GOVERNMENT OF INDIA
(Ministry of Home Affairs)
DIRECTORATE GENERAL
CENTRAL RESERVE POLICE FORCE
EAST BLOCK-7, SEC-1, R.K. PURAM, NEW DELHI-110066
(Email:- comncell@crpf.gov.in Tele/Fax:011-26107493)

No. B.V-7/2020-21-C (QRs) Dated, the 20th November'2020

To

1. DIG (Comn), ITBP
   Block No. 2, CGO Complex
   Lodhi Road, New Delhi-03

2. DIG (Comn), NSG
   Meharam Nagar
   Palam, New Delhi-37

3. DIG (Comn), SSB
   East Block-V, R.K Puram
   New- Delhi-66

4. AIG (Comn), CISF
   Block No. 13, CGO, Complex
   Lodhi Road, New Delhi-03

5. DIG (Prov), BSF
   Block No. 10, CGO Complex
   Lodhi Road, New Delhi-03

6. Liaison Office, Assam Rifle
   Room No-171, North Block, MHA
   New Delhi -01

Subject: Regarding QRs/TDs of Communication Equipments

Please find enclosed QRs/TDs of "Tethered UAV with Digital VHF Repeater" and QRs/TDs of "Point to Multipoint communication with Aerostat" as Annexure-A & Annexure-B respectively duly approved by the competent authority is forwarded herewith for further necessary action.

Encl: 1.QRs & TDs of "Tethered UAV with Digital VHF Repeater"
2.QRs & TDs of "Point to Multipoint communication with Aerostat"

{P.R.Jha, DC (Comn)}
For DIG (Equipment)
Directorate General, CRPF

QRs of Tethered UAV with Digital VHF Repeater

S N	Parameter	Specifications
1	**Tethered UAV System with digital VHF repeater should consist of following**	
1.1	UAV bird with back up battery pack	
1.2	Tethering power base station	
1.3	Ground control station	
1.4	Day & Night camera payload or Integrated camera payload	
1.5	Digital VHF Repeater and antenna with duplexer	
1.6	Universal battery charger with power supply system	
2	**UAV Characteristics**	
2.1	Role	Seamless surveillance during day & night and enhance communication range
2.2	Launch and Recovery mode	i) Automatic Vertical Take Off and Landing (VTOL)
		ii) Payload should not damage during landing of UAV
2.3	Propulsion system	Electrical with rechargeable batteries
2.4	Payloads carrying capability	Should have capability to carry digital VHF repeater with antenna and Day & Night camera payload or Integrated camera payload at the same time
2.5	Flight Modes	a) Fully Autonomous Vertical Take Off
		b) Fully Autonomous Vertical Landing
		c)Hover at defined fixed altitude
		d) Remote piloted mode for video-based user navigation
		e) Vision based Autonomous Target Tracking of fixed and moving targets
		f) Should be controllable in real time from the GCS up to recovery
		g) Fully autonomous and stabilized
2.6	Endurance	08 hrs with all payloads. After 45 minutes of cooling period, bird will be ready for another 08 hrs operational flights
2.7	Operating Altitude	100m AGL (Above Ground Level) or more
2.8	Launch Altitude	2000m AMSL (Above Mean Sea Level) or more
2.9	Operating Wind Conditions	a) Take off: 20 km/h or more b) Landing: 20 km/h or more c) Operate: 20 km/h or more

S N	Parameter	Specifications
2.10	Failsafe features	a) Automatic Return to Home on communication failure
		b) Automatic Return to Home/Land on low battery and power cut.
		c) Multiple GPS on-board for GPS failure redundancy
		d) Should support power line failure and seamless switching to backup battery
		e) High wind and high temperature indication
		f) Should support one motor failure during flight
3	**Payload characteristics**	
3.1	Payloads required	a) Should have capability to carry digital VHF repeater and antenna with duplexer b) Day & Night camera payload or Integrated camera payload
3.2	Payload and Video Stabilization	a) EO/IR payload should be gimbals stabilized on-board
		b) Video output should be digitally stabilized at all zoom levels
		c) Quality f video should not be affected by UAV vibrations
3.3	Electro optic (EO) Daylight Payload	a) Color Camera with 360° pan and 90° tilt control during flight
		b) Resolution: 1920 × 1080 pixel or better
		c) Optical zoom:-30X or more with minimum-FOV≤5°, maximum- FOV ≥ 45° (wide field). Digital Zoom:- 4X or more
		d) Should be able to detect human size target at 750-meter slant or more
3.4	Thermal Imager (TI) Night Payload	a) Thermal Camera with 360° pan and 90° tilt control during flight
		b) Resolution: 640 X 480pixels or better
		c)White/Black Hot modes
		d) Digital Zoom: 4X or more
		e) Should be able to detect human size target at 400-meter slant or more

S N	Parameter	Specifications
4	**Ground control station characteristics**	
4.1	GCS should be MIL STD-810G or better and IP65 Rugged laptop	
4.2	Computing Hardware	
	CPU	Intel Core i5 v Pro Processor, 2.3 GHz or better
	Storage	1 TB or more
	Memory	4GB or more
	Display	10 inch or more – 1024 x 768 XGA sunlight readable screen, anti-glare
	Keyboard & input	Touch screen
4.3	Battery Operation	Minimum 02 hours at peak utilization
4.4	Battery Charging time of GCS	Should be less than 3.5 hours
4.5	Data portability	Ports for data transfer to external secondary storage devices
4.6	Interface	VGA, HDMI, USB, 10/100/1000 Ethernet
4.7	Capability	a) Transmit control commands to UAV b) Receive UAV flight and propulsion parameters c) Capability to control UAV during the flight
4.8	GCS Application Software	a) Geographic map along with UAV location
		b) Real-time video from the UAV with on-screen display of important parameters like:- i. Coordinate of target ii. UAV Position iii. Height of UAV above ground level iv. Mission time
		c) Geographic map and real-time video should be displayed at all times during the flight.
		d) Geographic map and real-time video views should be resizable and/or switchable to allow user to switch between big map/small video and small map/big video views through a single click/button input
		e) Artificial Horizon indicating UAV altitude
4.9	Payload Controls	a) Selection and switch on/off of payload
		b) Pan/Tilt/Zoom Controls
		c) Point payload to ground co-ordinate function

S N	Parameter	Specifications
4.10	Joystick Controls	a)Full Camera Control Pan/Tilt b)Zoom In/Out Black/White Hot c) RPV Mode d)Altitude Control
4.11	Pre-flight checks	Self-test of UAV system
5	**Communication Link**	
5.1	Communication link equipment capability	i) Transmit control commands from GCS to UAV
		ii) Transmit parameter of UAV and payload to GCS
		iii) Transmit day and night video from UAV to GCS
5.2	Type of link	Digital uplink & downlink with optic fiber cable
5.3	Frequency Band	System should operate on S & C frequency band uplink and down link, preferably on license free band i.e 2.4 GHz or 5.8 GHz
6	**General System requirements**	
6.1	Weight	The weight of complete Tethered UAV bird including battery pack & one payload should ≤ 70 kg
6.2	Assembly/ Disassembly time	Less than15 minutes each
6.3	Environmental Conditions for Operation and Storage	The UAV and associated systems should operate and stored at following environment conditions i) Damp Heat: 40°C at RH not less than 95%
		ii) Operating temperature & Storage temp: -10°C to +55°C
		iii) Ability to withstand dust, drizzle and humid conditions
6.4	Portability and Operation	The tethered UAV should be electrical and battery operated portable, light in weight, compact, for day and night surveillance, capable of being carried and operated by three men
6.5	Battery of AV	The intelligent standard lithium based battery pack should have back up of safely landing aerial vehicle in event of ground transmission power failure
6.6	Battery Charger of AV battery	Suitable universal battery charger to charge the battery.
7	**Tethering Power Base Station**	
7.1	Base station weight	40 kg or less

S N	Parameter	Specifications
7.2	Input Voltage	220 V ±10%
7.3	Wire Winch System	Automatic cable winding and unwinding
7.4	Display	Parameter such as output/input voltage should be displayed
7.5	Ventilation System	Should have ventilation cooling system to avoid system overheating
7.6	Body Material	Should be of insulating material to avoid electrical shock
7.7	Safety Switch	Should have Safety switch to turn system off in case of an accident
8	**Tether Cable**	
8.1	Length	100 mtrs or more
8.2	Tensile Strength	50kg or more
8.3	Insulating covering	Should be of insulating material to avoid electrical shock
9	**Digital VHF Repeater**	
9.1	Protocol	DMR
9.2	RF Power Output	25 watt or more
9.3	Frequency Band	136-174 MHz
9.4	Type	IP based digital VHF Repeater, should be able to transmit data/voice using Ethernet/internet
9.5	Antenna	Antenna with duplexer
9.6	Ethernet Port	IP Ports for VoIP telephony using OFC in tether wire
10	Life of Tethered UAV	The total technical life of tethered UAV should not be less than 5 years and 6000 flying hours whichever is earlier
11	Comprehensive warranty on site	2 years for Tethered UAV system and 1000 flying hours for aerial vehicle and LiPo battery

S N	Parameter	Specifications
12	Accessories	a) Hard transportation boxes with wheels: 1set
		b) Field repair kit: 1 No's
		c) Lithium based battery packs: 1 Nos
		d) User, technical & maintenance manual: 1set
		e) Spare landing gear sets: 1 No's

Insp/Tele. Sukhpal Singh
ITBP

Insp/RM. Apoorv Awasth
BSF

Daud Topno, AC
SSB

Shashi Kant Singh, AD
DCPW

Dr. Raveesh Kumar,PSO(W)
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Harjinder Singh, DIG(Eqpt)
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DIG(Comn),CRPF

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Sanjay Arora, IPS,ADG(HQ)
CRPF

Approved/~~Not Approved~~

Dr. AP Maheshwari, IPS
DG, CRPF

Trial Directives of Tethered UAV with Digital VHF Repeater

S N	Parameter	Specifications	Trial Directives
1	**Tethered UAV System with digital VHF repeater should consist of following**		
1.1	UAV bird with back up battery pack		BOO will check practically.
1.2	Tethering power base station		
1.3	Ground control station		
1.4	Day & Night camera payload or Integrated camera payload		
1.5	Digital VHF Repeater and antenna with duplexer		
1.6	Universal battery charger with power supply system		
2	**UAV Characteristics**		
2.1	Role	Seamless surveillance during day & night and enhance communication range	BOO will check practically.
2.2	Launch and recovery mode	i) Automatic vertical takeoff and landing (VTOL)	
		ii) Payload should not damage during landing of UAV	
2.3	Propulsion system	Electrical with rechargeable batteries	BOO will check practically.
2.4	Payloads carrying capability	Should have capability to carry digital VHF repeater with antenna and Day & Night camera payload or Integrated camera payload at the same time	BOO will check practically.
2.5	Flight modes	a) Fully autonomous vertical take off	BOO will check practically.
		b) Fully autonomous vertical landing	
		c)Hover at defined fixed altitude	
		d) Remote piloted mode for video-based user navigation.	
		e) Vision based autonomous target tracking of fixed and moving targets	
		f). Should be controllable in real time from the GCS up to recovery	
		g). Fully autonomous and stabilized	
2.6	Endurance	08 hrs with all payloads. After 45 minutes of cooling period, bird will be ready for another 08 hrs operational flights	BOO will check practically for 03 cycles of 08 hrs each.
2.7	Operating altitude	100m AGL (Above Ground Level) or more.	BOO will check practically.
2.8	Launch altitude	2000m AMSL (Above Mean Sea Level) or more	Firm will submit OEM certificate.
2.9	Operating wind conditions	a) Take off: 20 km/h or more b) Landing: 20 km/h or more c) Operate: 20 km/h or more	
2.10	Failsafe features	a) Automatic return to home on communication failure	BOO will check practically.
		b) Automatic Return to Home/Land on low battery and power cut	
		c) Multiple GPS on-board for GPS failure redundancy	Firm will submit OEM certificate.

S N	Parameter	Specifications	Trial Directives
		d) Should support power line failure and seamless switching to backup battery.	BOO will check practically and firm will submit OEM certificate.
		e) High wind and high temperature indication	
		f) Should support one motor failure during flight	Firm will submit OEM certificate.
3	**Payload characteristics**		
3.1	Payloads required	a) Should have capability to carry digital VHF repeater and antenna with duplexer. b) Day & Night camera payload or Integrated camera payload	BOO will check practically.
3.2	Payload and video stabilization	a) EO/IR payload should be gimbals stabilized on-board.	BOO will check practically.
		b) Video output should be digitally stabilized at all zoom levels.	
		c) Quality of video should not be affected by UAV vibrations.	
3.3	Electro optic (EO) daylight Payload	a) Color Camera with 360° pan and 90° tilt control during flight.	BOO will check practically.
		b) Resolution: 1920 × 1080 pixel or better	Firm will submit OEM certificate.
		c) Optical zoom:-30X or more with minimum-FOV≤5°, maximum-FOV ≥ 45° (wide field). Digital Zoom:- 4X or more	BOO will check practically & firm will submit OEM certificate.
		d) Should be able to detect human size target at 750-meter slant or more	BOO will check practically.
3.4	Thermal imager (TI) night payload	a) Thermal Camera with 360° pan and 90° tilt control during flight.	BOO will check practically.
		b) Resolution: 640 X 480pixels or better	Firm will submit OEM certificate.
		c)White/Black hot modes	BOO will check practically.
		d) Digital Zoom: 4X or more	
		e) Should be able to detect human size target at 400-meter slant or more	
4	**Ground control station characteristics**		
4.1	GCS should be MIL STD-810G or better and IP65 rugged laptop		Firm will submit certificate of Govt. Lab. or NABL/ILAC accredited laboratory.
4.2	Computing Hardware		
	CPU	Intel Core i5 v Pro Processor, 2.3 GHz or better	BOO will check practically and firm will also submit OEM certificate.

S N	Parameter	Specifications	Trial Directives
	Storage	1 TB or more	BOO will check practically and firm will also submit OEM certificate.
	Memory	4GB or more	
	Display	10 inch or more – 1024 x 768 XGA sunlight readable screen, anti-glare	
	Keyboard & input	Touch screen	
4.3	Battery operation	Minimum 02 hours at peak utilization	
4.4	Battery charging time of GCS	Should be less than 3.5 hours	
4.5	Data portability	Ports for data transfer to external secondary storage devices	
4.6	Interface	VGA, HDMI, USB, 10/100/1000 Ethernet.	
4.7	Capability	a) Transmit control commands to UAV b) Receive UAV flight and propulsion parameters c) Capability to control UAV during the flight	BOO will check practically.
4.8	GCS application software	a) Geographic map along with UAV location	BOO will check practically.
		b) Real-time video from the UAV with on-screen display of important parameters like:- i. Coordinate of target ii. UAV Position iii. Height of UAV above ground level iv. Mission time	
		c) Geographic map and real-time video should be displayed at all times during the flight	
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		e) Artificial horizon indicating UAV altitude.	
4.9	Payload controls	a) Selection and switch on/off of payload	BOO will check practically.
		b) Pan/Tilt/Zoom controls	
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4.10	Joystick controls	a) Full Camera Control Pan/Tilt b) Zoom In/Out Black/White Hot c) RPV Mode d) Altitude Control	BOO will check practically.

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4.11	Pre-flight checks	Self-test of UAV system	BOO will check practically.
5	**Communication Link**		
5.1	Communication link equipment capability	i) Transmit control commands from GCS to UAV	BOO will check practically.
		ii) Transmit parameter of UAV and payload to GCS	
		iii) Transmit day and night video from UAV to GCS	
5.2	Type of link	Digital uplink & downlink with optic fiber cable	Firm will submit OEM certificate
5.3	Frequency Band	System should operate on S & C frequency Band uplink and down link, preferably on license free band i.e 2.4 GHz or 5.8 GHz	Firm will submit OEM certificate
6	**General System requirements**		
6.1	Weight	The weight of complete Tethered UAV bird including battery pack & one payload should ≤ 70 kg	BOO will check practically.
6.2	Assembly/ Disassembly time	Less than15 minutes each	
6.3	Environmental conditions for operation and storage	The UAV and associated systems should operate and stored at following environment conditions. i) Damp heat: 40°C at RH not less than 95%	Firm will submit certificate of Govt lab or NABL/ILAC accredited laboratory
		ii) Operating temperature & Storage temp: -10°C to +55°C	
		iii) Ability to withstand dust, drizzle and humid conditions	
6.4	Portability and operation	The tethered UAV should be electrical and battery operated portable, light in weight, compact, for day and night surveillance, capable of being carried and operated by three men	BOO will check practically.
6.5	Battery of AV	The intelligent standard lithium based battery pack should have back up of safely landing aerial vehicle in event of ground transmission power failure	
6.6	Battery charger of AV battery	Suitable universal battery charger to charge the battery	BOO will check practically and firm will submit OEM certificate.

S N	Parameter	Specifications	Trial Directives
7	**Tethering Power Base Station**		
7.1	Base station weight	40 kg or less	BOO will check practically and firm will submit OEM certificate.
7.2	Input Voltage	220 V ±10%	BOO will check practically and firm will submit OEM certificate.
7.3	Wire Winch System	Automatic cable winding and unwinding	
7.4	Display	Parameter such as Output/Input voltage should be displayed	
7.5	Ventilation System	Should have Ventilation Cooling system to avoid system overheating	
7.6	Body Material	Should be of insulating material to avoid electrical Shock	
7.7	Safety Switch	Should have Safety switch to turn system off in case of an accident	
8	**Tether Cable**		
8.1	Length	100 mtrs or more	BOO will check practically and firm will submit OEM certificate.
8.2	Tensile Strength	50kg or more	Firm will submit OEM certificate.
8.3	Insulating covering	Should be of insulating material to avoid electrical shock	BOO will check practically and firm will submit OEM certificate.
9	**Digital VHF Repeater**		
9.1	Protocol	DMR	BOO will check practically and firm will submit OEM certificate.
9.2	RF Power Output	25 watt or more	
9.3	Frequency Band	136-174 MHz	
9.4	Type	IP based digital VHF Repeater, should be able to transmit data/voice using Ethernet /internet	
9.5	Antenna	Antenna with duplexer.	
9.6	Ethernet Port	IP Ports for VoIP telephony using OFC in tether wire	
10	Life of Tethered UAV	The total technical life of tethered UAV should not be less than 5 years and 6000 flying hours whichever is earlier	Firm will submit undertaking
11	Comprehensive warranty on site	2 years for Tethered UAV System and 1000 flying hours for Aerial Vehicle and LiPo Battery	

S N	Parameter	Specifications	Trial Directives
12	Accessories	a) Hard transportation boxes with wheels: 1set	BOO will check practically.
		b) Field Repair kit: 1 No's	
		c) Lithium based Battery packs: 1 Nos	
		d) User, Technical & Maintenance Manual: 1set	
		e) Spare Landing Gear sets: 1 No's	

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