**Script Overview:**

Missile utilizes merge release to undock from ship grid and should have option to switch between vertical and horizontal launch protocols. Once undocked, missile should push itself away from the launch and engage tracking. Tracking utilizes combination of communicated raycasting results from controlled ship and on-missile LIDAR from any number of forward facing cameras.

LIDAR utilizes stored information on target velocity and position from most recent successful raycast result. Number of raycasts and spread is dependent on target position uncertainty, which scales linearly with time since last successful raycast result. Raycast load is split between all forward facing cameras to ensure that we don’t run out of available raycast charge and to prevent missiles from being complete blinded by enemy PDCs. Raycast distance changes with estimated target distance (go for 100m past estimation) to reduce raycast load. Target position estimation is made using a 1st degree physics calculation using target position and velocity without acceleration. Intercept position estimation is made using a 1st degree physics calculation with the assumption that the missile is currently heading towards the intercept at its current speed (Norm of velocity vector).

Missile orientation is defined by axis only with angle as an arbitrary factor. Once a vector to the intercept position is calculated, the orientation of the missile is defined by the delta vector between the missile’s current velocity and the vector from missile position to intercept position scaled to have a magnitude slightly greater than max velocity (360 m/s is good). This ensures that the missile can adjust its path to get to intercept without the necessity of RCS thrusters (although their presence would significantly improve the missiles turn rates).

Missile reorientation is achieved through remote control waypoints. Remote control is allowed access to thrusters and gyros, but forward thrusters are overridden and backward thrusters are absent to prevent max remote speed from affecting the flight pattern. Waypoints are checked for duplicates to reduce wobbling during periods without reorientation of the missile.

Missile flight path should also have a helix flight pattern to avoid PDC fire. This can be achieved by transforming the delta velocity vector by a quaternion generated from a constant pitch and linearly interpolated roll that changes (linearly) over time.

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Need to add capability for random position homing to prevent continuous homing in on bounding box center

**Mandatory Missile Components:**

* Programmable Block
* Forward facing Remote Control (Orientation to worldMatrix is a non-issue)
* Antenna (For initial target lock)
* Forward Thruster (s)
* Power Source (Battery is cheapest)
* Gyroscope (s)
* Forward facing Camera (s)

**Some Recommendations for Missile Design:**

* Try to design the missile with redundancy (Multiple gyros, remotes, cameras, etc…) and protect the components that can’t be redundant (Batteries, Programmable Block)
* RCS thrusters aren’t required, but highly recommended to improve turn speed
* Cameras are easily picked off by turrets. Add more cameras so the missile doesn’t fly blind. Add even more cameras so raycast charge is a non-issue.

**Some Question:**

* Does “precision mode” on the remote control improve the performance of missiles?