

**CORRIGENDUM**

**Expression of interest**

**Expression of interest from academic / technical institution of national/international repute for providing solutions for UAV surveillance**

(Design, Implement and support UAV surveillance System for Betla National Park, Jharkhand)

The key objective of the system will be to reduce man animal conflict and poaching with minimal human intervention and to develop algorithms based on machine learning to achieve this goal. The interested institution is expected to take full responsibility of providing three UAVs along with visual daylight cameras and one thermal camera with following technical specifications; operating the system for one year and developing solutions to reduce man animal conflict, poaching and illegal entries with minimum human intervention using algorithms based on machine learning.

**Technical Specifications of the UAV**

**1. One unit of HexaCopter/octacopter:**

This unit is envisioned to be the main work horse for long range video surveillance. Both camera payloads should be swappable as per requirement with minimal effort. And for long range operation it should be pluggable into the antenna tracker detailed in heading 4

**Technical Specification:**

- Min Flight time – 45 minutes with camera payload.
- Min Speed required – 12 m/s.
- Robustness - Ability to withstand adverse weather conditions: Rain, wind tolerance of 9m/s, temperature tolerance range: 0°C to 55°C
- The UAV must be equipped with GPS system and should be capable of doing autonomous missions
- Failsafe options for “out of range”, “battery low” or Bad weather like rain are must. System should provide RTL (return to launch) in such case
- Compatible with antenna tracker.

**1.1 Camera Payload requirements this unit:**

This section describes the specification for swappable camera for this UAV unit.

**1.1.1 Visual Daylight Camera Requirement:**

- Minimum camera resolution – 1920 x 1080 (Full HD mandatory), 3,840 x 2160 (4k preferred)
- Min optical zoom for camera – 20X (digital zoom should not be counted in this)
- Camera zoom should be controllable from Ground station application
- Camera should be controllable from Ground station application

- Camera should provide live view down to ground station
- Camera should always record full resolution video on board the camera irrespective of the view
- Camera should be 3-axis gimbal stabilized. Control of pitch angle through ground stations is mandatory, control of all 3 - axis from ground is desirable.

#### **1.1.2 Thermal camera requirements: -**

- Min Resolution: 640 x 512
- Operating Temperature Range: -0°C to +50°C
- The camera should be 3-axis brushless gimbal stabilized.
- Control of pitch angle through ground stations is mandatory, control of all 3 - axis from ground is desirable.
- Modes – Black hot, Red hot and White hot

### **2. One unit of portable/foldable Quadcopter**

This unit will be used as a field unit and has to be small enough to carry in a regular sized backpack with both thermal and visual sensors integrated. The expectation from this unit is user friendliness rather than topline specification. This portable unit is exempt of the antenna tracker requirement as specified in section 4.

- Minimum Flight time with camera payload included: 20 minutes
- Integrated visual/thermal camera. Visual should be capable of 1920 x 1080 while thermal can be lepton series of cameras. Both these sensors should not require any swapping or connections in field.
- Brushless gimbal stabilization is desirable but not mandatory for this unit. Portability and ease of operation is paramount.
- Full autonomy. The drone should have GPS and be capable of doing autonomous missions.
- Robustness - Ability to withstand adverse weather conditions: Rain, wind tolerance of 9m/s, temperature tolerance range: 0°C to 55°C.
- Failsafe options for “out of range” or “battery low” like conditions are must. System should provide RTL(return to launch) or Land options in such case.

### **3. Fixed wing QuadPlane for Long term mapping**

This will be used for long term pattern analysis of animals and forest activity. The proposed fixed wing solution should be able to map a 10sq km area every two days. Mapping will be done only during the day. Minimum spatial resolution for the generated map should be 10cm/pixel. Long endurance and VTOL capability is must.

#### **Technical Specifications:**

- Min Flight time – 75 minutes with camera payload.
- Min Speed required – 25 m/s.
- Robustness - ability to withstand adverse weather conditions: Rain, wind tolerance of 9m/s, temperature tolerance range: 0°C to 55°C
- The UAV must be equipped with RTK GPS system and should be capable of doing autonomous missions
- Failsafe options for “out of range”, “battery low” or Bad weather like rain are must. System should provide RTL (return to launch) in such case

- Positioning accuracy : Horizontal – 1 cm + 1 ppm, Vertical – 5 cm + 1 ppm

### **3.1 Camera Requirement:**

- Sony QX1 camera or higher sensor size camera. Full frame is preferable.
- Minimum 20MPixels.
- All images should be geotagged using the RTK GPS so that mapping accuracy is good.
- Provider has to take care of all post processing eg. Stitching and animal movement and forestry pattern extraction both in terms of hardware and software.

### **4. Antenna tracker and operational requirements:**

One two axis (pitch and yaw) antenna tracker should be provided for range extension of UAVs.

- Both UAVs should use common communication technology so that they can be easily plugged into antenna tracker for range extension
- The controllers should have a standalone range of minimum 2km. But the equipment of both UAVs should be pluggable to antenna tracker for range extension upto 10kms.
- Antenna Tracker should be tripod mounted and portable.
- All equipment should come in hard case for easy transportation from one place to another.
- The communication technology used should only use ISM license free frequency bands and should honor radiated power regulatory requirement in their respective bands.

### **Operational specifications: -**

- Minimum one year of onsite support must be provided for operational and training purposes. At least one person should be deployed onsite at Betla National Park. This period is in addition to any installation period that might be required. So, this support period starts from the day when all systems are operations.
- All equipment should be accurately rated in terms of its flight time / operational life and warranty in the bid.

### **Research and Development Intention: -**

- The key objective of research will be to reduce man animal conflict, poaching and illegal entries with minimal human intervention and to develop algorithms based on machine learning to achieve this goal.
- Early detection of forest fires and development for alarm systems for the same purpose.
- The institution can collect the surveillance data and can also maintain a presence in the forest by sending experts to the Reserve from time to time.

**The interested institution shall also quote an amount(tentative) for the whole package of the work defined above for one year and the cost for subsequent one year. Operational costs can be billed on monthly basis as well. The interested institutions might be asked for presentation in front of technical evaluation committee.**

**The last day for submission of proposal is 1 PM on 20.03.2017.**

**Divisional Forest Officer,  
Core Area, Tiger Project, Palamau**

