



भारतीयरेल / Indian Railways
बनारसरेलइंजनकारखाना, वाराणसी
वाराणसी-221004भारत
Banaras Locomotive Works, Varanasi
Varanasi-221004, India

ISO 9001 :2015
 ISO 14001 :2015
 OHS 18001 :2007
 ISO 50001 :2011
 ISO 3834-2 :2005
 NABL Accreditation
 'GreenCo Silver' Rating
 SS Workplace Management System



Unmanned Aerial Vehicle (UAV) i.e. Drone, Specification No.: MOD/72511 (Rev.1)

Note: This Specification consists of two sections:

1. (a) : General instruction to Tenderer & Commercial condition (this document)
- (b) : Technical specification part-I (this document)
2. : Technical specification part-II & special conditions of contract (Enclosed separately)

1. (a) : General Instructions to tenderers & commercial conditions

- i) Offers are likely to be ignored in case of non-compliance with these instructions.
- ii) Tenderer must submit /enclose the clause-wise comments on technical specification Part-I with the offers.
- iii) The clause indicated in this specification shall over-ride those mentioned in technical specification Part-II, wherever applicable.
- iv) Deviation from any of the clause/sub-clause of this specification has to be given at the pre-nominated place of IREPS under heading technical deviation statements. If any document for technical deviation is uploaded with the reference as offer & same may be specifically mentioned in the pre-nominated place of the technical deviation statement, failing which those documents will not be considered for evaluation.

Clause-wise comments to technical specifications:

S.N	Clause No	Clause Heading/Sub-heading	Detailed comments on compliance with offer to the clause

Statement of deviation

S.N	Clause No	Clause Heading/Sub-heading	Deviation	Remarks (including justification)

Note: Clause Numbers not applicable may be mentioned as NA (not applicable). Clause requiring comments may be adequately commented

- v) The tenderer must submit the technical particulars, specifications, component drawings with specifications (if required), schematic diagrams, foundation related drawings & other related particulars required for the machine in the offer itself
- vi) The tenderer will quote only for the make of sub-assemblies and equipment wherever specified. Other make of sub-systems will normally not be acceptable. In case, some other make is quoted, specific reasons for the same including its features/advantages over specified makes or equivalent must be brought out in the offer.
- vii) Unless stated otherwise, latest alterations/revisions of specifications/ standards/ drawings shall be applicable. In respect of safety standards & environmental standards relevant to the machine, it is mandatory for the machine manufacturers to ensure compliance with International (CE/ISO/DIN/JIS)/ National standards (IS) (Where applicable) in their offer.

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viii)	The tenderer must offer and quote the price of all the specified concomitant accessories, as these are considered essential for commissioning and utilization of the machine. In case, any item is required in sets, please specify nos. /Pieces per set. This is essential for proper technical evaluation of the offer. Offers received without price of any of the specified concomitant accessories, are to be considered as incomplete and liable to be rejected.	
ix)	Credential & Qualifying Requirements of Tenderers.	
	Credential & Qualifying Requirements of Tenderers	Compliance by Tenderers
(a)	The tenderer should be OEM or authorized by OEM for this specific tender. OEM should be DGCA approved/type certified for the quoted product (proof should be attached)	
(b)	Tenderer must have successfully supplied at least 10 (ten) units of Unmanned Aerial Vehicle (UAV) having Time Flight/endurance of 40 minutes or more and Maximum Takeoff Weight(MTOW) 2 kg or more to any Organization with satisfactory report from user. (MTOW: Max. Takeoff weight)	
(c)	The document in support of the above conditions should be submitted/ uploaded along with the offer and no document in support of these will be accepted after the opening of tender.	
(d)	Tenderer not submitting the above essential required information as desired may note that their offer will be summarily rejected.	

x) **Evaluation Criteria:** Total value of the offer will be calculated based on.

- 1) The cost of the basic machine.
- 2) Cost of the concomitant accessories according to tender specifications.
- 3) Cost of any other accessory which in the opinion of supplier is essentially required for making the machine fully functional.
- 4) Duties and taxes as quoted by the tenderer, along with insurance, freight, and other related charges.
- 5) Cost of comprehensive AMC for consecutive 03 years after warranty period .

*Note : Tenderer should quote AMC rate for each of the 03 years i.e. 1st year, 2nd year and so on.. The AMC price for each year will be firm (fixed) The CAMC charges would be added to the FOR destination price for M&Ps for the purpose of comparative evolution of offer.
CAMC shall be operated, managed and paid by consignee.*

XI Payment: Machine shall be supplied, inspected and tested at consignee's end:

- a) 80% of the payment after successful supply, inspection, and commissioning of M&P on proof of inspection certificate, joint inspection (JI), receipted Challan (RC) and commissioning certificate.
- b) Balance 20% payment after issue of proving test certificate (PTC) of M& P (issue after watching performance of machine for one month from commissioning), subject to submission of Bank Guarantee for an amount 05% of machine cost, as warranty security.

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1. (b) : Technical Specification Part-I

Clause no.	Clause	Compliance by Tenderers
1.0	Description	
	Unmanned Aerial Vehicle (UAV) i.e. Drone, Specification No.: MOD/72511 (Rev.1) , Qty-01 No.	
2.0	Scope of Supply	
2.1	Design, manufacture/fabrication, Supply, Installation/Commissioning and Testing/Prove-out of Unmanned Aerial Vehicle (UAV) i.e. Drone, Specification No.: MOD/72511(Rav.1) required for RPF/BLW, Varanasi.	
2.2	Unmanned Aerial Vehicle (UAV) i.e. Drone, should be capable of covering technical requirements as per Annexure 'A'.	
3.0	Purpose	
	Unmanned Aerial Vehicle (UAV) i.e. Drone are for security related item in BLW Varanasi.	
4.0	Technical requirement	
	Unmanned Aerial Vehicle (UAV) i.e. Drone, should meet the parameters/ requirements as per enclosed Annexure 'A'.	
5.0	Concomitant accessories and any other accessories	
5.1	Bidder may quote for concomitant accessories which the manufacturer considers essential to make the machine fully operational, when installed and commissioned connected to power source and give the specified output/productivity & any other accessories (if any) considered essential for proper working of the machine. The cost of accessories should be quoted separately. Wherever, for any reason, the cost of any accessories is included in the basic price of the machine, the same shall be specifically mentioned.	
5.2	Spare parts and accessories of supplied equipment should be available in the market for next 7 Years for maintenance purpose after successfully commissioning of the equipment.	
6.0	Optional accessories	
6.1	Any item which can result in improved working or additional capability may be quoted as optional accessory with full description.	
6.2	This will not be considered for inter se ranking.	
7.0	Documentation/ Literature	
7.1	One set of manuals/user guide (hard copies) must be supplied along with Unmanned Aerial Vehicle (UAV) i.e. Drone.	
7.2	Manual of each part of equipment along with part no./ other details are require.	
7.3	Any other information considered essential for technician/maintenance personnel for the proper running and upkeep of Unmanned Aerial Vehicle (UAV) i.e. Drone.	

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8.0	Inspection of Machine at BLW's Premises	
8.1	Inspection of Unmanned Aerial Vehicle (UAV) i.e. Drone shall be carried out by ASC/RPF/BLW or his authorized representative(s) at BLW Varanasi after receipt of machine.	
8.2	The tenderer shall attend inspection at BLW premises after receipt of machine.	
8.3	The machine shall be inspected at BLW Varanasi as per technical requirements Annexure 'A'.	
9.0	Joint Inspection, Commissioning & Prove out	
9.1	Joint Inspection: The contractor or his agent would be required to carry out a joint check at consignee's end, along with consignee, before unpacking is done, to avoid subsequent complaints regarding short shipment/transit damages. It is necessary that this joint receipt inspection shall be done immediately on receipt of the Unmanned Aerial Vehicle (UAV) i.e. Drone, by consignee & bidder's representative to avoid commissioning delays due to shortages/transit damages.	
9.2	Installation/Commissioning & Prove out: The complete responsibility for successful installation, commission and prove out of Unmanned Aerial Vehicle (UAV) i.e. Drone, at BLW shall be lies with the successful tenderers.	
9.3	The equipment performance shall be demonstrated by the supplier or his agent after successful commissioning at the consignee's work. Thereafter the equipment performance shall be watched by the consignee for a period of one month, before the final proving test certificate (PTC) is issued.	
9.4	The successful bidder shall carry out test of machine at the consignee's works at BLW for accuracy and capabilities Varanasi. Consignee shall arrange the material for this purpose.	
10.0	Training	
	The tenderer will have to arrange the theoretical & practical training for technical personnel of the user, as well as technical personnel of the concerned area maintenance wing at BLW during commissioning & prove-out of the machine.	
11.0	After sales service	
11.1	The firm should confirm availability of spares, services for 7 years of equipment life.	
11.2	The tenderer will clearly spell out in the offer, the facilities such as servicing organizations, trained staff, machine spares, consumables, etc. available with him or his representative for providing adequate after sales service anywhere in India during warranty and post warranty periods. Suitable undertaking should be submitted from OEM for providing the service and sales facility till the codal life of the equipment.	
12.0	Comprehensive AMC	
12.1	Comprehensive AMC will be for 03 years after warranty	
12.2	Tenderer should quote AMC rate for each of the 03 years i.e. 1st year,	

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	2nd year and so on.. The AMC price for each year will be firm (fixed) The CAMC charges would be added to the FOR destination price for M&Ps for the purpose of comparative evolution of offer. CAMC shall be operated, managed and paid by consignee.	
13.0	Warranty	
13.1	Warranty period for M&P items will be 24 (twenty-four) months from the date of commissioning of M&P. A maximum period of 2 (two) weeks will be allowed for Warranty attending and rectification of faults during the warranty period.	
12.2	During warranty the supplier should replace or repair all the defective parts on free of cost to run the Equipment in smooth working condition	
13.0	Other requirements: It shall be as per technical specification Part-II and special conditions of contract (whichever is applicable).	

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Annexure 'A'Technical Parameter for Drone/UAV-.(Must satisfy all criteria)

S.N.	Items	Requirements	Compliance by Tenderers
1.0	Unmanned Aerial Vehicle (UAV) i.e. Drone		
1.1	Category/Sub-category	Small UAV (45 min Endurance) 2 to 5 Kg (MTOW)	
1.2	DGCA compliance	Type Certified by DGCA (Attach proof)	
1.3	Portable	Portable GCS -01 No.	
1.4	Data link Equipment	Antenna – 01 No.	
1.5	Design of UAV	Rotorcraft	
1.6	Role of UAV	Surveillance drone	
1.7	Launch and recovery mode (In meter)	Automatic Vertical takeoff and landing (VTOL) within the area of 5X5 m	
1.8	Aural Signature (In dB)	≤ 40 dBs at 300-m above AGL (The firm will submit certificate of Govt. Lab. or NABL/ILAC accredited laboratory)	
1.9	Propulsion system	Electrical with rechargeable batteries	
1.10	Payloads carrying capacity	Capable to carry EO for day and Thermal imager for night one at a time Or Integrated day & night	
1.11	Flight modes	a) Fully autonomous Mode	
		b) Fully autonomous and stabilized	
		c) Hover at defined waypoint	
		d) Remote piloted mode (RPV Mode) and target tracking mode	
		e) Waypoint Navigation (Pre-defined as well as dynamically adjustable waypoints during flight)	
		f) Should be controllable in real time from the GCS up to recovery	
		g) Real time target tracking of designated static and moving targets.	
1.12	Endurance (In Minutes)	Min 45 minutes with payload at 1000M degradation Of 10% of every increase in 1000M	
1.13	Maximum Operating altitude above ground level (AGL) (In meter)	500M AGL (Above Ground level) or more	
1.14	Maximum Launch altitude above mean sea level (AMSL) (in meter)	3000M AMSL (Above Mean Sea Level) or more (Firm will submit OEM certificate)	

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1.15	Operating wind conditions (In km/h)	a) Take off : 25 km/h or more b) Landing : 25 km/h or more c) Operate : 25 km/h or more (Firm will submit OEM certificate)	
1.16	Cruise Speed (In km/h)	Minimum 30 kmph or more (MSL) (Firm will submit OEM certificate)	
1.17	Collision Avoidance sensor	Should be available during takeoff and landing. (Firm will submit OEM certificate)	
1.18	Range of live transmission (LOS) (unobstructed & interference free)	Minimum 5 km line of sight (Firm will submit OEM certificate)	
2.0	Failsafe features	a) Automatic change to recovery mode after 10 seconds on communication loss, again on mission of communication restore. (Firm will submit OEM certificate) b) Automatic Return to Home/Land on battery low/ imbalance. (Firm will submit OEM certificate) c) (i) Multiple GNSS on board for failure redundancy (ii) NAVIC (Firm will submit OEM certificate) d) Warning on exceeding wind limit or gust. (Firm will submit OEM certificate)	
		e) Warning on exceeding the UAV health parameters (Temperature, vibration and throttle limit of the system) (Firm will submit OEM certificate)	
3	Payload Characteristics		
3.1	Payloads required	Electric Optic (EO) for day, Thermal imager (TI) for night payload Or Integrated day and night payload.	
3.2	Payload and video stabilization	a) All payload should be gimbal 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. d) Payload with 360° pan & 90° tilt control during flight e) Single payload assembly housing for day/night camera or integrated both day and night camera	
3.3	Electro optic (EO) daylight Payload	a) UAV should transmit real time imagery to GCS b) Resolution : 1920X1080 or better (Firm will submit OEM certificate) c) Continuous Optical Zoom in 10X or 20X Optical zoom or more with minimum- NFOV≤5° maximum WFOV ≥ 45° (Wide field) Digital Zoom: 4X or more (Firm will submit OEM certificate)	
3.4	Thermal imager (TI) night payload	a) Payload with 360° pan & 90° tilt control during flight b) Resolution: 640 X 480 pixels or better (Firm will submit OEM certificate)	

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01.06.2026
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5100809/2026/O/o Dy CME/TOOLING & MOD/SED/BLW

		c) Digital Zoom : 4X or more	
		d) White and Black hot modes	
3.5	Target Detection, Recognition, identification	Day Payload	
		Vehicle size (4.5X1.5m)	Group of 3-4 People
	Detection: Ability to distinguish an object from background	2000M	1500M
	Recognition: Ability to classify the object class (Animal, Human, Vehicle, Boat etc)	1500M	750M
	Identification: Ability to describe the object in details (man with weapon, hat, Uniform/colour of clothes, type/colour of vehicles)	1000M	500M
	Detection: Ability to distinguish an object from background	Night Payload	
		750M	500M
4	Ground control station characteristic		
4.1		CGS should be portable minimum 10-inch display with rugged IP 65 tablet/laptop which is compatible with GCS for surveillance. (Firm will submit certificate of Govt. Lab. or NABL/ILAC accredited laboratory)	
4.2	Computing Hardware		
	CPU	CPU- Clock speed minimum 2.3 GHz or better (Firm will submit OEM certificate)	
	Storage	Minimum 256 GB (Firm will submit OEM certificate)	
	RAM Memory	8GB or more (Firm will submit OEM certificate)	
4.3	Battery operation	Minimum 02 hours at peak utilization	
4.4	Capability	a) Transmit control commands to UAV (Firm will submit OEM certificate)	
		b) Receive UAV flight and propulsion parameters (Firm will submit OEM certificate)	
		c) Receive, display and transfer real time day and night video to display unit from GCS. (Firm will submit OEM certificate)	
		d) Capability to control UAV while on the move. (Firm will submit OEM certificate)	
		e) Record real time video in display unit. (Firm will submit OEM certificate)	
		f) Capable to storing 100 or more flight routes with each route having capacity to configure minimum 70 waypoints in GCS. (Firm will submit OEM certificate)	

By
01.06.2026
ASC/RPF

5100809/2026/O/o Dy CME/TOOLING & MOD/SED/BLW

4.5	GCS application software	a) Able to control all aspect like pre-flight checks, self- tests, control of takeoff/landing, payloads, output: go/no go and payloads (Firm will submit OEM certificate)	
		b) The software should have following mission information i. Coordinate of target ii. Ttarget distance. iii. AV co-ordinates. iv. Distance of AV from GCS v. AV Speed vi. Mission Time vii. Payload looking angle viii. Communication link status ix. GPS Status x. Health status of AV Battery xi. UAV heading/true north indication xii. Bearing (Azimuth) of UAV from GCS xiii. Geographic map & real time video should be displayed at all times during the flight xiv. Geographic map & real time video view 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 input. xv. Artificial horizon indicating UAV altitude. xvi. Switchable between 2D/3D views, capability to tilt/ rotate 3D maps as per user input. xvii. Perpetual proprietary software of the system product support for minimum 05 years. xviii. AI/ML capability for identification and detecti on of targets/humans/friendliest	
4.6	Map formats	a) Should have the capability to integrate geo-referenced raster maps provided in commonly digital formats as per user requirement b) Ability to display 3D maps with the digital terrain data provided. Option to switch between 2D and 3D maps in real time. (Firm will submit OEM certificate)	
4.7	Button Based/USB Joystick control	a) Full camera control pan/tilt b) Zoom In/Out Black/White Hot c) RPV Mode d) Altitude control	
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	Data Link	S/C Band (2GHz to 6GHz) with 128bit or better AES encryption (Firm will submit OEM certificate)	
6	General System Requirements		
6.1	Weight (in Kg)	Complete weight of the UAV not more than 15 kg and system should be packable into backpacks with 02 spare batteries	

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5100809/2026/O/o Dy CME/TOOLING & MOD/SED/BLW

6.2	Assembly/Disassembly time (in minutes)	Less than 15 minutes with person	
6.3 (a)	Environmental conditions for operation and storage	The UAV and associated systems should operated and stored at following environment conditions (Firm will submit certificate of Govt. Lab. or NABL/ILAC accredited laboratory) i) Damp heat: 40 \pm 2 $^{\circ}$ C at RH not less than 90% as per JSS 55555 or equivalent ii) starting operating temperature and storage temperature : -10 $^{\circ}$ C to +55 $^{\circ}$ C with \pm 10% tolerance. iii) Ability to withstand dust, drizzle and humid conditions.	
(b)	IP (Ingress protection) of the UAV	IP 54 or better (Firm will submit certificate of Govt. Lab. or NABL/ILAC accredited laboratory)	
6.4	Portability and operation	The UAV should be battery operated portable, light in weight, compact for day and night surveillance, capable of being carried and operated by two men	
6.5	Battery Charger of AV Battery	Suitable universal battery charger to charge the batteries within 03 hours. (Firm will submit OEM certificate)	
6.6	Accessories	i) Field repair kit – 01No. ii) Lithium based battery packs- 02 Nos. iii) Spare propeller -01 complete set iv) Spare landing gear set- 01 complete set v) Associated Cables and mounting- 01 set vi) User , technical and maintenance manual- 01 set vii) Water resistance (IP 66) back packs to carry UAV- 02 Nos. (Firm will submit certificate of Govt. Lab. or NABL/ILAC accredited laboratory) viii) Rugged, compact and light weight transportation box- 01 No.	
6.7	Night Recovery Beacon	Switchable LED light when operating with night payload	
7	Miscellaneous Requirements		
7.1	Warranty	02 years (Firm will submit OEM Certificate)	
7.2	Total technical life	1000 Flight Landings	
7.3	Total Product Support	7 years (Firm will submit OEM Certificate)	
7.4	Manufacturer Recommended list of Spare (MRLS)	Should be provide (Firm will submit OEM Certificate)	
7.5	Spare Ground control system (2 Remote Controllers Master and Slave configuration, Telemetry and display device) for training UAV.		
7.6	Training simulator with RC option.		

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Land Border Certificate for critical Subsystems

- (i) It is highlighted that Critical Active Subsystems from countries sharing land borders with India have security loop holes leading to compromise in critical Data of National importance.
- (ii) Some of the active critical Sub Systems in Drones / UAV' switch are critical for data security are- data Acquisition, Transmission and storage. Subsystems like Camera / payloads, Ground Control Station and Autopilot Software.
- (iii) Communication modules:- It is recommended that in view of National Security, above mentioned critical subsystems of UAV should not be from countries sharing Land border with India. Also recommended that a certificate shall be taken from all participating vendor store veal the details of the country of origin of critical active subsystems like.

- 1. Auto-Pilot (software)
- 2. Ground Control Station
- 3. Camera Payload
- 4. Gimbals
- 5. Radio Transmission Subsystem
- 6. Operating Software .

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