MI2 REQUEST FOR SYSTEM PERFORMANCE SUMMARY

The Mi2 Technology Demonstration is a response to changing program requirements driven by the evolution of threats and the intent to incorporate the latest technologies. The demonstration will provide a review of current and near-future capabilities available in UAS systems. Maximum portability, self-sufficiency, and modularity across UAS hardware and payloads are key facets of the expected solution. This document provides Mi2 Technology Demonstration applicants with the criteria that Government judges will use to evaluate UAS solutions described in requested system performance summaries.

Notes:

1. All parameters marked with " * " are critical parameters. Critical parameter thresholds must be met in combination with all other critical parameter thresholds in a single UAS configuration. This means the UAS may not be physically reconfigured to meet individual critical parameters.
2. International Standard Atmosphere, Sea Level Standard (SLS), is the reference for performance parameters. (59F, 29.92inHg).
3. All references to payload weight totals include the camera/turret in the total.

1 PERFORMANCE

1.1 *(T) Launch and recover with a 20lb payload. SLS conditions. (O) Launch and recover with 25lb+ payload. SLS conditions.

1.2 *(T) Continuous electrical power available for payloads only: 150W at 28VDC regulated. (O) Continuous electrical power available for payloads only: 300W+ at 28VDC regulated.

1.3 *(T) 8hr endurance (launch to recovery). (O) 12hr+ endurance (launch to recovery).

1.4 *(T) 50 nautical mile line of sight range. (O) 70 nautical mile line of sight range, for both aircraft Command and Control (C2) and payload data link connectivity with all specified/required UAS aircraft equipment, FMV sensor, and payload.

1.5 *(T) AV shall be able to launch and recover within a 23 ft diameter circle and clear a 30 ft obstacle directly adjacent to the 23 ft diameter circle with a 55 ft minimum transition altitude to forward flight. (T=O)

1.6 (T) Level flight cruise speed no less than 40 kts, indicated airspeed. (O) Level flight cruise speed greater than 75kts, indicated airspeed.

1.7 (T) Ability to launch and recover from moving vessels under sea condition 2 (Douglas Scale) with 10kt forward vessel movement. (O) Ability to launch and recover from moving vessels under sea condition 2 (Douglas Scale) with 10kt forward vessel movement with an available landing footprint of less than 15ft x 15ft

1.8 (T) Launch and recovery in winds 20kts, gusting to 25kt

1.9 Operational ceiling (defined as when climb rate decreases to less than 100 feet per minute) in a camera only configuration of and fuel for and 8 hour mission shall be (T) 13,000 ft. (O) 25,000 ft.

1.10 UAS shall be able to launch and recover UAV at a density altitude of (T) 4000 feet (O) 8000 feet in a camera only configuration and enough fuel for an 8-hour mission.

2 SYSTEM ATTRIBUTES

2.1 Manufacturer of the UAS must be based in the United States. UAS production must be based in the United States. UAS software and firmware shall be developed, modified, and controlled within the United States. UAS designed and manufactured in foreign countries are ineligible for consideration.

2.2 Technology Readiness Level (TRL) 7 required, as defined by the Defense Acquisition Guidebook (DAG), Defense Acquisition University (DAU).

2.3 Manufacturing Readiness Level (MRL) 7 required. UAS should be in or near a state of detailed design. Manufacturer has demonstrated the ability to produce small numbers of aircraft with consistent quality. Quality Assurance processes are in place to assure consistent subsystem and system performance. Maturity of manufacturing processes should be commiserate with a TRL 7 UAS.

2.4 (T) AV operations (launch and recovery) must be runway independent

2.5 No dedicated launch and recovery equipment outside of ground control system strongly preferred

2.6 *System can be configured for day and night full motion video capability. (T) Daytime, 2 in. Ground Resolved Distance (GRD) at mission altitude and slant range. Nighttime, 20 in. GRD at mission altitude and slant range. (O) 0.1 in. or less daytime GRD at mission altitude and slant range, 0.1 in. or less nighttime, at mission altitude and slant range.

2.7 At the FMV target and on the ground below the flight path, the UAS shall maintain an acoustic signature below a rural environment ambient level. The UAS shall satisfy this requirement while in a configuration and fuel load sufficient to achieve all other requirements. (T) night-time desert environment ambient level (O) while simultaneously achieving the threshold GRD requirements.

2.8 In-class UAS Group 2/Group 3 “autopilot” (T) UAS has flight automation with the possible capability of payload automation to reduce operator workload. (O) UAS has flight and payload automation capability, with ability to self-task based on user-defined priorities and actions to reduce operator workload

2.9 The UAS shall be capable of injecting near real-time UAS FMV into host unit's ISR Processing, Exploitation, and Dissemination (PED) system(s) using video distribution such as HDMI/HD-SDI (or NTSC if standard definition), KLV metadata stream over RS-232 cabling, and network stream simultaneously (T/O).

2.10 The KLV metadata format shall meet (T) Motion Imagery Standards Board (MISB) Standard (ST) 0902.1. (O) MISB ST 0601.15 format.

2.11 UAS FMV clips shall be easily and quickly exportable into industry standard format playable by (T) Windows Media Player on any standard computer without the need for proprietary video playback software. (O) Video clips shall be geospatially/temporally searchable and exportable during the mission.

2.12 (T) The UAS shall have metadata (air vehicle location, true north compass, center field of view location, target range, slant angle, and time stamp) associated with each FMV frame (O) The UAS shall have metadata severable from FMV (EO/IR) imagery. Metadata shall not be permanently burned into the pixels of still or recorded FMV files, and have the ability to be turned on/off.

2.13 Modular AV design to accommodate rapid repair and replacement of AV components under operational conditions

2.14 Modular, non-proprietary, Ethernet-based payload interface and infrastructure that supports user configurable payload loadouts and the ability to quickly swap between them. This must provide a layer two or layer three bridged internet protocol (IP) connection between the aircraft and ground. “Mod Payload Rev 4.0 October 2019” compliance preferred. The payload bay dimensions shall be able to accommodate payloads with dimensions of (T) minimum of 4.6”x 4.29” x 7.25” (O) 6.15”x 4.29” x 7.25”

2.15 *All system design/infrastructure shall support command/control and data link encryption (minimum Advanced Encryption Standard (AES)-256). Data link encryption must protect C2, FMV, and payload.

2.16 The UAS shall have data rates, over and above that which is required for FMV and C2 concurrently, for secondary payload(s) capable of delivering 500 kilobits per second to the GCS from 50 nm (T), and 15 megabits per second (total) to the GCS from 70 nm (O).

2.17 “Open Architecture” control and payload software that allows modification by the Government preferred.

2.18 Ability to utilize multiple energy sources for maximum operational flexibility. Preference is to be able to utilize USN heavy fuels. (T) Ability to utilize DoD supply system sources for fuels and energy storage. (O) Able to utilize energy sources worldwide, military and commercial.

2.19 UAS batteries or battery packs should contain cells that have obtained UN/DOT 38.3 certification. Batteries should have non-proprietary connectors/interfaces.

2.20 The UAS should minimize packed system weight for maximum portability. This should include the AV, control system, and support footprints

2.21 Unpacked AV, ready to fly, should be able to launch and recover in a 400 $ft.^2$ area, approximately 20 ft. x 20 ft. or a 23 ft. diameter circle.

2.22 No reliance on local infrastructure for setup, operation, and breakdown.

2.23 (T) AV shall contain a Mode 3/C transponder with "IDENT" capability with optional Automatic Dependent Surveillance Broadcast (ADS-B) in/out capability controlled via the Ground Control Station (GCS) for International Civil Aviation Organization (ICAO) compliant airspace

transportation. (O) Mode 5 transponder capability.

2.24 The UAS shall have a GCS-controllable daylight and infrared (IR) anti-collision lighting system

2.25 Packed for transport (shipping configuration) UAS shall have the ability to be unpacked by two trained personnel and ready to fly in (T) no more than 3 hours, (O) 60 minutes or less.

2.26 The UAS shall be able to store and download mission-length system logs in a non-proproprietary open source format. System logs may be, but are not limited to: aircraft, propulsion, and GCS critical parameters.

2.27 The UAS shall display to the operator via the GCS interface, real-time aircraft data, propulsion system data, and GCS critical parameters that are necessary to maintain safe AV operation.

3 OPERATIONAL ENVIRONMENT

3.1 (T) Preflight or ground operation from -5F to +100F (O) Preflight or ground operation from -20F to +120F

3.2 System must be able to operate under long-term exposure to dusty, humid, and marine environments. Periodic maintenance is allowable within maintenance time allocations.

3.3 Packed system must be able to be stored in uncontrolled climate conditions (temperature 0-120F, relative humidity 10-100%, full sunlight exposure, marine conditions) (T) one year without the need for periodic preservation. (O) five years without the need for periodic preservation.

3.4 (T) The system shall be capable of operation in rain up to 0.1 in. per hour. (O) System shall be capable of operation in rain up to 0.3 in. per hour.

4 MAINTENANCE/RELIABILITY

4.1 (T) System shall require no more than two work hours maintenance time to perform 80% of all operational-level maintenance tasks. (O) System shall require no more than one work hour maintenance time to perform 80% of all operational-level maintenance tasks. Work hours may be split between two maintenance personnel (i.e., two persons working for one hour counts as two work hours).

4.2 Operational maintenance should be able to be performed with basic hand tools. Maximum utilization of COTS tools preferred.

5 TRANSPORTABILITY

5.1 Packed UAS shall be transportable via commercial international airfreight when disassembled and loaded into its shipping containers.

5.2 Maximum two-man lift for any individual container. (T) No loaded container is heavier than 164

lbs. (O) No loaded container is heavier than 150.0 lbs.

5.3 Containers shall not exceed 84 linear inches

5.4 Packed GCS shall not weigh more than 84lb.

5.5 No manufacturer-unique tools shall be required for system unpacking, assembly, or breakdown.

Note: Directional or "tracker" antenna solutions do not count against stated GCS weight limits. Packed antenna solutions must still be transportable via commercial airfreight.

6 TRAINING

6.1 (T) Required operator instruction and certification time, 160hrs. (O) Required operator instruction and certification time, 120hrs.

6.2 (T) Required operational level maintainer instruction and certification time, 120hrs. (O) Required operational level maintainer instruction and certification time, 80hrs.

6.3 The GCS should contain flight simulator capability.

6.4 Ability to perform self-guided training via the GCS preferred.

7 REFERENCES FOR FUTURE DISCUSSIONS WITH THE GOVERNMENT

Applicants are encouraged to review the following standards to facilitate clear future conversations with the Government.

7.1 MIL-STD-810H

7.2 MIL-STD-1474E App. C

7.3 STANAG 4586

7.4 MISB ST 0902.8

7.5 MISB ST 0601.16a

7.6 MOD Payload Design Standard Rev 4.0