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-7/2018-19-C (UAV) Dated, the 27th August'2018

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: **Revised QRs/TDs of Micro Unmanned Aerial Vehicle (UAV) (60 Minutes) System.**

Please find enclosed here with revised QRs and TDs in respect of Micro Unmanned Aerial Vehicle (UAV) System (60 Mnutes) as per Annexure-A & Annexure-B respectively duly approved by the competent authority for further necessary action.

Encl: (QRs & TDs of Micro UAV System (60 Mnutes))

27/8

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

For Perusal please.
27/8

DIG (Eqpt)
27/8/18.

No. B.V-7/2018-19-C(UAV) Dated, the 27th August'2018

Copy to:-

SO(IT), MHA, North Block with request to host the QRS and TDs of Micro Unmanned Aerial Vehicle (UAV) System (60 Minutes) on MHA website. Soft copy is being sent through email also.

27/8

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

Annexure "A"

QRs FOR MICRO UNMANNED AERIAL VEHICLE (UAV) SYSTEM (60 Minutes)

SN	Parameter	Specifications
1	**Micro UAV system should consist of the following sub-systems:-**	
1.1	UAV Bird with battery pack	
1.2	Ground Control station with data link equipment	
1.3	Daylight Camera Payload	
1.4	Night Camera Payload	
1.5	Universal Battery Charger with Power Supply System	
2	**Micro UAV characteristics:-**	
2.1	Role	Surveillance, reconnaissance and detection during day and night.
2.2	Launch and Recovery mode	i) Vertical Take Off and Landing (VTOL) from within an area of 25m x 25m clearing or less.
		ii) Payload should not damage during recovery of UAV
2.3	Aural Signature	≤40dbs at 300 meters Above Ground Level
2.4	Payloads carrying capability	Should have capability to carry electro Optic (EO) for day and Thermal Imager (TI) for night one at a time. or Integrated day & Night payload. (As per user requirement)
2.5	Flight Modes	a) Fully Autonomous Vertical Take Off
		b) Fully Autonomous Vertical Landing
		c)Hover at defined waypoint
		d) Autonomous waypoint navigation (pre-defined as well as dynamically adjustable waypoints during flight)
		e) Remote Piloted mode for video based user navigation.
		f) Vision based Autonomous Target Tracking of fixed and moving targets.
		g) Should be controllable in real time from the GCS up to recovery.
		h) Fully autonomous and stabilized.
2.6	Endurance	60 minutes or more with all payloads at Mean Sea Level.

SN	Parameter	Specifications
2.7	Operating Altitude	400m AGL (Above Ground Level) or more.
2.8	Launch Altitude	2000m AMSL (Above Mean Sea Level) or more
2.9	Range of Operation	Minimum 5 km line of sight
2.10	Cruise Speed	25 km/h or more
2.11	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
2.12	Failsafe features	a) Automatic Return to Home on communication failure
		b) Automatic Return to Home/Land on low battery
		c) Multiple GPS on-board for GPS failure redundancy
2.13	Propulsion system	Electrical with rechargeable batteries
3.	**Payload characteristics:-**	
3.1	Payloads required	a) Electro Optic (EO) for day (colour) b) Thermal Imager (TI) for night or c) Integrated day & night payload. (As per user requirement)
3.2	Payload and Video Stabilization	a) All payloads should be gimbals stabilized on-board.
		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) Colour Camera with 360° pan and 90° tilt control during flight.
		b) Resolution: 1280 X 720 pixel or better

SN	Parameter	Specifications
		c) Optical Zoom: 10X zoom with minimum-FOV≤5°, maximum-FOV ≥ 45° (wide field). Digital zoom: 4X
		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 480 pixels 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
3.5	Night Recovery Beacon	Switchable (from GCS) LED light when operating with Night Payload
4.	**Ground Control Station characteristics:-**	
4.1	Option-1: GCS should have MIL-STD-810G or better and IP51 or better, semi rugged laptop. Option-2: GCS should have MIL-STD-810G or better and IP65 or better, rugged laptop. (As per user requirement)	
4.2	Computing Hardware :-	
	CPU	Intel Core i5 v Pro Processor, 2.3 GHz or better
	Storage	Minimum 500 GB
	Memory	2GB or more
	Display	Minimum 10 inch – 1024 x 768 XGA sunlight readable screen, anti-glare.
	Keyboard & input	Touch screen
4.3	Battery Operation	Minimum 02 hours at peak utilisation.
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.

SN	Parameter	Specifications
4.7	Capability	a) Transmit control commands to UAV. b) Receive UAV flight and propulsion parameters. c) Receive, display and record real time day and night video from UAV. d) Capability to control UAV while on the move.
4.8	GCS Application Software	a) Geographic Map along with UAV location, UAV trajectory, camera view polygon, waypoints and flight plan.
		b) Real-time video from the UAV with on-screen display of important parameters like:- i. Coordinate of target ii. Ground altitude of target iii. UAV Position iv. Height of UAV above ground level v. Distance of UAV from GCS vi. Bearing (Azimuth) of UAV from GCS vii. Ground speed of UAV viii. UAV Heading/ True North indication ix. 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.
		f) Switchable between 2D/3D views, capability to Tilt/rotate 3D map as per user input.
4.9	Map Formats	a) Should have the capability to integrate geo-referenced raster maps provided in at least one of the commonly used digital map formats (GIF, TIFF, DTED and SRTM etc.)
		b) Should be able to work with Google Maps, application should have the capability to download maps automatically after specifying location GPS co-ordinates.

SN	Parameter	Specifications
4.10	Payload Controls	a) Selection and switch on/off of payload
		b) Pan/Tilt/Zoom Controls
		c) Point payload to ground co-ordinate function
		d) Recording on/off
		e) Switch on/off Night Recovery Beacon
4.11	Joystick Controls	i. Full Camera Control Pan/Tilt Zoom In/Out Black/White Hot ii. RPV Mode iii. Altitude Control
4.12	Video	a) Video should be recorded in any commonly portable video formats (AVI/MPEG/ MP4 etc)
		b) Video of the full flight should be recorded
		c) Should have capability to take image snapshots at any time during flight
		d) Software should be provided that will facilitate extraction of imagery from the recorded video post flight
4.13	Pre-flight checks	Self-test of UAV system, Output: go/no go
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	Secured digital uplink & downlink with AES encryption.
5.3	Frequency Band	System should operate on S & C frequency Band uplink and down link, preferably on license free band i.e 2.4Ghz or 5.8 Ghz.
6.	**General System requirements:-**	
6.1	Weight	The weight of complete Micro UAV bird including battery pack & one payload should ≤ 6kg.
6.2	Assembly/ Disassembly time	Less than10 minutes each.
6.3	Life of Micro UAV	The total technical life of micro UAV should not be less than 500 landings.

SN	Parameter	Specifications
6.4	Environmental Conditions for Operation and Storage	The UAV and associated systems should be certified for operation and storage for 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
6.5	Portability and Operation	The Micro UAV should be battery operated portable, light in weight, compact, for day and night surveillance, capable of being carried and operated by two men.
6.6	Battery of AV	The intelligent standard lithium based battery pack should have the backup of minimum 60 minutes.
6.7	Battery Charger of AV battery	Suitable universal battery charger to charge the batteries within two to three hours.
6.8	Accessories	a) Water proof Back Packs IP66: 1 set
		b) Field Repair kit: 1 No's
		c) Lithium based Battery packs: 3No's
		d) Spare propeller Sets: 2 No's
		e) Spare Landing Gear sets: 2 No's
		f) Associated Cables & Mountings: 1set
		g) Hard transportation boxes: 1set
		h) User, Technical & Maintenance Manual: 1set
		i) Log book : 1 set

WO/RM R.S.Dhaka
Assam Rifles

INSP/T V.K.Kothiyal
BSF

INSP.Rajeev Dahiya
CISF

J.K.Sharma, DC(MOE)
SSB

P.R.Jha,DC(UAV)
CRPF

B.N.Sonawan, 2 I/C
ITBP

Harjinder Singh,DIG(Eqpt)
CRPF

D.S.Rawat ,DIG(Comn)
CRPF

Raju Bhargava. IPS, IG(Comn &IT),
CRPF

R.P.Singh. IPS, SDG(Comn)
CRPF

Approved/Not Approved

Rajeev Rai Bhatnagar,IPS
DG, CRPF

Annexure "B"

TRIAL DIRECTIVES OF MICRO UNMANNED AERIAL VEHICLE (UAV) SYSTEM (60 Minutes)

Trial/Technical evaluation of UAV will be conducted by a Board of Officers (B.O.O.) to assess actual performance of the equipment.

2. All parameters/Specifications mentioned in QRs will be checked by the Board of Officers in the presence of representative of firm.

i) **Physically check**:- In this category, specifications of the equipment will be checked physically as per QRs.

ii) **Practically check**:- The representative of firm will show all the features/ configuration of the equipment to the board of officers during trial.

iii) **Submission of certificates**:- Firm will provide certificate from Govt. Lab. or DRDO or NABL accredited or ILAC accredited laboratory which are mentioned in respective parameters.

SN	Parameter	Specifications	Trial directives
1	**Micro UAV system should consist of the following sub-systems:-**		
1.1	UAV Bird with battery pack		Board will check physically and practically.
1.2	Ground Control station with data link equipment		
1.3	Daylight Camera Payload		
1.4	Night Camera Payload		
1.5	Universal Battery Charger with Power Supply System		
2	**Micro UAV characteristics:-**		
2.1	Role	Surveillance, reconnaissance and detection during day and night.	Board will check practically.
2.2	Launch and Recovery mode	i) Vertical Take Off and Landing (VTOL) from within an area of 25m x 25m clearing or less.	Board will check practically.
		ii) Payload should not damage during recovery of UAV	
2.3	Aural Signature	≤40dbs at 300 meters Above Ground Level	The firm will submit certificate of Govt. Lab. or DRDO or NABL or ILAC accredited laboratory.
2.4	Payloads carrying capability	Should have capability to carry electro Optic (EO) for day and Thermal Imager (TI) for night one at a time. or Integrated day & Night payload. (As per user requirement)	Board will check practically.

SN	Parameter	Specifications	Trial directives
2.5	Flight Modes	a) Fully Autonomous Vertical Take Off	Board will check practically.
		b) Fully Autonomous Vertical Landing	Board will check practically.
		c) Hover at defined waypoint	Board will check practically.
		d) Autonomous waypoint navigation (pre-defined as well as dynamically adjustable waypoints during flight)	Board will check practically.
		e) Remote Piloted Mode for video based user navigation.	Board will check practically.
		f) Vision based Autonomous Target Tracking of fixed and moving targets.	Board will check practically.
		g) Should be controllable in real time from the GCS up to recovery.	Board will check it practically.
		h) Fully autonomous and stabilized.	Board will check it practically.
2.6	Endurance	60 minutes or more with all payloads at Mean Sea Level.	Board will check practically with maximum payload up to launch altitude of 1000 meter Above Mean Sea Level (AMSL).
2.7	Operating Altitude	400m AGL (Above Ground Level) or more.	Board will check practically.
2.8	Launch Altitude	2000m AMSL (Above Mean Sea Level) or more	Firm will submit OEM certificate.
2.9	Range of Operation	Minimum 5 km line of sight	Board will check practically.
2.10	Cruise Speed	25 km/h or more	Board will check practically.
2.11	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	Board will check practically or firm will also submit OEM certificate.
2.12	Failsafe features	a) Automatic Return to Home on communication failure	Board will check practically.
		b)Automatic Return to Home/ Land on low battery	Board will check practically.
		c) Multiple GPS on-board for GPS failure redundancy	Firm will submit OEM certificate.

SN	Parameter	Specifications	Trial directives
2.13	Propulsion system	Electrical with rechargeable batteries	Board will check practically.
3.	**Payload characteristics:-**		
3.1	Payloads required	a) Electro Optic (EO) for day (colour) b) Thermal Imager (TI) for night or c) Integrated day & night payload. (As per user requirement)	Board will check practically after fitting the required payloads and ensure that UAV working satisfactorily.
3.2	Payload and Video Stabilization	a) All payloads should be gimbals stabilized on-board.	Board will check practically all parameters.
		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) Colour Camera with 360° pan and 90° tilt control during flight.	Board will check practically and ensure day payload working as per their parameters and firm will also submit OEM certificate for resolution and FOV.
		b) Resolution: 1280 X 720 pixel or better	
		c) Optical Zoom: 10X zoom with minimum-FOV≤5°, maximum-FOV ≥ 45° (wide field). Digital zoom: 4X	
		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.	Board will check practically and ensure night payload working as per their parameters and firm will also submit OEM certificate for resolution and FOV.
		b. Resolution: 640 X 480 pixels 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	
3.5	Night Recovery Beacon	Switchable (from GCS) LED light when operating with Night Payload	Board will check practically.
4.	**Ground Control Station characteristics:-**		
4.1	Option-1: GCS should have MIL-STD-810G or better and IP51 or better, semi rugged laptop. Option-2: GCS should have MIL-STD-810G or better and IP65 or better, rugged laptop. (As per user requirement)		Firm will submit certificate of Govt. Lab. or NABL accredited or ILAC accredited laboratory.

SN	Parameter	Specifications	Trial directives
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.
	Storage	Minimum 500 GB	
	Memory	2GB or more	
	Display	Minimum 10 inch – 1024 x 768 XGA sunlight readable screen, anti-glare.	
	Keyboard & input	Touch screen	
4.3	Battery Operation	Minimum two hours at peak utilisation.	Board will check practically.
4.4	Battery Charging time of GCS	Should be less than 3.5 hours	Board will check practically.
4.5	Data portability	Ports for data transfer to external secondary storage devices	Board will check practically.
4.6	Interface	VGA/HDMI, USB, 10/100/1000 Ethernet.	Board will check practically.
4.7	Capability	a) Transmit control commands to UAV. b) Receive UAV flight and propulsion parameters. c) Receive, display and record real time day and night video from UAV. d) Capability to control UAV while on the move.	Board will check capability.
4.8	GCS Application Software	a) Geographic Map along with UAV location, UAV trajectory, camera view polygon, waypoints and flight plan.	Board will check practically.
		b) Real-time video from the UAV with on-screen display of important parameters like:- i. Coordinate of target ii. Ground altitude of target iii. UAV Position iv. Height of UAV above ground label v. Distance of UAV from GCS vi. Bearing (Azimuth) of UAV from GCS vii. Ground speed of UAV viii. UAV Heading/ True North indication ix. Mission time	

SN	Parameter	Specifications	Trial directives
		c) Geographic map and real-time video should be displayed at all times during the flight.	Board will check practically.
		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.	
		f) Switchable between 2D/3D views, capability to Tilt/rotate 3D map as per user input.	
4.9	Map Formats	a) Should have the capability to integrate geo-referenced raster maps provided in at least one of the commonly used digital map formats (GIF, TIFF, DTED and SRTM etc.)	Board will check practically.
		b) Should be able to work with Google Maps, application should have the capability to download maps automatically after specifying location GPS co-ordinates.	
4.10	Payload Controls	a) Selection and switch on/off of payload	Board will check practically.
		b) Pan/Tilt/Zoom Controls	
		c) Point payload to ground co-ordinate function	
		d) Recording on/off	
		e) Switch on/off Night Recovery Beacon	
4.11	Joystick Controls	i. Full Camera Control Pan/Tilt Zoom In/Out Black/White Hot ii. RPV Mode iii. Altitude Control	Board will check practically.
4.12	Video	a) Video should be recorded in any commonly portable video formats (AVI/MPEG/ MP4 etc)	Board will check practically.
		b) Video of the full flight should be recorded	
		c) Should have capability to take image snapshots at any time during flight	
		d) Software should be provided that will facilitate extraction of imagery from the recorded video post flight	

SN	Parameter	Specifications	Trial directives
4.13	Pre-flight checks	Self-test of UAV system, Output: go/no go	Board will check practically.
5.	**Communication Link:-**		
5.1	Communication link equipment capability	i) Transmit control commands from GCS to UAV	Board 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	Secured digital uplink & downlink with AES encryption.	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 Micro UAV bird including battery pack & one payload should ≤ 6kg.	Board will check practically.
6.2	Assembly/ Disassembly time	Less than10 minutes each.	Board will check practically.
6.3	Life of Micro UAV	The total technical life of micro UAV should not be less than 500 landings.	Firm will submit OEM certificate.
6.4	Environmental Conditions for Operation and Storage	The UAV and associated systems should be certified for operation and storage for following environment conditions.	Firm will submit certificate of Govt. Lab. or NABL accredited or ILAC accredited laboratory.
		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	

SN	Parameter	Specifications	Trial directives
6.5	Portability and Operation	The Micro UAV should be battery operated portable, light in weight, compact, for day and night surveillance, capable of being carried and operated by two men.	Board will check practically.
6.6	Battery of AV	The intelligent standard lithium based battery pack should have the backup of minimum 60 minutes.	Board will check practically and firm will also submit OEM certificate for chemistry of battery.
6.7	Battery Charger of AV battery	Suitable universal battery charger to charge the batteries within two to three hours.	Board will check practically.
6.8	Accessories	a) Water proof Back Packs IP66: 1 set	Board will check physically and firm will also submit certificate of Govt. Lab. or NABL accredited or ILAC accredited laboratory for IP66.
		b) Field Repair kit: 1 No's	
		c) Lithium based Battery packs; 3No's	
		d) Spare propeller Sets: 2 No's	
		e) Spare Landing Gear sets: 2 No's	
		f) Associated Cables & Mountings: 1set	
		g) Hard transportation boxes: 1set	
		h) User, Technical & Maintenance Manual: 1set	
		i) Log book : 1 set	

WO/RM R.S.Dhaka
Assam Rifles

INSP/T V.K.Kothiyal
BSF

INSP.Rajeev Dahiya
CISF

J.K.Sharma, DC(MOE)
SSB

P.R.Jha,DC(UAV)
CRPF

B.N.Sonawan, 2 I/C
ITBP

Harjinder Singh,DIG(Eqpt)
CRPF

D.S.Rawat ,DIG(Comn)
CRPF

Raju Bhargava, IPS, IG(Comn &IT),
CRPF

R.P.Singh, IPS, SDG(Comn)
CRPF

Approved/Not Approved

Rajeev Rai Bhatnagar,IPS
DG, CRPF