Link 16 Site Types are defined.

5.1.3 TACELINT

If a sensor has a collection method of ACTIVITY-BASED and a collection method of ELINT, then the grids covered by the sensor can detect enemy emissions. The ELINT sensors can be mounted on satellites, air missions, naval units, ground units, and HRUs, Emissions capable of being can come from:

- An enemy or suspect sensor.
- An enemy or suspect jammer.
- An enemy or suspect air defense site.

If the enemy emitters are given the proper engineering level data, which includes the Electronic Intelligence Notation (ELNOT) for the emitter and information such as frequency and scan rate, the model will publish an object called an Emitter Object.

The TACELINT Message Server TEMS) is passed Emitter Objects and in turn the TEMS generates the full TACELINT message with all appropriate data filled. The TEMS can deliver the generated TACELINT messages using numerous methods:

- A direct socket connection to a real-world C4I system.
- Via e-mail.
- Via a text readable file.
- Output to a terminal display.

5.3 JTLS-GO Transaction Operational Interfaces (JTOIs)

There are three JTOIs delivered with JTLS-GO:

- The TBMCS JTOI which updates TBMS with the current status of air missions and the MISREPs generated by completed missions. JS/J7 seldom uses this capability, but it is used in almost every US INDOPACOM supported exercise.
- The ICC JTOI, which updates ICC and is used in every NATO exercise.
- The Logistics Functional Services (LOGFAS) JTOI that is just beginning to be used in every NATO exercise. NATO is in the process if refining its use of LOGFAS within an exercise environment.

6.1 Known Issues

JTLS-GO's Intelligence representation has always been a source of concern to exercise audiences. The R&A Design Team has always felt that these concerns are due to the following issues:

- Other exercise support tools, such as the Joint Live Virtual Constructive (JLVC) federation, do not work with perceived and incomplete data. The exercise audience is used to getting a good, complete, and accurate picture during exercises when the JLVC is creating the simulated situational environment.

  This is not to imply that this is necessarily wrong or incorrect. Intelligence information is never 100% accurate, and the fog of war will always play a part in the decision environment. Exercises attempt to provide a realistic decision environment, but they are inherently fraught with errors mainly due to the personnel entering incorrect orders into the simulation tool. Thus, the fog of war happens naturally and the additional layer of incomplete intelligence information, as played by JTLS-GO, may be unnecessary.

  The R&A Design Team does not advocate this position, but it is an understandable point of view. JTLS-GO will continue to provide intelligence information based on the collection conditions and the employed assets.

- Each Combatant Command (COCOM) and NATO Organization using JTLS-GO has their own rules and expectations for messaging contents, especially for the IIR Messages. In fact, it has been my experience that each Intelligence Officer that attends the JTLS-GO functional tests expect different free-form amplification information. Although the format of the IIR produced by JTLS-GO matches the USMTF standard, the information that the model generates does not always meet a specific Intelligence Officer's expectations for realism.

  In some cases, JTLS-GO has access to information, that on the surface appears important to the R&A Design team, but when generated, the Intelligence Officer may believe it should not be listed. For example:

  1. JTLS-GO has the concept of a missed detection. "I looked here expecting to see this object, because it was there the last time I looked. The object is not here and I have no idea where it is." We have yet been able to find an expert to tell the Design Team how this important piece of information should be reported.
  2. JTLS-GO, since it is integrated completely with the combat functions, has the ability to provide intelligence estimates such as "Runway repairs appear to be progressing with an engineering estimate that it will be functional on the 250010ZMAY20." Besides the inappropriate accurate "estimate", which could be easily fixed, many Intelligence Officers do not want to see this type of information, but others expect it.

  These differences make it difficult to build a one-size meets all IIR message neds. Still we strive to do so and the best way to make sure the IIR message meets a specific COCOM exercise audience is to review various IIR messages during functional tests to see what can be changed.

- JTLS-GO does not do a good job of representing the impact of cloud cover on the collection capability. Cloud cover is considered but the height of the cloud cover is not considered. Assume that a weather area has moved into an area and the assumption for this weather area is that it contains a 7,500 foot dense cloud layer which reduces the probability of a specific imagery sensor by 90%. The actual numbers do not matter, since it is simply data and can be easily changed prior to and during an exercise.

  An air mission flying at 5,000 feet and an air mission flying at 8,500 feet with the exact same sensor will use the same probability of detection for objects that are covered by the sensor. Once an object is detected, the 5,000 foot air mission will be able to collect more information because it is "closer" to the object, but the original probability of detection is the same, which is obviously not logical.

- JTLS 5.1 is currently not detecting Cruise Missiles via Link-16. Theater Ballistic Missiles (TBM), all aircraft, and ships are being detected and reported via Link-16, but Cruise Missiles are currently an issue, This issue is being fixed in JLS-GO Version 6.0, and depending on the testing, results, it will be back integrated into JTLS 5.1.

- Satellites can only carry one sensor. To represent more than one sensor, the database builder simply needs to build several satellites using the same Two-Line Entry data, each satellite with its own sensor. This results in no degrade in representing satellite coverage but it is inefficient from a model computation point of view.

7.1 Conclusions

If interested, I have the ability to send to you unclassified examples of the following messages:

- IIR Messages.
- MISREPs.
- TACREPs.
- TACELINT.
- OTH-Gold.

I cannot provide examples of Link16 messages since they are binary in nature.

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