JTLS-0431 GPS and Infrared Jammers

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1.0 Summary of Model Change Request

JTLS jammers are currently assumed to be radar jammers that interfere or jam the ability of a sensor to detect objects. There is no manner available in JTLS to represent the jamming of a weapon's guidance capability.

Provide a capability to define various types of weapon guidance mechanisms used by precision guided weapons and also allow the opposing force to employ jammers capable of interfering with the weapon's guidance system. Each weapon should have a guidance type, possibly both a long-range and/or terminal capability. Jammers should specify which type of guidance they are capable of jamming.

2.0 Design Summary

The purpose of this ECP is to

1. Expand the representation of various weapon guidance types.
2. Allow the user to jam each of the weapon guidance types
3. Alter the representation of sensor jammers for consistency purposes.
4. Expand the enforcement of the various weapon guidance types, especially Anti-Radiation guidance systems.

Four new types of weapon guidance capabilities have been identified for weapon delivery. These are:

- Infra-Red (IR)
- Global Positioning System (GPS)
- Light Amplification by Stimulated Emission of Radiation (LASER).
- Radio Detection and Ranging (RADAR)

3.0 Detailed Design

3.1 Background

Before discussing how jamming of weapons will work within JTLS-GO, it is necessary that the reader understand how sensor detection, jamming, and weapon guidance currently works. The design needs to consider a coordinated approach to jamming sensors and jamming weapon guidance systems.

3.1.1 Current JTLS Sensor Capability

Currently within JTLS, each Sensor Type has an attribute called the ST COLLECTION MODE. There is also an attribute called ST USE, These two attributes work together to determine what the sensor can and cannot do. This parameter can take on the values and capabilities summarized in Table 1. The cells highlighted in “Yellow” are typically not combinations that are used, but the capability indicated works as described. Those cells highlighted in “Red” will not result in any information collection.

Table 1. Allowable Values For ST COLLECTION MODE

ST COLLECTION MODE	ST USE / MEANING
IMAGERY	Air Search - Allowed to detect Air Missions, Theater Ballistic Missiles (TBMs), and Cruise Missiles.
	Surface Search - Allowed to detect Aggregate Resolution Units (ARU), High Resolution Units (HRUs), Targets, and Supply Runs.
	Active Sonar - Allowed to detect any Naval Unit
	Passive Sonar - Allowed to detect any Naval Unit
	Counter-Battery - Allowed to detect any artillery round fired.
ELINT	Air Search - Allowed to detect Air Missions that have an emitting sensor turned on or a jammer turned on. Note a sensor is assumed to be emitting, if it has a positive ST JAM FACTOR specified in the database. This will need to change as a result of this design.
	Surface Search - Allowed to detect: • Any emitting Sensor Target with a ST that is functioning • An emitting Fire Control Radar from an AD Site that is functioning
	Active Sonar - Allowed to detect any Naval Unit
	Passive Sonar - Allowed to detect any Naval Unit
	Counter-Battery - Allowed to detect any artillery round fired.

Table 1. Allowable Values For ST COLLECTION MODE

ST COLLECTION MODE	ST USE / MEANING
VISUAL	Air Search - Allowed to detect Air Missions, Theater Ballistic Missiles (TBMs), and Cruise Missiles.
	Surface Search - Allowed to detect Aggregate Resolution Units (ARU), High Resolution Units (HRUs), Targets, and Supply Runs.
	Active Sonar - Allowed to detect any Naval Unit
	Passive Sonar - Allowed to detect any Naval Unit
	Counter-Battery - Allowed to detect any artillery round fired.
Radio Detection And Ranging (RADAR)	Air Search - Allowed to detect Air Missions, Theater Ballistic Missiles (TBMs), and Cruise Missiles.
	Surface Search - Allowed to detect only Ships and non-submerged submarines.
	Active Sonar - Allowed to detect any Naval Unit
	Passive Sonar - Allowed to detect any Naval Unit
	Counter-Battery - Allowed to detect any artillery round fired.
IR	Air Search - Allowed to detect Air Missions, Theater Ballistic Missiles (TBMs), and Cruise Missiles.
	Surface Search - Allowed to detect Aggregate Resolution Units (ARU), High Resolution Units (HRUs), Targets, and Supply Runs.
	Active Sonar - Allowed to detect any Naval Unit
	Passive Sonar - Allowed to detect any Naval Unit
	Counter-Battery - Allowed to detect any artillery round fired.
ACOUSTIC	Air Search - Allowed to detect Air Missions, Theater Ballistic Missiles (TBMs), and Cruise Missiles.
	Surface Search - Allowed to detect Aggregate Resolution Units (ARU), High Resolution Units (HRUs), Targets, and Supply Runs.
	Active Sonar - Allowed to detect any Naval Unit
	Passive Sonar - Allowed to detect any Naval Unit
	Counter-Battery - Allowed to detect any artillery round fired.
COMINT	Air Search - Will obtain information from implied communication within its coverage area.
	Surface Search - Will obtain information from implied communication within its coverage area.

Table 1. Allowable Values For ST COLLECTION MODE

ST COLLECTION MODE	ST USE / MEANING
COMINT (Con't)	Active Sonar - Will obtain information from implied communication within its coverage area.
	Passive Sonar - Will obtain information from implied communication within its coverage area.
	Counter-Battery - Will not result in obtaining communication information. Will result in detecting artillery and start counter-battery firing.

As can be seen in Table 1, there are few restrictions in the model concerning the coordination between these two attributes. Flexibility can be good or it can lead to odd circumstances that an uninitiated user would label as a model flaw.

In addition to these two sensor capability attributes, there is another important sensor characteristic that describes whether the sensor can be jammed. This characteristic is called ST JAM CAPABLE FLAG. If this parameter is set to "YES" then the sensor is subject to being jammed.

3.1.2 Current JTLS Jammer Capability

Turning to the jamming capabilities modeled within JTLS-GO, there are currently three types of jammers represented in JTLS-GO which is held in the jammer type attribute called JT USE. These are labeled as:

- Radar Jammer - This type of jammer interferes with Sensor detections. Currently this interference is based on the ST JAM CAPABLE FLAG and does not care whether the sensor is or is not labeled as a RADAR sensor. This is a known consistency issue. The original concept was that the only type of sensors that could be jammed were "Radar" sensors, but there is absolutely no restriction to building a database in which, for example, an "Imagery" sensor is given a ST JAM CAPABLE flag of "Yes". In this case, a "Radar" jammer would be capable of jamming the "Imagery" sensor. Naturally with a diligent database builder, this type of situation would not exist.

  Still this inconsistency needs to be kept in mind as the reader goes through this proposed design. The Design Team does not want to make the same mistake as was done for jamming sensors when JTLS is improved to jam weapon guidance systems.

- Communications Jammer - This type of jammer slows down the speed at which information from the units in the game are delivered to the Web Hosted Interface Program (WHIP) user and the speed at which orders from the users are received by the units in the model.

- Broadcast PSYOP “Jammer” - although this is not a true jammer, it does “jam” with people’s thoughts and it was an expedited methodology to put the effects of psychological operations into JTLS.

3.1.3 Current JTLS Targetable Weapon Guidance Capability

Currently in JTLS, a Targetable Weapon (TW) has two attributes that are related to how the weapon is guided to its target. These two attributes are:

- TW GUIDANCE TYPE - This attribute indicates the type of guidance system that the TW uses. Currently the only value that can be placed in this attribute is “Anti-Radiation Missile” (ARM) guidance. This capability was never fully implemented or realized within JTLS, and as mentioned above, this is one of the primary goals for this ECP.

- TW PRECISION GUIDE - This flag is set to YES or NO. If the weapon is precision guided, then it is given some special capability of not firing on dead elements of a multiple element target. The concept is that it is being guided to the correct place and that location needs to be destroyed. This too is obviously not always true, but that is the current logic under which JTLS is executing.

3.1.4 Background Conclusions

Given this background, the following issues will be solved or at least mitigated as part of this design:

1. Expand the representation of various weapon guidance types.

2. Allow the user to jam each of the weapon guidance types

3. Alter the representation of sensor jammers for consistency purposes.

4. Expand the enforcement of the various weapon guidance types, especially Anti-Radiation guidance systems.

3.2 Representation Of Weapon Guidance Types

In a review of the literature, the Design Team found the following types of weapon guidance systems:

- Anti-Radiation Missile (ARM) Guidance

- Global Positioning Satellite (GPS) Missile Guidance

- Infra-Red (IR) Missile Guidance

- Light Amplification by Stimulated Emission of Radiation (LASER) Missile Guidance

- Electro-Optical (EO) Missile Guidance
- RADAR Missile Guidance

As mentioned above, the database builder can currently only specify that a TW uses an ARM guidance system. This list will be expanded to allow the database builder to select from any of the above six guidance types. For the new five guidance types (GPS, IR, LASER, EO, and RADAR), this assignment will not affect how the model determines if the weapon hits its target. this will continue to be a function of the PH data contained in the database.

On the other hand, the Design Team feels it is important to improve the logic used to determine the Probability of Hit data for a TW that uses an ARM guidance systems. This is discussed in Section 3.5.

3.3 Representation of Weapon Guidance Jamming

For each of the weapon guidance types there will be an equivalent jammer use type. Thus the list of the current three jammer use types will now also include the following:

- GUIDANCE.ARM.JAMMER - will jam weapons that use an ARM guidance system
- GUIDANCE.GPS.JAMMER - will jam weapons that use a GPS guidance system
- GUIDANCE.IR.JAMMER - will jam weapons that use an IR guidance system
- GUIDANCE.LASER.JAMMER - will jam weapons that use a LASER guidance system
- GUIDANCE.EO.JAMMER - will jam weapons that use an EO guidance system
- GUIDANCE.RADAR.JAMMER - will jam weapons that use a RADAR guidance system

The implementation is fairly simple. If a weapon guidance jammer covers the impact location of the weapon, then its PH will be adjusted. In JTLS, if a weapon does not hit the target at which it is aimed, it causes no damage to the target. There may be secondary damage, but the primary target will not be affected.

There are two additional parameters that will be added to the model to determine how much of an effect the jammer has on the PH. These two parameters are:

- TW GUIDANCE JAMMING FACTOR - This indicates how susceptible the weapon is to jamming. The larger the value, the more shielding has been built into the weapon to counter opposing force jamming.
- JT WEAPON DEGRADE FACTOR - This indicates how strong the jammer is. The smaller the number the more powerful the jammer because it will reduce the PH the most.

Consider the examples shown in Table 2. Especially note the last example, in which the weapon has extensive jamming protection. The existence of the jammer can never make the PH for the weapon better.

Table 2. Example Weapon Jamming Alternatives

TYPE	PH	JT WEAPON DEGRADE FACTOR	TW GUIDANCE JAMMING FACTOR	COMPUTATION IF JAMMER COVERS TARGET AREA
• Powerful Jammer • No Weapon Protection	0.8	0.1	1.0	PH = 0.8 * 0.1 * 1.0 = 0.08
• Weak Jammer • Weak Weapon Protection	0.8	0.9	1.05	PH = 0.8 * 0.9 * 1.05 = 0.756
• Weak Jammer • Effective Weapon Protection	0.8	0.9	1.8	PH = 0.8 *0.9 * 1.8 = 1.296 PH = Min(PH, Adjusted PH) PH = Min(0.8, 1.296) = 0.8

The next issue that needs to be discussed is the types weapons that can be affected by these weapon guidance jammers. Obviously the only weapons that can have their PH adjusted must have a TW GUIDANCE TYPE. The following rules are being proposed for implementation:

- For Surface weapons - those weapons fired from aircraft or SSMs at Surface targets, any guidance jammer of the appropriate type from a side other than the side that fired the weapon which covers the impact location of the weapon has an effect on the fired weapon's PH.

- For Surface-to-Air (SA) weapon - those weapons from a SAM site that are fired on an aircraft, if the aircraft has an weapon guidance jammer on board, then the jamming algorithm is applied to the fired SA weapon's PH.

- For Air-to-Air weapons - those weapons fired from one aircraft against another aircraft, if the aircraft that is receiving the fire has an operational self-protection weapon guidance jammer on board, then the jamming algorithm is applied to the fired AA weapon's PH.

These rules then lead to several other issues. Namely:

- When is an airborne jammer considered a self-protection jammer and when is it considered an area jammer? The Design Team felt that this was best represented as a database parameter. It will now be perfectly legal to have a jammer with a range of zero, indicating that the jammer can only be used for self-protection purposes.

The SVP will check:

a. Error: That a self-protection, zero range, jammer is labeled as one of the Weapon Guidance Jammers.

b. Warning: That an EW Mission Load has at least one area jammer included in the jammer load assigned to the Aircraft Load for the EW Mission Type.

The CEP will not place grid tags on the game surface for self-protection, zero range jammers.

- What happens if multiply weapon guidance jammers cover the same location? The Design Team had two options available to handle this issue.

  a. Each jammer could interfere and adjust the PH or

  b. Only the strongest jammer in the area would have an impact of the weapons PH.

  The Team chose the latter option. When determining the effect of jamming on weapon guidance, the jammer with the highest JT WEAPON DEGRADE FACTOR will be used to adjust the PH.

- What is the best way to represent Chaff deployed from aircraft and ships for self-protection purposes? There will be two methods available to represent Chaff deployment which interferes with a weapons PH. The database builder should consider the information presented in Table 3 when deciding which method should be used.

Table 3. Comparing Chaff Representation Options

Representation Method	Pros	Cons
Represent Chaff as SAM/AAA Site - This is the current method within JTLS. A Naval Unit is given a Chaff SAM/AAA Target that is allowed to fire on incoming missiles. If it kills the missile prior to impact, the missile is not allowed to hit the ship.	Requires Weapon Supplies. Thus Chaff is a limited resource that can be used up.	Cannot be represented on aircraft.
Represent Chaff as Weapon Guidance Jammer(s) - This method will now be available as an option based on the capabilities of this design.	Can easily be represented on aircraft, which is currently not a capability.	Requires several extra jammers on aircraft and ships to indicate that it can interfere with several types of weapon guidance types: Radar, IR etc.
		Has no supply usage; therefore the aircraft or unit has an infinite supply of the “Chaff”.

3.4 Representation of Sensor Jamming

As mentioned above, a Radar Jammer will jam any type of sensor if the ST JAM CAPABLE flag is set to YES. The original concept was that the ST JAM CAPABLE flag would only be set for sensors labeled as RADAR Sensors, but there is nothing that limits this capability. The Design Team feels that this inconsistency should be corrected as part of this design. The team is proposing that this limitation be formalized within the code.

Specifically, the following is being proposed:

- An SVP Warning be added indicting that the ST JAM CAPABLE flag is being set for a sensor that is not labeled as a RADAR Sensor.

- The model will be changed. Prior to implementing the effects of a RADAR JAMMER, the model will check if the ST JAM CAPABLE FLAG is set to YES, as is currently done, and that the ST COLLECTION MODE of the sensor is set to RADAR, which is currently not done.

3.5 Improvement of ARM Guidance Rules

Finally, the Design Team feels that the ARM Guidance Type needs to be represented in more detail. A weapon that has an ARM Guidance Type will only be allowed to fire if there is an active emitter on the object being fired on. Specifically, ARM Guidance Type Weapons will only be allowed to fire on the following objects:

- SAM/AAA Targets that have a Fire Control Radar that is labeled as a ST COLLECTION MODE of RADAR. The SAM/AAA site must be turned on and the Fire Control Radar cannot be destroyed.

- Sensor Targets that have an ST COLLECTION MODE of RADAR. The Sensor Target must be turned on and functioning for the weapon to be fired on the target.

- Facility Targets that are alive and point to a Facility Type that has a FAT EMITTING FLAG of YES. This FAT attribute is new and will be added to the database to support this design, These targets represent objects such as Radio Towers. Facility Targets are assumed to alway be one. Thus as long as an emitting Facility Target is alive, an ARM weapon will be able to fire on the target.

  The reader should note that these Facility Targets are susceptible to fire from ARM guided weapons, they cannot be picked up by Electronic Intelligence (ELINT) assets. This decision was made because of potentially thousands of these facility targets being represented in a database, and the Design Team feels that this would overload the Tactical ELINT (TACELINT) feed. If this decision does not meet the needs of the Government, a new ECP can be submitted to allow emitting Facility Targets to be picked up by ELINT.

4.0 Data Changes

The following data changes will be made as a result of this ECP.

TW GUIDANCE TYPE - Expanded Definition

- Dimension: Variable – Entity Attribute
- Mode: Text
- Unit of Measure: N/A
- Range: ARM, GPS, INFRARED, REMOTE-LASER, ELECTRO-OPTICAL, RADAR, or Null.
- Default Value: Null
- Definition: This attribute of the Targetable Weapon permanent entity represents the type of guidance used by the weapon.
- Relationships: Weapons that have a TW GUIDANCE TYPE of ARM can only be fired on:

  Sensor Site targets that are Turned On, operational, and have a Sensor Type with its ST JAM CAPABLE FLAG attribute set to YES and its ST COLLECTION MODE set to RADAR.

  Jammer target that are Turned On, operational and have a Jammer Type with its JT USE attribute set to RADAR_JAMMER or COMM_JAMMER.

  SAM/AAA targets that are Turned On, operational, and have a Fire Control Radar (attribute AD FIRE CONTROL SENSOR) pointing to a Sensor Type that has an ST JAM CAPABLE FLAG attribute set to YES and its ST COLLECTION MODE set to RADAR.

  FACILITY targets that are not dead and have a Facility Type that has a FAT EMITTING FLAG set to YES.

JT USE - Expand Definition

- Dimension: Variable – Entity Attribute
- Mode: Text
- Unit of Measure: N/A
- Range: RADAR_JAMMER, COMM JAMMER, BROADCAST, GUIDANCE ARM JAMMER, GUIDANCE GPS JAMMER, GUIDANCE IR JAMMER, GUIDANCE LASER JAMMER, GUIDANCE EO JAMMER, GUIDANCE RADAR JAMMER.

- Default Value: RADAR_JAMMER
- Definition: This variable is an attribute of the JAMMER TYPE (JT) entity. It holds the indicator designating the function of a jammer of this type.
- Relationships: No other relationship changes from what is in the current documentation.

JT RANGE - Change

- Dimension: Variable - Entity Attribute
- Mode: Real
- Unit Of Measure: Kilometers
- Range: 0.0 or Greater
- Definition: This variable is an attribute of the JAMMER TYPE (JT) entity. It represents the maximum jamming range of the jammer.
- Relationships: A range of 0.0 indicates that the jammer is a self-protection jammer and cannot provide any area support.

  The remainder of the relationship section as it exists in the current documentation remains as is,

JT WEAPON DEGRADE FACTOR - New

- Dimension: Variable - Entity Attribute
- Mode: Real
- Unit Of Measure: Multiplier
- Range: 0.0 to 1.0
- Definition: This variable is an attribute of the JAMMER TYPE (JT) entity. It represents the degrade it will cause in a weapon's Probability of Hit.
- Relationships: The smaller the value, the more powerful and capable the jammer is to interfering with a weapons guidance system.

  This attribute is related to the JT USE attribute. It is only used in the JT USE attribute is set to one of the Guidance Jammer Types.

  This attribute is also related to the TW GUIDANCE JAMMING FACTOR which indicates how susceptible the weapon is to jamming.

TW GUIDANCE JAMMING FACTOR - New

- Dimension: Variable - Entity Attribute
- Mode: Real
- Unit Of Measure: Multiplier
- Range: 0.0 or greater
- Definition: This variable is an attribute of the TARGETABLE WEAPON (TW) entity. It represents the degrade to its Probability of Hit (PH) if its guidance system is jammed.
- Relationships: The larger the value, the more protection the weapon has against jamming. A value greater than 1.0 will "undo" some of the jammer effects.

  This attribute is related to the weapons PH data held in either its associated Surface Air Lethality data, Air-to-Air Lethality Data or its Surface Lethality data. All of the that data is the weapon's data in a non-jamming environment. No matter how large this attribute is, the computation will never result in an increase if the PH for the weapon.

  This attribute is also related to the JT WEAPON DEGRADE FACTOR which indicates the power or capability of a weapon guidance jammer.

FAT EMITTING FLAG - New

- Dimension: Variable - Entity Attribute
- Mode: Text (Boolean)
- Unit Of Measure: N/A
- Range: YES or NO
- Default: NO
- Definition: This variable is an attribute of the FACILITY TYPE (FAT) entity. It represents whether a target of this type is emitting. If it is emitting an Anti-Radiation Missile (ARM) can be used to fire on the target.
- Relationships: The variable is related to the TW GUIDANCE TYPE. If a Facility Target is using a FAT that has its FAT EMITTING FLAG set to YES, then a weapon with an TW GUIDANCE TYPE of ARM will be considered a legal weapon to use against the target.

If the FAT EMITTING FLAG is NO, then ARM Guidance Weapons will not be considered, but other types of guidance targets will still be considered.

This attribute is also related to the Probability of Hit data for a weapon against these Facility Type targets. The database builder no longer has to alter the Probability Of Hit to zero to indicate that the ARM Guidance Weapon has no PH against this type of target.

5.0 Order Changes

The only order changes needed to support this ECP are the changes required for the Controller to alter the new data. Specifically, the following orders will change:

- The SET FACILITY TYPE Order - Allow the Controller to change the FAT EMITTING FLAG
- The SET JAMMER TYPE Order - Allow the Controller to change the JT USE flag for the Jammer to one of the new values. Allow the Controller to change the JT WEAPON DEGRADE FACTOR.
- The SET TARGETABLE WEAPON Order - Allow the Controller to change the TW GUIDANCE TYPE to one of the new values. Allow the Controller to change the TW GUIDANCE JAMMING FACTOR.

6.0 JODA Changes

No JODA Data System parameter, structure, or protocol changes are required to implement this design.

7.0 Test Plan

7.1 Check Data Changes Required For This ECP

Purpose: The purpose of this test is to ensure that the data changes implemented for this ECP are properly working in the database, can be changed by the Controller and appear in the OPM.

Step 1: Using the DDS, create a new Targetable Weapon for each of the new TW GUIDANCE TYPE. Given each weapon a TW GUIDANCE JAMMING FACTOR. Have some of them less than 1.0, some equal to 1.0 and some with values greater than 1.0

Step 2: Using the DDS, create a new Jammer Type for each of the new JT USE types specified in Section 3.3. Give the Jammer Types various values of JT WEAPON DEGRADE FACTOR.

Step 3: Using the DDS, create a new Jammer Type with a JT USE of GUIDANCE IR JAMMER and a JT RANGE of zero.

Step 4: Create an Aircraft Load that has only the Jammer Type create in Step 3. Assign this new load to an Electronic Warfare aircraft for the EW Load.

Step 5: Using the DDS, create a new Jammer Type with a JT USE of BROADCAST and a JT RANGE of zero.

Step 6: Using the DDS, create a new Facility Type with a FAT EMITTING FLAG equal to YES

Step 7: Using the DDS, set the ST JAM CAPABLE FLAG for a sensor that is not have an ST COLLECTION MODE of RADAR.

Step 8: Using the DDS, give a Theater Ballistic Missile (TBM) a TW GUIDANCE TYPE of GUDANCE GPS.

Expected Results: The DDS should allow you to accomplish each step without incident.

Step 9: Download the database

Step 10:Run a Scenario Verification.

Expected Results: Errors reporting the following problems should be generated:

a. Warning: An EW load does not contain any Area Jammers.
b. Error: A non-guidance jammer has a range of zero.
c. Warning: A sensor is labeled as Jam Capable and it is not a RADAR sensor.
d. Warning: The TBM has a TW GUIDANCE TYPE.

Step 11:Use the automatic correction option for the Errors and Warnings

Expected Results: The correction options selected should work as indicated.

Step 12:Download the database

Step 13:Run a Scenario Verification.

Expected Results: The Errors and Warnings should no longer be listed.

Step 14:Generate the Online Players Manual

Step 15:Review the new data that was added to this database in the OPM.

Expected Results: All data should be in the OPM and understandable.

Step 16:Bring the model up with this new database.

Step 17:Have the Controller submit the following Orders:

a. Change the TW GUIDANCE TYPE of a Targetable Weapon
b. Change the JT USE for a jammer.
c. Change the range of a Jammer Type to zero for a Jammer Type that has a JT USE of one of the weapon guidance options.
d. Change the range of a Jammer Type to zero for a Jammer Type that has a JT USE not equal to one of the weapon guidance options.
e. Change the range of a non-weapon guidance jammer to zero and in the same order change the JT USE to one of the weapon guidance options.
f. Change the JT WEAPON DEGRADE FACTOR for a jammer.
g. Change the TW GUIDANCE JAMMING FACTOR for a jammer.
h. Change the FAT EMITTING FLAG for a Facility Type.

Expected Results: All orders should work except Order “d”, which should be rejected by the model.

Step 18:Take a Checkpoint

Step 19:Regenerate OPMs and look at the data that has been changed.

Expected Results: The OPM should reflect all of the database changes that were entered.

7.2 Test Weapon Guidance Jamming

Purpose: The purpose of this test is to test that weapon guidance jamming reduces the PH for a weapon.

Step 1: Select 100 similar targets and create 100 air missions. One mission per target. Set the ROE for the mission side to permissive so the mission will fire its weapon load on its assigned target. This will be easier to track if each air mission has the same weapon and is assigned only one weapon.

Step 2: Once the mission orders are in the game, take a checkpoint. This will be called Checkpoint 0002.

Step 3: Fly the missions and note the number of targets that were hit and the number that were killed.

Step 4: Restart the game from Checkpoint 0002.

Step 5: Have the Controller create a Jammer Target that uses the Jammer Type that has been identified as a GUIDANCE GPS JAMMER. Give the Jammer Type a range big enough to cover each of the 100 targets. Give the Jammer Type a JT JAMMING FACTOR of 0.75. Give the weapon that you are placing on the aircraft a TW GUIDANCE TYPE of GUIDANCE.GPS and given the weapon a TW JAMMING FACTOR of 1.0.

Step 6: Re-fly the missions and take note of the number of targets that were hit and the number that were killed.

Expected Results: The number hit should decrease. There should be approximately 25% fewer hits than what was recorded as part of Step 3.

Step 7: Restart the game from Checkpoint 0002.

Step 8: Have the Controller change the TW JAMMING FACTOR of 0.25.

Step 9: Re-fly the missions and take note of the number of targets that were hit and the number that were killed.

Expected Results: The number hit should decrease. There should be approximately 75% fewer hits than what was recorded after Step 3.

Step 10:Restart the game from Checkpoint 0002.

Step 11:Have the Controller create a Jammer Target that uses the Jammer Type that has been identified as a GUIDANCE IR JAMMER. Give the Jammer Type a range big enough to cover each of the 100 targets. Given the Jammer Type a JT JAMMING FACTOR of 0.75. Give the weapon that you are placing on the aircraft a TW GUIDANCE TYPE of GUIDANCE.GPS and given the weapon a TW JAMMING FACTOR of 1.0.

Step 12:Run the attack missions.

Expected Results: This jammer should not have an effect of the weapon being dropped. The results should be similar to the original results recorded after Step 3.

Step 13:Restart the game from Checkpoint 0002.

Step 14:Have the Controller create a Jammer Target that uses the Jammer Type that has been identified as a GUIDANCE IR JAMMER. Give the Jammer Type a range big enough to cover each of the 100 targets. Given the Jammer Type a JT JAMMING FACTOR of 0.75. Give the weapon that you are placing on the aircraft a TW GUIDANCE TYPE of GUIDANCE.GPS and given the weapon a TW JAMMING FACTOR of 0.5.

Step 15:Re-fly the air missions.

Expected Results: There should be approximately 67.5% fewer hits than in the original run.

Step 16:Take a Stop Checkpoint. This will be Checkpoint 0003.

Step 17:Have the Controller using the WHIP spreadsheet order, put all of the targets back at 100%.

Step 18:Re-fly the air missions.

Expected Results: The results should be approximately the same Step 15 run.

Step 19:Restart the game from Checkpoint 0002.

Step 20:Change the TW JAMMING FACTOR to zero.

Step 21:Re-fly the air missions

Expected Results: There should be no hits.

Step 22:Restart the game from Checkpoint 0002.

Step 23:Create a weather front over the 100 targets.

Step 24:Given the weapon a TW WC MODIFIER to 0.8.

Step 25:Re-fly the air missions

Expected Results: There should be approximately 40% fewer hits that the results observed after Step 3.

Step 26:Restart the game from Checkpoint 0002.

Step 27:Turn the jammer off.

Step 28:Re-fly the air missions

Expected Results: The results should be approximately the same as the results observed after Step 3.

Step 29:Restart the game from Checkpoint 0002.

Step 30:Assign the created jammer target to a unit and give it a MOBILE.

Step 31:Start the unit moving in a tight pattern so the jammer still covers each of the targets.

Step 32:Re-fly the air missions

Expected Results: The results should be approximately the same as the results observed after Step 3 because the target is not on while the unit is moving.

Step 33:Restart the game from Checkpoint 0002.

Step 34:Assign the created jammer target to a unit and give it a DEPLOY ON MOVE

Step 35:Start the unit moving in a tight pattern so the jammer still covers each of the targets.

Step 36:Re-fly the air missions

Expected Results: The results should be approximately the same as the results observed after Step 6 because the target is on while the unit is moving.

Step 37:Restart the game from Checkpoint 0002.

Step 38:Assign the created jammer target to a unit and give it a DEPLOY ON MOVE Mobility Type.

Step 39:Start the unit moving in a tight pattern so the jammer still covers each of the targets.

Step 40:Have the Controller TPFDD the unit out of the theater.

Step 41:Re-fly the air missions

Expected Results: The results should be approximately the same as the results observed after Step 3 because the target is no longer in the game.

Step 42:Restart the game from Checkpoint 0002.

Step 43:Assign the created jammer target to a unit and give it a STATIONARY Mobility Type.

Step 44:Fly an opposing force air mission to kill the jammer target.

Step 45:Once it is killed, Re-fly the air missions

Expected Results: The results should be approximately the same as the results observed after Step 3 because the target is no longer functional.

Step 46:Restart the game from Checkpoint 0002.

Step 47:Assign the created jammer target to a unit and give it a STATIONARY Mobility Type.

Step 48:Have the Controller kill the jammer target.

Step 49:Once it is killed, Re-fly the air missions

Expected Results: The results should be approximately the same as the results observed after Step 3 because the target is no longer functional.

Step 50:Restart the game from Checkpoint 0002.

Step 51:Assign the created jammer target to a unit and give it a STATIONARY Mobility Type.

Step 52:Using the Emission Control Order, turn the jammer off.

Step 53:Re-fly the air missions

Expected Results: The results should be approximately the same as the results observed after Step 3 because the target is no longer functional.

Step 54:Restart the game from Checkpoint 0002.

Step 55:Have the opposing side fly an EW mission with a GUIDANCE GPS JAMMER over the target area.

Step 56:Re-fly the air missions

Expected Results: The results should be approximately the same as the results observed after Step 6 because the air mission is jamming the weapon guidance system.

Step 57:Restart the game from Checkpoint 0002.

Step 58:Have the opposing side fly an EW mission with a GUIDANCE GPS JAMMER over the target area.

Step 59:This time fly 100 Cruise Missile against the targets.

Expected Results: The results should be approximately the same as the results observed after Step 6 because the air mission is jamming the weapon guidance system.

7.8 Ensure Self Protection Jammers Work

Purpose: The purpose of this test is to ensure that an air mission's Self Protection Jammers will reduce the PH.

Step 1: Select an Aircraft Class that has a Self Protection GUIDANCE IR JAMMER.

Step 2: Give the GUIDANCE IR JAMMER a JT WEAPON DEGRAGE FACTOR of 0.5

Step 3: Fly 10 missions over an opposing force SAM site that fires an Targetable Weapon with an TW GUIDANCE TYPE of IR.

Step 4: View the Controller ADA Engagement Reports

Expected Results: The PH should be 50% less than the database PH for the weapon against the Aircraft Class.

Step 5: Fly another 10 missions over an opposing force SAM site that fires an Targetable Weapon with an TW GUIDANCE TYPE of IR. In each mission turn of the Self Protection Jammer.

Step 6: View the Controller ADA Engagement Reports

Expected Results: The PH should closely match the PH specified for the weapon against the Aircraft Class in the database.

Step 7: Fly an opposing force DCA mission with an Air-to-Air Weapon with a TW GUIDANCE TYPE of GUIDANCE IR.

Step 8: Fly the air mission with the Self-Protection GUIDANCE IR JAMMER close to the Opposing Force DCA mission.

Step 9: View the Controller Air Engagement Reports

Expected Results: The PH should be 50% less than the database PH for the weapon against the Aircraft Class.

Step 10:Fly an opposing force DCA mission with an Air-to-Air Weapon with a TW GUIDANCE TYPE of GUIDANCE IR.

Step 11:Given the TW a TW JAMMING FACTOR to 10.0

Step 12:Fly the air mission with the Self-Protection GUIDANCE IR JAMMER close to the Opposing Force DCA mission.

Step 13:View the Controller Air Engagement Reports

Expected Results: The PH should be about the same as the PH in the database because the weapon has “shielding” against the jamming.

7.9 Test ARM Guidance Limitations.

Purpose: The purpose of this test is to ensure that an Anti-Radiation weapon only fires on a radiating target.

Step 1: Create an Air Mission that only carries ARM Guidance Weapons.

Step 2: Tell the mission to attack a Facility Target that has a FAT EMITTING FLAG of NO.

Expected Results: The mission should not fire with a no suitable weapons found.

Step 3: Tell the mission to attack a Facility Target that has a FAT EMITTING FLAG of YES

Expected Results: The mission should fire on the target.

Step 4: Tell the mission to attack a Sensor Site Target that has a ST COLLECTION MODE of IMAGERY.

Expected Results: The mission should not fire with a no suitable weapons found.

Step 5: Tell the mission to attack a Sensor Site Target that has a ST COLLECT MODE of RADAR and a ST JAM CAPABLE FLAG of NO.

Expected Results: The mission should not fire with a no suitable weapons found.

Step 6: Tell the mission to attack a Sensor Site Target that has a ST COLLECT MODE of RADAR and a ST JAM CAPABLE FLAG of YES.

Expected Results: The mission should fire on the target.

Step 7: Tell the mission to attack a Surface-to-Air Missile Site with a Fire Control Sensor that has an ST COLLECTION MODE of IMAGERY.

Expected Results: The mission should not fire with a no suitable weapons found.

Step 8: Tell the mission to attack a Surface-to-Air Missile Site with a Fire Control Sensor that has a ST COLLECT MODE of RADAR and a ST JAM CAPABLE FLAG of NO.

Expected Results: The mission should not fire with a no suitable weapons found.

Step 9: Tell the mission to attack a Surface-to-Air Missile Site with a Fire Control Sensor that has a ST COLLECT MODE of RADAR and a ST JAM CAPABLE FLAG of YES.

Expected Results: The mission should fire on the target.