

## **Visual observation by ground observers.**

**a. What are the skills, knowledge, and certifications of each ground observer to detect other airborne operations (i.e., familiarity with FAR, ATC operations, and procedures, etc.)?**

Ground observers are trained members of the flight crew. Ground observers are trained in airspace awareness and the requirement to deconflict UAS from all other airborne operations.

**b. How will each ground observer detect other airborne operations in comparison to human visual capabilities from the cockpit perspective (on the UAS)?**

The Class D airspace over MAAF is sterilized by MAAF ATC Tower prior to any launch or recovery. The Mission Commander (MC) and ground observers however visually assess the surrounding airspace and are capable of notifying the UAS operator in the event of any potential conflict. In addition to the MC and ground observers, the UAS is provided air traffic services and advisories by MAAF ATC Tower. The VO will take appropriate action to avoid other airborne traffic as instructed by ATC or upon notification by an observer on headset. Should another aircraft flight converge into the flight path of the UAS, the UAS VO will alter its flight path away from the other aircraft.

**c. What are the lateral and vertical range limits that ground observers will be employed?**

The lateral and vertical limits for all ground observers is 1 NM, Surface to 3000ft MSL. The primary ground observer is the Mission Commander who operates from the control booth near the flight line with direct communications with ATC. The MC is assisted by 3 crewmember ground observer on the flight line adjacent to the runway. The UAS does not operate outside of R-4301 at an altitude greater than 3000ft MSL during launch and recovery. The ceiling of the Class D airspace is 3700ft MSL.

**d. What are the communications capabilities between each ground observer and UA pilot?**

Ground observers use headset communications on a common net with the Mission Commander and the Ground Control Station.

**e. How many aircraft will each ground observer be responsible to monitor?**

Observers will only monitor one (1) UAS at a time.

**f. Will any ground observer also pilot the aircraft? No.**

**g. What is the legal connection between each ground observer and the proponent's organization?**

Ground observers include trained military personnel and AAI contractors under contract with Department of the Army.

## **Forward or side-looking cameras**

### **a. What types or models of cameras are being used to detect other airborne operations?**

The Plug in, Optronic Payload Model 200 (POP 200). The POP 200 primary use is to provide either IR or Television (TV) real time imagery down linked from the AV to GCS MPO.

### **b. What are the characteristics of these cameras? (Including field of vision, resolution, scan rates, etc.)**

The Shadow 200 utilizes a POP 200 with two EO/IR sensors.

#### **Sensor #1 – Electrical Optical:**

Type: InSb, 320 x 240 IR Charge-Coupled Device (CCD) array

Resolution: 470 TV lines

Fields of View: 3 Steps

Wide 22 degrees Horizontal x 16.5 degrees Vertical

Medium 6.9 degrees Horizontal x 5.2 degrees Vertical

Narrow 1.72 degrees Horizontal x 1.29 degrees Vertical

Super Narrow 0.85 degrees Horizontal x 0.65 degrees Vertical

#### **Sensor #2 - Infrared:**

Camera Type: InSb, 320 x 240 IR Charge-Coupled Device (CCD) array

Resolution: 470 TV lines

Fields of View: 3 Steps

Wide 22 degrees Horizontal x 16.5 degrees Vertical

Medium 6.9 degrees Horizontal x 5.2 degrees Vertical

Narrow 1.72 degrees Horizontal x 1.29 degrees Vertical

Super Narrow 0.85 degrees Horizontal x 0.65 degrees Vertical

### **c. How will these cameras function in comparison to human visual capabilities from the cockpit perspective (on the UA)?**

Pop 200 cameras have focus and zoom.

### **d. Describe the display system and the presentation available to the pilot.**

Video can be displayed on a dedicated LCD screen at the operator station or as an inset on the control monitor.

### **e. What are the interfaces and communications links between the camera and display system? LOS downlink between vehicle and ground station.**

### **f. What is the reliability of the camera, display, and communications link being used by the pilot? Cameras & displays have a high reliability rate.**

Communications link is redundant. (Primary and back-up Links)



