Annexure-c

QRs FOR MICRO UNMANNED AERIAL VEHICAL (UAV) SYSTEM (60 minutes)

SN	Parameter	Specification
1	**Micro UAV system Should consist of the fallowing 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 &night.
2.2	Launch and recovery mode	I-vertical takeoff and landing (VTOL)from within an area of 25x25m clearing or less.
		ii- payload should not damage during recovery of UAV
2.3	AURAL SIGNATURE	=/<40 dbs at 300 meters above Ground Level
2.4	Payload 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 mode	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 waypoint 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 l level.
2.7	Operating altitude	400m AGL (ABOVE GROUND LEVEL) or more.
2.8	Launch altitude	2000m ASML (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:20km/h or more
		c) operate:20km/h or more
2.12	Failsafe feature	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 optics (EO) for day (color)
		b) thermal imager(TI) for night
		c) integrated day & night payload (as per user requirement)
3.2	Payload and video stabilization	a) all payload 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) Color camera with 360° pan and 90° tilt control during flight.
		a) Resolution 1280x720 pixel or better.
		b) optical zoom: 10x zoom with minimum FOV=<5°, maximum FOV >=45°(wide field).digital zoom:4x
		c) 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: 640x480 pixel 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	2 GB or more
	display	Minimum 10 inch-1024x768 XGA sunlight readable screens, anti glare.
	Keyboard & input	Touch screen
4.3	Battery operation	Minimum 2 hour at peak utilization.
4.4	Battery charging time of GCS	Should be less than 3.5 hours
4.5	Data portability	Port for data transfer to external secondary storage device
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 – 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 onscreen display of important parameters like:-

		1 – coordinate of target 2- Ground altitude of target. 3- UAV position 4- height of UAV above ground level 5- Distance of UAV from GCS. 6- Bearing (azimuth) of UAV from agcs. 7- Ground speed of UAV. 8- UAV heading /true north indication 9- 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-reference 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 capacity to download maps automatically after specifying location GPS CO- ordination.
4.10	Payload control	A – selection and switch on/off payload
		b- pan/tilt/zoom controls.
		c- Point payload to ground co-ordinate function.
		d- recording on/off
		e- Switch off/on night recovery beacon.
4.11	Joystick control	1 – full camera control ,pan/tilt/zoom in/zoom out, black/white hot
		2- RPV mode
		2- altitude control

4.12	video	A – video should be recorded in any commonly portable video format (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	1 – Transmit control commands from GCS to UAV.
		2- Transmit parameter of UAV and payload to GCS.
		3- 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. 2.4 GHz to 5.8 GHz.
6	**General system requirement**	
6.1	weight	The weight of complete micro UAV bird including battery pack & one payload should =< 6 kg.
6.2	Assembly/disassembly times	Less than 10 minutes.
6.3	Life of micro UAV	The total technical life of micro UAV should not be less than 500 landing.
6.4	Environmental condition for operation and storage	The UAV and associated systems should be certified for operation and storage for fallowing environment condition. 1 – damp heat 40 ^{0} C at RH not less than 95% 2- operating temperature& storage temperature: -10 ^{0}C to +55^{0} C 3 – ability to withstand dust, drizzle and humid condition
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 intelligence 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 the 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: 3 no's
		d- spare propeller sets: 2 no's
		e- spare landing gear sets: 2 no's
		f- associated cables& mounting: 1 set
		g- hard transportation boxes: 1 no.
		h- user, technical & maintenance manual: 1 set
		I – log book:1 set