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The Director
IRDE, Dehradun

No. DG ECS/15258/04/BU/CARS/012

भारत सरकार/Government of India
रक्षामंत्रालय/ Ministry of Defence
रक्षा अनुसंधान एवं विकास संगठन
Defence Research and Development Organisation
महानिदेशक (इलेक्ट्रॉनिक्स एवं संचार प्रणालियाँ) का कार्यालय
**OFFICE OF THE DIRECTOR GENERAL
(ELECTRONICS & COMMUNICATION SYSTEMS)**
एल. आर. डी. ईकैम्पस/ LRDE Campus
सीवीरामनगर, बेंगलूर- 560 093
CV Raman Nagar, BANGALORE – 560 093.
दिनांक/Date : 10 Oct 2024

SANCTION OF CARS PROJECT

- Ref:** i. Letter No. DRDO/DFMM/PL/83226/M/01/1976/D (R&D) dt. 18 Dec 2019 (Para No. 2.4) and as amended.
ii. Letter No. DG (ECS)/Adm/12517/DFP Dt. 22 May 2024.
iii. DRONA mail from IRDE Dt. 17 Sep 2024.

2. Sanction by the CFA i.e. DS & DG (ECS) is hereby conveyed for undertaking a CARS Titled **"Advanced Humanoid Robot for Surveillance and Situational Awareness"** to Department of Mechanical Engineering, APS College of Engineering, Bengaluru, under Build-Up (Capital) as per details below:

a.	Title of Proposal	:	Advanced Humanoid Robot for Surveillance and Situational Awareness
b.	Nodal Lab	:	IRDE, Dehradun
c.	CARS Project Allotted to	:	Department of Mechanical Engineering, APS College of Engineering, Bengaluru
d.	Research Service Provider (RSP)	:	Dr. Ravi Kumar R, Assistant Professor Dr. Satyabodh M Raichur, Assistant Professor
e.	Total Estimated Cost	:	Rs. 231.834 Lakhs (Rupees Two Crores Thirty One Lakhs Eighty three Thousand Four Hundred Only) Inclusive of all taxes
f.	Start Date	:	From the date of Sanction.
g.	Probable Date of Completion of the CARS Project	:	30 Months from the date of sanction

h. Objectives:

1. Develop a humanoid robot for surveillance and situational awareness with integrated decision support systems.
2. Enable target location identification and sharing with peers and the control station.
3. Integrate day and night (uncooled thermal imaging) camera with a laser rangefinder for a 2 km range.
4. Ensure self-balancing capabilities, fall avoidance, and fall recovery.
5. Implement passive ranging technology.
6. Equipped with GPS, digital magnetic compass (DMC), and inertial measurement unit (IMU).
7. Provide battery power with solar charging options, ensuring up to 8 hours of endurance.

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8. Facilitate secure wireless communication up to 500 meters.
9. Support video and data streaming, along with audio communication.
10. Include a round-shaped gimbal camera system.
11. Perform operations such as surveillance, object detection, friend and foe identification, data fusion, situational awareness, and self-reinforcement training.
12. Offer multiple control modes: GPT-based, manual, and autonomous.
13. Create a networked humanoid capable of communicating with peers and the remote control station.

J. Milestones and Deliverables of the CARS Proposal:

Milestones	Milestone /Target Name	Timeline in months	Deliverables
Milestone 1	Design and Planning	T0+6	<ul style="list-style-type: none"> • Detailed Project Plan • Design Specifications • Prototypes and CAD Models • Simulation Results Requirement Analysis • Compliance Documentation.
Milestone 2	Component Acquisition and Assembly	T0+12	<ul style="list-style-type: none"> • Component Sourcing • Assembly Line Setup • Initial Prototypes • Integration Documentation • Quality Assurance Plan • Supplier Contracts
Milestone 3	Software Development and Testing	T0+24	<ul style="list-style-type: none"> • Software Architecture • Control Algorithms • AI Models • Firmware Development • Communication Protocols • Software Integration • Testing Reports
Milestone 4	Final testing and Demonstration	T0+30	<ul style="list-style-type: none"> • System Integration • Comprehensive Testing: • Final Prototypes: • User Documentation • Training Sessions • Demonstration • Feedback and Adjustments • Final Report

K. Breakup Cost:


Sl. No.	Expenditure (in Lakh)	Total (Rs in Lakhs)
1	Hiring of Manpower [RA, JRF, SRF, RA] for 30 months & Consultancy (including TDS & GST)	42.09
b.	Equipments & Experimental Consumables (including GST)	168.740
c.	Others (Travel Cost including GST)	4.130
d.	Overhead (Including GST @ 18% of Overhead Amount)	16.874
	Total	231.834

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L. Schedule of payments:

Sl. No.	Payment milestone	Duration	Amount (Rs in Lakhs)
1.	Initial advance @ 25% of the total	To +0	57.9585
2.	Milestone 1 (Design & planning) @ 20% of the total	To+6	46.3668
3.	Milestone 2 (Component Acquisition and Assembly) @ 15% of the total	To+12	34.7751
4.	Milestone 3 (Software Development and Testing @ 20% of the total	To+24	46.3668
5.	Milestone 4 (Final Testing and Demonstration) @ 20% of the total	To+30	46.3778
Total			231.834

3. The Research Service Provider (RSP) will raise the contingency bills to Director, IRDE for each advance/ stage payments. The certificate of utilization from the competent authority will be submitted before releasing the subsequent installment.
4. Normal rules of purchase and accounting procedures will be followed.
5. The Research Service Provider (RSP) will abide by the general conditions of CARS as enclosed in Annexure A.
6. Expenditure will be under Build-Up (Capital)
(Major Head: 4076; Minor Head: 052; Code Head: 929/21)
7. This issues with the concurrence of IFA (R&D), Bangalore vide their No. IFA (R&D) ECS/2024-25/IRDE/CARS/0166 dated 08 Oct 2024.
8. Approval of DS & DG ECS has been obtained vide note dated 09 Oct 2024 in O/o DG (ECS) file No. DG ECS/15258/04/BU/CARS/012.
9. Unique Sanction Code allotted: DG (C)/ECS/IRDE/PROC (BCR)/2024-25/0062.


(RAJEEV MARATHE)
 Off. Director, PM (ECS)

Ink Signed Copy to:-

- i. DG (ECS), Bangalore
- ii. PCDA(R&D), New Delhi
- iii. JCDA(R&D), Dehradun
- iv. Department of Mechanical Engineering, APS College of Engineering, Bengaluru

Copy to:-

- i. Director General of Audit, New Delhi
- ii. DG (R&M)
- iii. Director, F&MM
- iv. Director, P&C
- v. IFA(R&D), ECS Cluster, Bangalore

I. Specific Conditions of this contract:

The following conditions apply in addition to General Conditions listed.

1. Technical performance: The satisfactory execution of the technical features of this contract shall be established against performance milestones as per Sl. No. **2(j)** of the Sanction Letter.
2. Delivery schedules: The interim reports and/or other outcome(s) of this contract shall be delivered as per Sl. No. **2 (j)** of the Sanction Letter.
3. Other specific conditions:
 - a. Identify at least two key personnel who will be engaged in the work, if the contract is more than 18 months.
 - b. The RSP shall send half-yearly financial statement to IRDE, duly audited by local auditors.
 - c. The RSP shall not publish the results of CARS in Journals, proceedings of symposium/seminar /conference etc. without the written permission of competent authority of IRDE.

II. General Conditions of this CARS

1. Equipment:

- a. All equipment of a capital nature purchased, by the Research Service Provider (RSP), to execute this contract are the property of DRDO (IRDE). These shall be returned to IRDE within 03 months of expiry of this contract, unless IRDE specifies otherwise separately. NOTE: Should there be a difference of opinion between the RSP and IRDE on whether or not a piece of equipment is of 'Capital nature', the decision of IRDE shall be final and binding on the RSP.
- b. Equipment included in the Summary Offer of Research Services [at Entry 9.1 (b)) of CARS shall be procured by the RSP].
- c. The RSP shall be responsible for the proper maintenance of the equipment and shall not alienate them, or use them without the prior permission of IRDE for purposes other than those specified in this contract.

2. Financial provisions:

By entering into this contract, the RSP agrees to make available to the IRDE, or to any person or bodies designated by it, if requested by the IRDE, all financial documentation and records on supplies and services purchased or acquired by the RSP for executing the contract.

1.1 Advances, work-in progress and schedule of payments:

- a) Advances or milestone payments are interim payments, which shall be deducted from the total sums due to the RSP.
- b) IRDE shall make payments for executing this contract on demands made through 'Contingent Bills' after certification by the pertinent financial authority of the RSP that

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the monies already released have been utilised for the purposes for which they were provided.

- c) Statements on expenditures incurred on items at 9.1 Summary Offer of Research Services the CARS as certified by the internal auditors of the RSP shall be submitted within 30 days of crossing of each Performance milestone identified in the schedule of payments at 9.2 overleaf of the CARS.
- d) Except with the specific written pre-agreement of the IRDE, the RSP shall not use for any purposes other than those specified in this contract, any material or services for which advances or milestone payments have been made.

2.2 Financial documentation and records:

- a) For work whose estimated time for completion is six months or less, the RSP shall submit only those reports as related to the purchase of equipment by the RSP, within thirty (30) days of such purchase.
- b) For contracts whose estimated time for completion is more than six months, the RSP shall provide the IRDE, not later than thirty (30) days after the end of each half-year, with a half-yearly financial report showing the actual expenditure incurred, against each of the entries at item 9.1 "Summary Offer of Research Services" for the execution of the contract up to the end of the previous half-year.
- c) IRDE, or other authority specified by DRDO, may inspect all books, bills, vouchers and other financial records at any time until the final settlement of accounts. The RSP shall supply the IRDE with such documents as are necessary for final settlement of claims, without explicit request by the IRDE, within three (3) months after the date of submission of the Final Report.
- d) The documents supporting claims shall be preserved by the RSP until one year after the contract accounts are finally settled.

3. Disclosure and use of information by the RSP:

The RSP will ensure that the documents supplied by the IRDE are not disclosed to any person other than a person authorised by the IRDE. Any pattern, sample or information in documentary or other physical form remains the property of the IRDE throughout the period of the contract and shall be returned to the IRDE after execution of the contract, unless their disposal is otherwise provided for in the contract.

4. Delivery schedule:

- 4.1 The interim outcomes of the contract shall be delivered at the time or times and in the manner specified in (I) above.
- 4.2 The RSP shall inform the IRDE promptly of any occurrence that is likely to cause delay in delivery of above contracted outcomes. IRDE shall determine in the light of circumstances reported, the extent of change(s) required in the delivery schedule of the contract.

Note: The above covers only unexpected technical difficulties, gross delays in deliveries by suppliers of purchased equipment or consumables, illness or other justifiable cause of unavailability of research personnel and similar unforeseen circumstances.

4.3 An extension of the time limit for execution of the contract, or a postponement of delivery of outcomes shall require the explicit approval of IRDE, which approval shall be contractually valid only when this contract is formally amended by IRDE, as recorded on top right-hand corner overleaf.

5. Short-closure of contract:

The contract may be short-closed at any time during the currency of its execution if the IRDE feels that no useful purpose will be served by continuing its implementation. The short closure will be deemed to be effective from the day the short closure order is received by the RSP. Subsequent to this short-closure the RSP will submit a technical report on the work done till short closure. The monies left unspent on the date of receipt of short closure order by the RSP shall be returned to IRDE. All equipment/stores acquired out of contract monies shall also be returned to IRDE.

6. Reports:

Reports giving details of the progress of the work shall be sent to IRDE at intervals as specified in (I) above. On completion of the contract, the RSP will submit a final report (Contractor Report). All reports shall be in a format conforming to Indian Standard IS: 1064-1980, bound with Bibliographic Description sheet conforming to IS: 9400-1980.

7. Ownership of Intellectual Property (IP):

7.1 The ownership of intellectual property, whether or not legally protected, generated by contract research performed under this contract shall vest in DRDO. However, the RSP shall receive, upon demand by it, a royalty-free license from DRDO to use these intellectual properties for its own purposes, which purposes specifically exclude sale or licensing to third parties.

7.2 Notwithstanding the above, all documents and information detailing the technical Performance of this contract (including pertinent laboratory notebooks, sketches, photographs, video tapes of experiments, electronic data acquisition records and other similar) shall be the property of DRDO, whether or not in the physical possession of DRDO.

8. Publications:

Interim technical results and the outcome of the contract, intellectual or physical, are the property of DRDO. If the investigator intends publishing the technical outcome, he shall send a written request to IRDE for permission to publish along with a copy of the manuscript. Within 60 (sixty) days of the receipt of such request, IRDE will inform the investigator(s) about its decision. If no communication is received from IRDE by the investigator/RSP within this period of 60 (sixty) days, the investigator/RSP shall be free to publish the material as proposed by him.

9. Publicity relating to this contract:

The existence of the contracts or the status of their execution shall not be publicised by the RSP in the media or in its Periodic/Annual Report except with the written consent of IRDE. The latter shall specify the text relating to this contract that may be made public.

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10. Communications:

All communications affecting the performance of the contract, or its terms and conditions, shall be contractually valid only when confirmed by formal amendments to this contract made by the original signatories to the contract, and recorded in the box at the top right- hand corner overleaf.

11. Compliance with Law:

Notwithstanding anything contained in this contract, the RSP shall be wholly responsible for complying with all laws in force in India.

12. Settlement of disputes:

All disputes relating to this contract shall be settled mutually between The Department of Mechanical Engineering, APS College of Engineering, Bengaluru & Director, IRDE placing this contract. Any remaining unresolved disputes shall be referred to final binding settlement by authorities mutually decided by the Secretary, Defence Research & Development, Ministry of Defence; and Secretary, HRD, Government of India, unless otherwise provided for in specific conditions at (I) above.



