AFRL

GOLDEN HORDE COLOSSEUM

DEPARTMENT OF THE AIR FORCE VANGUARD PROGRAM

DEVELOPING THE TECHNOLOGIES FOR NETWORKED, COLLABORATIVE AND AUTONOMOUS WEAPONS

WHAT IS IT?

Golden Horde, a DAF Vanguard Program, is aligned with the Program Executive Officer for Weapons. Its original objective was to demonstrate Networked Collaborative and Autonomous (NCA) weapons by creating an integrated weapon system of systems where weapons autonomously work together to increase survivability and lethality.

In the past two years, Golden Horde successfully developed and tested a Collaborative Small Diameter Bomb (CSDB) integrated weapon system to enable a swarm of CSDBs to share data and execute coordinated behaviors. Onboard radios transmit data to other CSDBs enabling the swarm to locate, identify, and defeat targets, while resisting attrition and optimizing target priority and time of arrival constraints.

MOVING INTO THE COLOSSEUM

Building on the success of the flight demonstration campaign, Golden Horde is pivoting from inventory weapon demonstrations to developing and delivering a multi-tier digital weapon ecosystem. This digital ecosystem offers a live, virtual, constructive testing and demonstration capability known as the Golden Horde Colosseum.

The Colosseum will expand the industrial base by lowering entry barriers, building a sandbox for traditional and non-traditional entrants, enabling rapid development and demonstration of new NCA technologies and providing quicker acquisition and transition on-ramps. This approach will cultivate competition and breed success.

CAN GOLDEN HORDE TECHNOLOGIES BE APPLIED TO OTHER WEAPONS OR CONCEPTS

- Yes, the NCA technologies used in Golden Horde can be applied to completely new weapons, inventory weapons, UAVs or ground vehicles and even under-water vehicles.

WILL GOLDEN HORDE WEAPONS BE AUTONOMOUS?

- Golden Horde weapons will be semi-autonomous, meaning that they will only engage targets or specific target groups that have been previously selected by a human operator as part of the mission planning process. Prior to being launched, the weapons are provided strict Rules of Engagement that dictate actions that can and cannot be taken. These ROES identify acceptable options and specify what should occur if acceptable options are not located.

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THE GOLDEN HORDE PROGRAM HAS FOUR TECHNICAL LINES OF EFFORT (LOE):

- **LOE 1** – Collaborative Weapon Demonstration: Demonstration of Networked Collaborative and Autonomous (NCA) weapons on inventory weapons.
- **LOE 2** – Weapons Digital Enterprise: The digital engineering framework and foundational tools that enable the establishment of a scalable, architected, and networked collaborative autonomous environment for weapons.
- **LOE 3** – Systems Engineering: Challenged-based digital engineering tools and processes to support the development, acquisition, upgrade and evaluation of system and component level technologies and employment tactics/strategies for NCA weapons. The basic Colosseum tools include both Software-in-the-Loop and Hardware-in-the-Loop simulation capabilities, as well as Surrogate UAVs to support quick turn algorithm flight tests.
- **LOE 4** – Experiment Infrastructure: Surrogate testbeds for rapid, low-cost testing of Networked Collaborative Autonomous weapon concepts prior to integration and testing on operational platforms.

WHAT KIND OF AUTONOMY WILL GOLDEN HORDE EMPLOY?

- Golden Horde employs a collaborative autonomy approach known as “play calling” in which a “play” is an established collaborative behavior by the swarm that is enabled (or disabled) when certain predefined conditions are met. A collection of plays is called a Playbook. This is similar to a play in football where every player on the field understands his or her specific role, that of others on the team and where to be on the field relative to other players throughout the play. In football, an initial play is often “called” by the coaches on the sideline. After the initial call, but prior to the snap of the football, each team attempts to read the opponent’s intent and call a new play if the belief is that the initial play will be ineffective. In a similar way, these weapons will be given a playbook with acceptable plays for the mission.