QRs FOR MINI UNMANNED AERIAL VEHICLE

S.N.	Parameter	Specification		
1	UAS (As a System)	a.	Aerial Vehicle	02
		b.	Ground Control System	01
		c.	Remote Video Terminal	01
		d.	Day & Night Camera	02 each
			or Integrated both day and night camera in one payload case. (As per user requirement)	02
		e.	Data link Equipment/ Antenna	01
		f.	Battery / Battery set for each Aerial Vehicle	04
		g.	Water resistance (IP66) back packs to carry UAS	03
		h.	Rugged, compact and lightweight transportation box	03
2	Aerial vehicle (AV)	a	Air frame should be made of composite material rugged, durable and robust.	
		b	The parts should be modular and easy to replace /maintain.	
		c	Fitment, removal and/or replacement of sensors/payload should be simple and easily executable in field conditions.	
		d	Suitable battery charger using normal commercial supply to charge the batteries.	
		e	The Aerial vehicle should have the capability to operate during day and night.	
3	Weight	a	Maximum Takeoff Weight - As per DGCA guidelines for Small category UAV	
		b	The complete weight of UAS should not be more than 40 Kg and system should be packable in three backpacks. Aerial Vehicle- 01 Ground Control System- 01 Remote Video Terminal- 01 Data link equipment/Antenna- 01 Day and Night cameras- 01 each Battery /Battery set for aerial vehicle- 02 Waterproof (IP66) backpacks - 03	
		c	Each back pack should not be more than 15 kgs including the weight of back packs.	
4	Launch and Recovery	Vertical Takeoff and Landing (VTOL) within the area of 25 X25 meter.		

S.N	Parameter	Specification	
5	Deployment time	Not more than 20 minutes.	
6	Aural signature	≤ 40 dB @ 300 meters AGL (Above Ground Level)	
7	Wind Speed	The AV should be able to Takeoff, Land and Fly upto the wind speed of 20 knots.	
8	Propulsion	The AV should be powered by battery.	
9	Operational Endurance	2 Hours with minimum loiter time of 60 minutes at full range with max payload up to launch altitude of 1000 meter above mean sea level.	
10	Mission Range	Minimum 15 Km	
11	Altitude	a.	Minimum Operational Altitude: 1000 meter AGL (Above Ground Level)
		b.	Max Launch Altitude: 3000 meter AMSL (Above Mean Sea Level)
12	Temperature	Starting, Operating and Storage Temperature – From Minus 5°C to Plus 55°C	
13	Flight Modes	The AV should be able to operate in following modes –	
		a	Fully Autonomous Mode
		b	Semi Autonomous Mode
		c	Loiter Mode
		d	Target tracking Mode
		e	Return to home mode
14	Payload	a	The payload should have Gyro based stabilised cameras.
		b	Single payload assembly housing for day / night camera. or Integrated both day and night camera in one payload case. (As per user requirement)
		c	Payload should not damage during rough landings.
		d	Locking and auto tracking of the selected target in the video imagery.
		e	360° pan and 90° tilt control during flight for Day and Night payloads independent of "YAW" movement of the UAV.

<table>
<tr><th>S.N</th><th>Parameter</th><th colspan="4">Specification</th></tr>
<tr><td></td><td></td><td>f</td><td colspan="3">UAV should transmit real time imagery to GCS
<u>Day payload</u>-
i. 0 to 15 km–1280 x 720p or better
<u>Night Payload</u>-
i. 0 to 15 km – 640 x 480 or better</td></tr>
<tr><td></td><td></td><td>g</td><td colspan="3">Capabilities of payload</td></tr>
<tr><td></td><td></td><td></td><td>Parameter</td><td>Night Payload</td><td>Day payload</td></tr>
<tr><td></td><td></td><td></td><td>Resolution (Minimum)</td><td>640 X 480 pixels or better</td><td>1280 X 720 pixels or better</td></tr>
<tr><td></td><td></td><td></td><td>Digital Zoom</td><td>4X or more</td><td>4X or more</td></tr>
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<tr><td></td><td></td><td></td><td>NFOV</td><td>----------</td><td>≤5°</td></tr>
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<tr><td>15</td><td>Target Detection, Recognition, Identification (Minimum Slant range)</td><td colspan="4">The system must be able to detect, acquire and designate targets up to maximum mission range of 15 Km in the following criteria:-</td></tr>
<tr><td></td><td></td><td colspan="2">Payload</td><td>Vehicle size (6x3 meter)</td><td>Group of 3-4 People</td></tr>
<tr><td></td><td></td><td colspan="4">Day payload</td></tr>
<tr><td></td><td></td><td colspan="2">Detection</td><td>2000 m</td><td>1000 m</td></tr>
<tr><td></td><td></td><td colspan="2">Recognition & Identification</td><td>500 m</td><td>500 m</td></tr>
<tr><td></td><td></td><td colspan="4">Night payload</td></tr>
<tr><td></td><td></td><td colspan="2">Detection & Recognition</td><td>1250 m</td><td>500 m</td></tr>
</table>

S.N	Parameter	Specification	
16	Ground control station (GCS)	a	The GCS should be portable, MIL-STD-810G or better.
			Rugged IP65 tablet/laptop, minimum display size 10" or more or Semi-rugged IP52 tablet/laptop, minimum display size 10" or more (As per user requirement)
		b	Battery backup upto 3 Hrs.
		c	Suitable battery charger using normal commercial supply.
		d	It should be able to control all aspects like pre-flight checks, self tests, control of takeoff/landing and payloads.
		e	Digital Mass storage: 1 TB for laptop or 512 GB for Tablet
		f	The laptop or tablet should have sunlight readable and touch screen.
		g	It should facilitate recording and playback of data.
		h	In flight, change of flight plan or waypoint.
		i	Suitable ports should be provided for taking the data.
		j	It should be capable of storing 100 or more flight routes with each route having capacity to configure minimum 70 waypoints.
		k	The software should have following mission information:- i. Coordinates of target ii. AV position iii. Distance of AV from GCS iv. Air speed v. Mission Time vi. Payload looking angle vii. Communication link status viii. GPS status ix. Health status of AV battery

S.N	Parameter		Specification	
17	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	Ability to display 3D maps with the digital terrain data provided. Option to switch between 2D and 3D maps in real time.	
18	Remote Video Terminal (RVT)	a	It should be minimum 10 inches tablet, must be MIL-STD-810G or more and IP65 or more, compact, light weight and portable with wrist/chest mountable holder. (As per user requirement)	
		b	UAV should be able to transmit video to RVT at a minimum distance of 3 Km or more from UAV.	
		c	RVT to have capability to display video, map and OSD (On screen display) similar to GCS.	
		d	Capable to record, playback and freeze the imagery received from AV.	
		e	RVT should have sunlight readable and touch screen.	
19	Data link	a	Secure communication links between Air Vehicle and Ground Control Station with minimum 128 bits encryption.	
		b	Should operate on S-band and / or C-band frequency for uplink and down link preferably on license free band i.e. 2.4GHz or 5.8 GHz.	
20	Failsafe features	a	In case of communication loss during flight, the system should automatically change to recovery mode after 10 seconds, till such time UAV should remain on its flight path.	
		b	Automatic Return to Home/Land on low battery.	
		c	Multiple GPS on-board for GPS failure.	
		d	There should be facility for on board light to facilitate visual signature for recovery, the operation of which should be GCS controlled.	
21	Miscellaneous	a	The comprehensive warranty of the UAS	2 yrs
		b	Total technical life (TTL)	5 yrs or 750 landings
		c	Life of AV battery	200 charging cycles or 2 years, whichever is earlier.

S.N	Parameter	Specification		
		d	Product support after warranty	up to 3 yrs
		e	Repair and maintenance including periodicity of midlife interventions/intent towards establishing maintenance hubs etc.	

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Trial Directives of Mini UAV

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.

S.N	Parameter	Specification			Trial directives
1	UAS (As a System)	a.	Aerial Vehicle	02	Board will check physically.
		b.	Ground Control System	01	Board will check physically.
		c.	Remote Video Terminal	01	Board will check physically.
		d.	Day & Night Camera	02 each	Board will check physically.
			or Integrated both day and night camera in one payload case. (As per user requirement)	02	Board will check physically.
		e.	Data link Equipment/ Antenna	01	Board will check physically.
		f.	Battery / Battery set for each Aerial Vehicle	04	Board will check physically. For single battery : 04 batteries or For battery set: 04 sets
		g.	Water resistance (IP66) back packs to carry UAS	03	Firm will produce certificate of Govt. Lab. or NABL/ILAC accredited laboratory.
		h.	Rugged, compact and lightweight transportation box	03	Board will check physically.
2	Aerial vehicle (AV)	a	Air frame should be made of composite material rugged, durable, and robust.		Board will check physically and firm will produce OEM certificate.
		b	The parts should be modular and easy to replace /maintain.		

S.N	Parameter	Specification		Trial directives
		c.	Fitment, removal and/or replacement of sensors/payload should be simple and easily executable in field conditions.	Board will check physically and firm will produce OEM certificate.
		d.	Suitable battery charger using normal commercial supply to charge the batteries.	
		e.	The Aerial vehicle should have the capability to operate during day and night.	
3	Weight	a.	Maximum Takeoff Weight - As per DGCA guidelines for Small category UAV	Board will check practically.
		b.	The complete weight of UAS should not be more than 40 Kg and system should be packable in three back packs. Aerial Vehicle- 01 Ground Control System- 01 Remote Video Terminal- 01 Data link equipment/Antenna- 01 Day and Night cameras- 01 each Battery /Battery set for aerial vehicle- 02 Waterproof (IP66) backpacks - 03	
		c.	Each back pack should not be more than 15 kgs including the weight of back packs.	
4	Launch and Recovery	Vertical Takeoff and Landing (VTOL) within the area of 25 X25 meter.		Board will check practically.
5	Deployment time	Not more than 20 minutes.		Board will check practically.
6	Aural signature	≤ 40 dB @ 300 meters AGL (Above Ground Level)		Firm will produce certificate of Govt. Lab. or DRDO or NABL/ ILAC accredited laboratory.
7	Wind Speed	The AV should be able to Takeoff, Land and Fly up to the wind speed of 20 knots.		Firm will produce OEM certificate.
8	Propulsion	The AV should be powered by battery.		Board will check practically.

S.N	Parameter	Specification	Trial directives
9	Operational Endurance	2 Hours with minimum loiter time of 60 minutes at full range with max payload up to launch altitude of 1000 meter above mean sea level.	Board will check practically and Firm will produce OEM certificate. Acceptable for degradation in endurance 10% per 1000 meter beyond 1000 meter above mean sea level.
10	Mission Range	Minimum 15 Km	Board will check practically.
11	Altitude	a. Minimum Operational Altitude: 1000 meter AGL (Above Ground Level)	Board will check practically.
		b. Max Launch Altitude: 3000 meter AMSL (Above Mean Sea Level)	Firm will produce OEM certificate.
12	Temperature	Starting, Operating and Storage Temperature – From Minus 5°C to Plus 55°C	Firm will produce certificate of Govt. Lab. or NABL/ILAC accredited laboratory.
13	Flight Modes	The AV should be able to operate in following modes –	Board will check practically.
		a Fully Autonomous Mode	
		b Semi Autonomous Mode	
		c Loiter Mode	
		d Target tracking Mode	
		e Return to home mode	
14	Payload	a The payload should have Gyro based stabilised cameras.	Firm will produce OEM certificate.
		b Single payload assembly housing for day / night camera. or Integrated both day and night camera in one payload case. (As per user requirement)	Board will check physically.

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<tr><th>S.N</th><th>Parameter</th><th colspan="4">Specification</th><th>Trial directives</th></tr>
<tr><td></td><td></td><td>c</td><td colspan="3">Payload should not damage during rough landings.</td><td>Board will check practically.</td></tr>
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<tr><td></td><td></td><td>f</td><td colspan="3">UAV should transmit real time imagery to GCS
<u>Day payload</u>-
i. 0 to 15 km–1280 x 720p or better
<u>Night Payload</u>-
i. 0 to 15 km – 640 x 480 or better</td><td>Board will check practically real time imagery and firm will produce OEM certificate.</td></tr>
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<tr><td>15</td><td>Target Detection, Recognition, Identification (Minimum Slant range)</td><td colspan="4">The system must be able to detect, acquire and designate targets upto maximum mission range of 15 Km in the following criteria:-<table><tr><td>Payload</td><td>Vehicle size (6x3 meter)</td><td>Group of 3-4 People</td></tr></table></td><td>Board will check practically.
Detection- Ability to distinguish an object from the background.
Recognition- Ability to classify the object class (Animal, Human, Vehicle, Boat etc)
Identification- Ability to describe the object in details (man with weapon, hat, Uniform / Colour of Cloths, type / colour of vehicle)</td></tr>
</table>

S.N	Parameter	Specification			Trial directives
		Day payload			During Recognition and Identification, UAV should be able to descend up to the height of 500 mtr AGL. However due to geographical or physical constraints like thick foliage, undulating terrain or LOS constraints, the UAV should be able to do recognition and Identification from 800 mtrs AGL at full range.
		Detection	2000 m	1000 m	
		Recognition & Identification	500 m	500 m	
		Night payload			
		Detection & Recognition	1250 m	500 m	Board will check practically. Detection- Ability to distinguish an object. Recognition- Ability to classify the object class (Animal, Human, Vehicle, Boat etc) During Recognition, UAV should be able to descend upto the height of 500mtrs AGL. However due to geographical or physical constraints like thick foliage, undulating terrain or LOS constraints, the UAV should be able to do recognition from 800 mtrs AGL

S.N	Parameter	Specification		Trial directives
16	Ground control station (GCS)	The GCS should be portable, MIL-STD-810G or better.		Firm will produce certificate of Govt. Lab. or NABL/ILAC accredited laboratory for MIL-STD-810G and IP. Board will check display size practically.
		a	Rugged IP65 tablet/laptop, minimum display size 10" or more or Semi-rugged IP52 tablet/laptop, minimum display size 10" or more (As per user requirement)	
		b	Battery backup upto 3 Hrs.	Board will check practically.
		c	Suitable battery charger using normal commercial supply.	Firm will produce OEM certificate.
		d	It should be able to control all aspects like pre-flight checks, self tests, control of takeoff/landing and payloads.	Board will check practically.
		e	Digital Mass storage: 1 TB for laptop or 512 GB for Tablet	Board will check practically.
		f	The laptop or tablet should have sunlight readable and touch screen.	Board will check practically.
		g	It should facilitate recording and playback of data.	Board will check practically.
		h	In flight, change of flight plan or waypoint.	Board will check practically
		i	Suitable ports should be provided for taking the data.	Board will check practically
		j	It should be capable of storing 100 or more flight routes with each route having capacity to configure minimum 70 waypoints.	Board will check practically.

S.N	Parameter	Specification		Trial directives
		k	The software should have following mission information:- i. Coordinates of target ii. AV position iii. Distance of AV from GCS iv. Air speed v. Mission Time vi. Payload looking angle vii. Communication link status viii. GPS status ix. Health status of AV battery	Board will check practically.
17	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 and firm will also submit OEM certificate.
		b	Ability to display 3D maps with the digital terrain data provided. Option to switch between 2D and 3D maps in real time.	
18	Remote Video Terminal (RVT)	a	It should be minimum 10 inches tablet, must be MIL-STD-810G or more and IP65 or more, compact, light weight and portable with wrist/chest mountable holder. (As per user requirement)	Board will check practically and firm will produce certificate of Govt. Lab. or NABL/ILAC accredited laboratory for MIL-STD-810G or more and IP65 or more.
		b	UAV should be able to transmit video to RVT at a minimum distance of 3 Km or more from UAV.	Board will check practically.
		c	RVT to have capability to display video, map and OSD (On screen display) similar to GCS.	Board will check practically.
		d	Capable to record, playback and freeze the imagery received from AV.	Board will check practically.

S. N	Parameter		Specification		Trial directives
		e	RVT should have sunlight readable and touch screen.		Board will check practically.
19	Data link	a	Secure communication links between Air Vehicle and Ground Control Station with minimum 128 bits encryption.		Firm will produce OEM certificate for AES encryption for both telemetry & video.
		b	Should operate on S-band and / or C-band frequency for uplink and down link preferably on license free band i.e. 2.4GHz or 5.8 GHz.		Firm will produce OEM certificate.
20	Failsafe features	a	In case of communication loss during flight, the system should automatically change to recovery mode after 10 seconds, till such time UAV should remain on its flight path.		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.		Firm will produce OEM certificate.
		d	There should be facility for on board light to facilitate visual signature for recovery, the operation of which should be GCS controlled		Board will check practically.
21	Miscellaneous	a	The comprehensive warranty of the UAS	2 yrs	Firm will produce OEM certificate.
		b	Total technical life (TTL)	5 yrs or 750 landings	Firm will produce OEM certificate.
		c	Life of AV battery	200 charging cycles or 2 years, whichever is earlier.	Firm will produce OEM certificate.

S.N	Parameter	Specification			Trial directives
		d	Product support after warranty	up to 3 yrs	Firm will produce OEM certificate.
		e	Repair and maintenance including periodicity of midlife interventions/intent towards establishing maintenance hubs etc.		Firm will produce undertaking.

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