JTLS-2015-12497 Add Control Range to Appropriate Aircraft

Ellen Roland, John Hertz, Robert Montgomery

1.0 Summary of Model Change Request

Positive command and control of Unmanned Aerial Vehicles (UAVs) is sometimes limited to line of sight or other communications distance restrictions. This Design Plan describes how JTLS-GO will be enhanced to apply operational range constraints based on communications/line of sight distances to aircraft. These enhancements will introduce a control linkage range that will prevent an aircraft from flying beyond that distance.

2.0 Design Summary

2.1 Current Capabilities

JTLS-GO currently does not restrict any aircraft type, including UAVs, to any specific communications control limits. Aircraft can fly up to the limit of their fuel-constrained ranges. While the lack of a maximum controllable range is not an issue for large, long range UAVs such as the Global Hawk, smaller tactical UAVs may be constrained by communication ranges in the real world.

2.2 Design Approach

Communication range restrictions will be imposed on certain aircraft types, primarily UAVs. A new aircraft attribute will limit the range of the UAV based on the maximum controllable communications distance for that aircraft type (class). The model will not allow the UAV to fly beyond this distance from the launching unit. A range ring will be displayed over the launching unit on the WHIP.

Although terrain masking is applied in the JTLS-GO detection algorithms, terrain masking will not be a factor in determining the control range, given the short ranges and low altitudes of small tactical UAVs relative to terrain grid sizes. Also, this design will not explicitly model flight range limitations based on radar horizon.

3.0 Detailed Design

To implement the new aircraft control range limit as described above, modifications will be necessary in JTLS-GO. Areas impacted include player orders, the Combat Events Program (CEP),

Scenario Verification Program (SVP), Database Development System (DDS) and the scenario database.

3.1 Communication Range Limitation

To implement the control range limitation, a new aircraft attribute will be required. The new AC MAX CONTROL DISTANCE attribute will be created to represent line of sight or other communications range limitations.

The model will reference the AC MAX CONTROL DISTANCE and use the value to limit the range of the aircraft or tactical UAV. The value is the maximum distance from the launching unit the UAV may fly. A value of zero will indicate there is no communications distance limitation for that aircraft type (class). Most aircraft types (i.e. crewed aircraft or long-range UAVs), will have a zero AC MAX CONTROL DISTANCE, meaning they are limited only by their fuel capacity and crew time.

As an aircraft flies in the model, its location is updated in small, discrete steps. Before each move is executed, the AC MAX CONTROL DISTANCE will be checked. If the value is greater than zero, the aircraft's distance from its next location to the launch unit will be calculated. If the distance would be greater than the AC MAX CONTROL DISTANCE, the mission will enter an airborne hold status to await further orders from the player. The player will need to use the Manage Air Mission Tasks order to alter the mission's flight plan to fly closer to the launching unit. For example, a new Move task with execution time NOW could be added and the airborne hold task and one or more pending Move tasks could be canceled, and/or the Orbit task location could be changed.

3.2 Range Rings

Currently, aircraft range rings are displayable only over squadrons on the WHIP. The ring radius is one-half the non-refueled range (i.e. 0.5 * AC RANGE) of the aircraft at the owning squadron. The model will be modified to display the lesser of one-half the non-fueled range and the AC MAX CONTROL DISTANCE, if the attribute is greater than zero. If the aircraft is flown from a ground unit (proposed in ECPs JTLS-2009-10195 and JTLS-2013-11748), the range rings will also be displayable over the ground unit.

3.3 Scenario Database

In some scenarios, the same aircraft types (primarily UAVs) assigned to a squadron may also be assigned to a ground unit (proposed in ECPs JTLS-2009-10195 and JTLS-2013-11748). The ground unit may not have the same command and control capability available at the squadron. Consequently, the UAVs may have a shorter control range at the ground unit. To represent this situation, the database builder will have three options:

- Deem the situation unimportant and ignore the different communication ranges, or
- Change the AC MAX CONTROL DISTANCE to the smaller value, or

- Create a second aircraft type (class) with identical characteristics, with a smaller AC MAX CONTROL DISTANCE value, to be assigned to the ground unit only.

4.0 Data Changes

4.1 AC MAX CONTROL DISTANCE

- Dimension: Variable – Entity Attribute
- Mode: Real
- Unit of Measure: Kilometers
- Range: 0.0 to 9999
- Default Value: 0.0
- Definition: This variable is an attribute of the AIRCRAFT CLASS entity. It holds the maximum straight line distance an aircraft can fly from its launch location and remain under positive control. The model will not allow the aircraft to fly beyond the AC MAX CONTROL DISTANCE.
- Relationships: The AC MAX CONTROL DISTANCE applies to all aircraft classes. However, a value of zero indicates the aircraft has no control distance limitation.

5.0 Order Changes

The Aircraft Max Control Range field will be added to the “RNG ALT and SPD” tab on the controller Set Aircraft Parameters order. If the value is changed, it will immediately affect all active missions of that aircraft type at their next move update.

6.0 JODA Changes

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

7.0 Test Plan

TBD. Depends on which aspects of the design are changed/approved.

7.1 Test 1 Title

Purpose: [*Describe the specific feature, function, or behavior to be tested or measured.*]

Step 1: Text

Step 2: Text

Expected Results: [*Describe the specific model behavior to be observed.*]

7.2 Test 2 Title

Purpose: [*Describe the specific feature, function, or behavior to be tested or measured.*]

Step 1: Text

Step 2: Text

Expected Results: [*Describe the specific model behavior to be observed.*]