QUESTIONNAIRE FOR DESIGN & DEVELOPMENT OF AUTONOMOUS COMBAT VEHICLE (ACV) FOR MECHANISED INFANTRY & ARMOURED UNITS UNDER MAKE-II ACQUISITION CATEGORY OF DAP-2020

Introduction / Project Brief

1. The Mechanised Infantry and Armoured units of the Indian Army operate in varied terrain ranging from Plains, Deserts and High Altitude. Mechanised operations being fluid and dynamic in nature, require day and night real-time standoff surveillance of enemy as well as seamless maintenance of logistics to support the fighting forces.

2. Presently for continuous surveillance of dormant sectors / gaps vehicle based manned teams are deployed which in long duration cause fatigue. Also due to large silhouette, these vehicles based manned teams are likely to be detected by enemy. For casualty evacuation and logistical support like replenishment of ammunition, fuel and spares to Armoured Fighting Vehicles along the frontline, manned teams on wheeled unprotected vehicles are utilised which leads to wastage of human and vehicle resources and are also prone of enemy action.

3. Induction of Autonomous Combat Vehicles (ACV) capable of mounting various types of payloads to undertake unmanned surveillance, logistic delivery and casualty evacuation will reduce manual handling and fatigue to soldiers, thereby improving combat efficiency and endurance at tactical level. The broad operational parameters desired in ACV are attached as **Appendix**.

4. **Company Details**.

(a) The company details as under:-

(i) Large/medium/small/Consortium or Start Up

(ii) GSTIN, Company Registration Details and MSME certification.

(iii) Public or private company.

(iv) Address of Company Factory/ Factories.

(v) Address of Research and development facilities.

(vi) Company Website.

(vii) If Consortium then should mention the details of the Consortium along with MoU details.

(b) Years of existence.

(c) Annual turnover of the company.

(d) Net worth.

(e) Credit rating.

(f) Annual profit in the last three financial years.

(g) **Research & Development**.

(i) Description of the vendor organisation in terms of Research and Development in ACV technology.

(ii) Infrastructure and number of employees working in R&D of systems related to the product.

(h) Whether the company is OEM, manufacturing agency or system integrator.

(i) Provide details regarding major successful projects/ products/ technologies developed/ under development or at Design/ Prototype stage whose technical specifications are similar, involving Research & Development in the field of ACV.

(j) Provide details of similar equipment manufactured by the vendor and supplied in India/ abroad/ Government agency (Type of equipment, quantity and cost).

(k) Experience of the company in related fields.

(l) **Intellectual Property Rights**

(i) Whether company has patents/IPR of any critical components/ sub-systems.

(ii) What are the proprietary technologies incorporated in the system being developed? Are the proprietary technologies indigenous or ex-import? If ex-import, will the foreign vendor transfer the technology? Clarify the issues of Intellectual Property Rights (IPR) for ACV.

(m) Whether the company has any tie-ups/ Joint ventures or plans for collaboration with any foreign firm for producing similar equipment.

(n) Is the ACV (including all components) / systems/ sub-systems designed in India? If no, please forward details of all the foreign companies with whom there is a partnership/ Joint Venture/ MoU for carrying out the design and development

(o) If firm is a Joint Venture, then who possesses/ will possess the intellectual and legal rights and ownership of ACV.

5. **Infrastructure**.

(a) Does the company have adequate infrastructure to develop, integrate and manufacture? If not, what would be the procedure and timelines to establish the same.

(b) Does the company have adequate infrastructure for carrying out trials and testing of equipment.

6. **Manufacturing Capability**. Production capability per year in respect of the final product.

7. **Critical and Core Technologies**.

(a) Critical and core technologies identified for the system.
(b) Details of critical technologies not likely to be available in India, to be sourced ex-import (in cost percentage terms).
(c) Critical and core technologies being Indigenised and not being Indigenised.
(d) Critical and core technologies indigenisation timelines.

8. **Indigenous Content**.

(a) Details of important sub systems and enabling technologies of ACV.

(b) Likely achievable indigenous content. Give a breakdown of the indigenous content (both in term of cost percentages).

(i) Prototype.

(ii) Final Product.

(c) **Sub-systems/ Equipment**.

S No	Sub-System/ Equipment	Name of Company	Outsourced/ in-house Development	Details of Outsourcing Company		
				Indian/ Foreign	Name of the Company	Address with Contact Number

(d) What are the areas of uncertainty being envisaged by the vendor in the design, development and production for the indigenous development of ACV.

9. **Cost**.

(a) Cost of one prototype

(b) Cost of one final product with all types of payloads as mentioned in the Technical brief of the case (for approximate quantities brief of the case may be referred).

10. **Minimum Order Quantity (MOQ)**.

(a) **MOQ**.

(i) MOQ economically viable for business.

(ii) Is MOQ of 150 viable from commercial point of view.

(b) **Prototypes**.

(i) Quantity of prototypes recommended for Field Evaluation Trials.

(ii) Will you be able to provide quantity two prototypes to enable simultaneous User and technical Trials.

11. **Timelines**. Anticipated timelines (recommended stages and phases of development with priorities and time schedule) for:-

(a) Development of prototypes – (in weeks).

(b) Manufacturing of final product - (in weeks).

12. **Licences**. Details of licences for manufacturing, development, R&D etc in defence sector and vehicle technology related to the product.

(a) Rights/ License for Commercial Development.

(b) Rights/ License for Series Production.

(c) Rights/ License for Continuing Engineering S.

(d) Rights/License for Product Improvement (including Exploitation and Upgradation).

13. **Future Upgrades**. Will the vendor be able to provide upgrades to ACV in future procurements. If yes, suggest the upgrades with technical specifications, tentative cost development timelines and production capability and delivery schedule of the upgrades.

14. **Sustenance**.

(a) The ability of the company to sustain the product through the lifecycle of the equipment (including spares and upgrades).

(b) How will you ensure continuous supply of spares especially for components procured ex-import.

(c) How will continuous supply of spares be ensured from sub-contractors.

(d) Maintenance philosophy to be proposed along with details of Equipment Support Package, Manufacturer Recommended List of Spares, SMTs/STEs, jigs and fixtures.

(e) Is it feasible to provide maintenance support in vicinity of units through a Comprehensive Annual Maintenance Contract. If yes, please provide fwg details:-

(i) Proposed time period of CAMC.
(ii) Proposed cost of CAMC.
(iii) Inclusions and exclusions of CAMC.

(f) Warranty being provided period of the product.

15. **Training**.

(a) Details of initial and refresher training required to be imparted to user.
(b) Details of training/operating manuals to be provided.
(c) Proposed training schedule for User, Quality Assurance and Maintenance Personnel.
(d) Feasibility of providing Computer Based Training (CBT) package.

16. **Quality Certification**.

(a) Compliance to which ISO / industry standards are applicable and feasible
(b) Details regarding quality certification held with your Company. Provide details along with date of certification with validity and certification agency.
(c) Measures and capability to meet environmental specification as per laid down norms.
(d) Feasibility to conform to Military Standards and JSS 55555.

17. **Broad Details/Technical Specifications of Existing Products/ Under Development or Capable of Being Manufactured**. Furnish following technical specifications of ACV that can be developed for Indian Army (broad operational parameters desired in ACV are attached as **Appendix**):-

(a) **Configuration**. Tracked or Wheeled -
(b) **Service Life**. Without any Overhaul Intervention –
(c) **Temperature Conditions**.
(i) Will all sub-systems be operational in ambient temperature conditions given for Plain and Desert Terrain in the ORs –
(ii) Will all sub-systems be operational in ambient temperature conditions given for High Altitude and Mountain Terrain in the ORs -
(iii) Will ACV perform without any de-rating upto 4500m altitude –
(iv) If no, what % of de-rating is likely to occur. Give details -
(d) **General Technical Parameters**.
(i) Can Technical parameters as per Para 5 of OR be provided.
(ii) If no then give your capability for each parameter –

(e) **Payload Specific Parameters**.

(i) Can agnostic payloads for Surveillance, Logistic Support and Casualty Evacuation be provided on same ACV chassis –

(ii) **ACV with Surveillance Payload**.

(aa) Can surveillance payload / sight as sought in ORs be provided.

(ab) If no then give your capability for each parameter including size, weight, pan capability, tilt/ elevation-depression, resolution, zoom and field of view (wide and narrow) and LRF -

(ac) Detection, Recognition and Identification (D-R-I) ranges for tank and human targets -

(ad) Can surveillance sight/payload be mounted on Telescopic Mast as mentioned in ORs be provided -

(ae) If no then give your capability -

(af) Can surveillance software as mentioned in ORs be provided –

(iii) **ACV with Logistic Support Payload**.

(aa) Can Logistic Support Payload as mentioned in ORs be provided-

(ab) If no then give your capability –

(ac) Volumetric load that can be carried –

(ad) Length and width of storage space -

(ae) Whether load will be in open storage or closed -

(iv) **ACV with Casualty Evacuation Payload**.

(aa) Can Casualty Evacuation Payload as mentioned in ORs be provided-

(ab) If no then give your capability –

(ac) Number of casualties that can be evacuated –

(ad) Details of seating or lying arrangements for the casualty –

(f) **Base / Control Station**.

(i) Can Base Station as mentioned in ORs be provided-

(ii) If no then give details of your capability –

(iii) Can Base / Control Station to be hand held / mobile -

(iv) Provide configuration of External Driver Station and Commander Station that can be provided-

(g) **Communication**.

(i) Can communication hardware for driving ACV in Remote Control Mode and for controlling / receiving feed from Surveillance Payload as mentioned in ORs be provided -

(ii) If no then give details of your capability –

(h) **Digital Recorder Device**.

(i) Can Digital Recorder Device as mentioned in ORs be provided -

(ii) If no then give details of your capability –

(iii) Can provision for recording navigation and surveillance payload data be provided on ACV also –

(i) **Maintainability**.

(i) Can Maintenance as mentioned in ORs be provided -

(ii) If no then give details of your capability –

(ii) Will redundancy at design stage be provided –

(j) **EMI/EMC**.

(i) Can ACV with EMI/EMC standards as mentioned in ORs be provided -

(ii) If no then give details of your capability –

(k) **QA Parameters**.

(i) Can ACV with QA parameters as mentioned in ORs be provided-

(ii) If yes then propose relevant tests under JSS:55555 along with severity of applicable tests -

(iii) If no then give details of your capability –

(l) **Miscellaneous Parameters**. Provide inputs on following:-

(i) Max endurance in Silent and Hybrid modes –

(ii) Travel Modes – feasibility of fully autonomous, semi auto mode, target following mode, camera guided mode, manual mode and Return to Home (RTH) mode.

(iii) Type and capacity of Power pack

(aa) Battery type –

(ab) APU type –

(ac) Fuel used in APU -

(iv) Type of transmission system –

(v) Approximate dimensions and weight of ACV –

(vi) Maximum operating range (km) –

(vii) Maximum operating altitude (in mtr AGL) –

(viii) Max and Min Temperature ranges in which ACV can operate –

(ix) Max Service Life of ACV, in terms of hours run and km –

(x) Remote Monitoring of vehicle diagnostic data from Base Station –

(xi) Max depth at which Fording can be done –

(xii) Details of navigation system and capability to operate in adverse jamming environment –

(xiii) Details of protection level which can be provided for protection against Small Arms and splinters –

(xiv) Feasibility of incorporating Artificial Intelligence enabled target recognition and identification capability -

(xv) Capability of transmitting the coordinates to the Base Station –

(xvi) Max noise levels (in db) produced by ACV in Battery Mode and APU Mode –

(xvii) Max range at which real-time wireless transfer of image and video can be provided –

(xviii) Media used for providing wireless transfer of image and video –

(xix) Can the Payloads be removed and fitted on ACV in field location without workshop support –

(xx) **Follow-me Mode**. Can provision / facility be provided in ACV to enable it to automatically follow its Base Station or any designated vehicle –

(xxi) Any other details which the vendor would like to bring before the Feasibility Study -

18. The response to the Questionnaire should be as elaborate as possible so that industry capability can be accurately assessed.

19. Any kind of assistance required from SHQ during development/ trails stage may also be indicated.

20. **Disclaimer**. This project brief and the appended questionnaire is neither an agreement and nor an offer by the MoD to the prospective bidders or any other

person. The purpose of this project brief and the appended questionnaire is to provide interested parties with information that may be useful to them in submitting their proposals pursuant to this project brief and appended questionnaire for the feasibility study to assess the status of enabling technologies and capabilities of the Indian industry. This project brief and the appended questionnaire includes statements, which reflect various assumptions and assessments arrived at by the MoD in relation to the project. This project brief and the appended questionnaire and any assumptions, assessments and statements made herein do not purport to contain all the information that each responding entity may require. The responding entity shall bear all its costs associated with or relating to the preparation and submission of proposal pursuant to this project brief and the appended questionnaire. Wherever necessary, MoD reserves the right to amend or supplement the information, assessment or assumptions contained in this project brief and the appended questionnaire. The MoD reserves the right to withdraw the project brief and the appended questionnaire or foreclose the procurement case at any stage. The issuance of this project brief and the appended questionnaire does not imply that the MoD is bound to shortlist a responding entity for the Project. The MoD also reserves the right to disqualify any responding entity should it be so necessary at any stage on grounds of National Security.

21. **Procedure for Response**.

(a) Interested Indian Companies must fill the above Questionnaire (**additional technical literature** on your product can also be attached).

(b) Interested vendors must also forward information as per **Vendor Information Proforma** as per Annexure II to Appendix 'A' to Chapter II of DAP-2020.

(c) **One set** of response to this Questionnaire along with Vendor Information Proforma should be submitted in **hard form** and **soft form (CDs)** at the following address: -

ADG MECH INF
MECH-8 Section, General Staff Branch
Room Number 525, A-Wing Sena Bhawan, Army HQ,
DHQ PO, New Delhi-110011

Email: AMIMAT.03315@GOV.IN

(d) Last date of acceptance of Response is **02 weeks** from date of publishing of this Questionnaire on MoD / SHQ website. In case the responses are delivered by courier or through authorised company representatives, it is requested that they be delivered at Gate No 4 Sena Bhawan between 0900 hours and 1700 hours on all working days till the final date of submission of responses.

File No : A/36019/ACV/GS/MECH-8 Dated : 28 March 2022

Appendix
(refer Para 03 & 17 of Questionnaire)

OPERATIONAL REQUIREMENTS (ORs): ACV

1. **Configuration**. ACV should be configured on a tracked / wheeled chassis.

2. **Service Life**. At least 10 years.

3. **Operating Temperature**. The ACV including all sub-systems should be operational in following ambient temperature conditions: -

   (a) **Plain and Desert Terrain**.
      (i) Minimum Operating Temperature: Between 0° to 05° Celsius.
      (ii) Maximum Operating Temperature: Between 40° to 45° Celsius.

   (b) **High Altitude & Mountain Terrain**.
      (i) Minimum Operating Temperature: Between (-)20° to (-)10° Celsius.
      (ii) Maximum Operating Temperature: 40° Celsius.

4. **Operating Altitude**. Upto 4500 m (ASL).

5. **General Technical Parameters**.
   (a) Mode : Autonomous Mode and Remote-Control Mode.
   (b) Speed : up to 35 Kmph.
   (c) Ground Clearance : at least 300 mm.
   (d) Gradient : at least 25º.
   (e) Vertical Step Crossing : at least 200 mm.
   (f) Trench Crossing : at least 250 mm.
   (g) Fording capability : ford through water up to depth of at least 500mm
   (h) **Navigation System**. Satellite and Inertial Navigation System with an accuracy of at least ±3m.
      (i) Based on Indian Regional Navigation Satellite System (IRNSS).
      (ii) Compatible to the Defence Series Maps (DSM).
      (iii) Compatible with GPS and GLONASS.
      (iv) Geo Fencing facility.
      (v) 'Return to Home' facility.
   (i) **Payloads**. Types of agnostic payloads required:-
      (i) **Surveillance Payload**. On-board payload for Day and TI surveillance and ranging of targets.
      (ii) **Logistic Payload**. Provision to carry logistic load up to 1000 Kg (restricted volume).
      (iii) **Casualty Evacuation Payload**. Provision to carry two lying casualties of 100 kg each.
   (j) **Endurance**.
      (i) **Silent / Battery Mode** : at least 06 hours.
      (ii) **Hybrid Mode** : at least 12 hours (combined with Auxiliary Power Unit and Battery Modes).
   (k) **Dimensions**
      (i) Length : upto 2000mm
      (ii) Width : upto 2000mm
      (iii) Height : upto 2500 mm
   (l) **Operating Range**. Distance from Base / Control Station:-
      (i) Autonomous Mode: at least 50 km.
      (ii) Remote Controlled Mode: at least 15 km.

(m) **Power Source**.

(i) **Battery Based**.

(aa) Suitable battery based power source to operate ACV and all on-board electronic equipment.

(ab) Provision for charging from on-board Auxiliary Power Unit (APU) and external source.

(ii) **Auxiliary Power Unit (APU)**.

(aa) Rugged fuel based APU mounted on-board ACV.

(ab) Provide power to all on-board equipment including mobility and charging of on-board batteries.

(ac) Operational from mounted position.

(ad) Capable to function while ACV is moving.

(ae) Remote starting / switch-off from Base Station.

Payload Specific Parameters.

6. **ACV with Surveillance Payload.**

(a) **Surveillance System**.

(i) **Surveillance Sight**. Fully stabilised day & night panoramic un-cooled TI sight integrated with a coloured day camera and Automatic Target Tracker (ATT).

(ii) **Field of View**.

(aa) Horizontal: 70° - 90°

(ab) Vertical: 40° - 50º .

(iii) **All Round View**. Traverse sight 360° unlimited times in either direction.

(iv) **Elevation / Depression**.

(aa) Elevation: 60º - 70º

(ab) Depression: 10º - 15º

(v) **Zoom**. At least 10X optical zoom. Capable of digital zoom also.

(vi) **Range**. Detection - 08 km, Recognition - 05 km & Identification - 4 Km for tank T-72 targets in front profile.

(vii) **Telescopic Mast**. Surveillance Sight to be mounted on an electrically and remotely operated telescopic mast of 2m height from home position.

(viii) **Laser Range Finder (LRF)**. LRF with a minimum range of 05 Kms integrated with the Surveillance Sight. It should be feasible to do remote ranging from the Base Station.

(b) **Surveillance Software**.

(i) Record high resolution video, photograph and sound in real-time.

(ii) Collate and Record following data:-

(aa) Realtime location coordinates of ACV.

(ab) Range of target in meters through a Laser Range Finder (LRF).

(ac) Location Coordinate of target.

(ad) Critical vehicle performance data like battery life, sub-system diagnostics & health.

(iii) Transmit above mentioned data to Visual Display Unit in Base Station in Real Time or when desired.

(c) **Communication System**.

(i) Independent system for transmission of surveillance data and for remote control of ACV.

(ii) Secure Communication.

(iii) Communication Range – at least 15 km

7. **ACV with Logistic Support Payload.**

(a) Suitable cage / space for carrying logistic load.
(b) Capacity: upto 1000 kg once Surveillance Payload is removed.
(c) Dimension of storage space: at least 1250mm x 1000mm.

8. **ACV with Casualty Evacuation Payload**.

(a) Securely mount two stretchers for carrying lying casualties in lying position with suitable harness.
(b) Capacity: at least 100 kg for each patient.
(c) Provision to remove stretcher from ACV without use on any tools.
(d) Provision of voice communication with Base Station.

9. **Base / Control Station**. Qty 01 Control Station to be provided for each ACV. Control Station should have the following characteristics:-

(a) The Base Station should function as a control centre that provides the facility for human control of ACV.
(b) ACV Commander and External Driver to be co-located at Base Station.
(c) The Base Station should have following sub-systems:-
(i) **External Driver Station**. Provide Day and TI Situational Awareness around ACV to enable physically driving and manoeuvring during Remote Control Mode.
(ii) **Commander Station**.
(aa) Suitable hardware to select destination for ACV during Autonomous Mode.
(ab) Suitable hardware to control Surveillance Payload.
(d) **Communication**. Suitable communication hardware for driving ACV in Remote Control Mode and for controlling / receiving feed from Surveillance Payload.
(e) **Digital Recorder Device**. There should be a Digital Recorder Device for:-
(i) Audio and Video transmitted & received.
(ii) Navigation data including location & route travelled.
(iii) Video from RCWS sights and Day and Night Sight.

10. **Maintainability**. The ACV, its sub-systems and components should be designed for easy maintainability in field conditions.
Single component failure should not cascade into a system/ sub-system level failure. Provide redundancy at design stage.

(a) Line replaceable units (LRUs) for easy and quick replacement of sub-systems in field conditions, rather than component level replacements for easier maintenance.
(b) Minimal or nil requirement of special / common use tools for LRU replacements. As far as possible, common tool to be used across multiple applications.
(c) Panels/access points located for ease of operation/opening/closing.

11. **EMI/EMC**.
(a) **System Level**. Mil Std 464C.
(b) **Sub-System Level**. Mil Std 461E/F.

12. **QA Parameters**. ACV should have a robust design and all sub-systems should be compact, hardened & water proof. ACV to be compliant for environmental and durability aspects as per relevant tests under JSS:55555. The severity of applicable tests will be decided by QA agencies based on inputs from User and DAs.