PBMD/PPME/LUM-UAV/RFP/2024-25/1

September 23, 2024

<u>Proceedings of the Pre-bid Conference held on 23rd September 2024 at CSIR-NAL,</u> <u>Bengaluru towards "Joint Collaboration in R&D, Manufacturing and Commercialization of</u> <u>150 kgs Category Loitering Munition – UAV"</u>,

The Pre-bid Conference was held and the following officials from CSIR-NAL & Participating CSIR Laboratories attended the meeting.

SI.No	Name & Designation		
1	Dr. P V S Murthy	Head, UAV	
2	Mr. R Venkatesh	Head, PBMD	
3	Mr. Raghavendra B	Sr. Principal Scientist, PBMD	
4	Dr. Somendu Jana	Head, PRD	
5	Mr. K M Pillai	Chief Scientist, PRD	
6	Mrs. Shikha Jain	Principal Scientist, FMCD	
7	Mrs. Devshree Kumar	Principal Scientist, UAV	
8	Mr. K Venkataramanan	STO-2, PBMD	
9	Mrs. Pooja Dipesh Shah	HRM, PBMD	
	Other participants include PIs of 17 modules attended both offline and online	PIs from CSIR-NAL, CSIR-CEERI, CSIR-CSIO, and CSIR-IMMT	

The list of prospective bidders who attended the Pre-bid Conference is as per Annexure-1

At the outset, the Head UAV & Head PBMD welcomed all the CSIR-NAL Team, invitees and the representatives of the bidders and briefed in general the scope of the RFP. The Head, UAV and Head, PBMD have made detailed presentation on technical and collaborative/commercial aspects respectively and the NAL addressed the clarifications sought by the bidders and the replied there to and PPTs made as detailed in **Annexure – 2**.

The representatives present were satisfied with the replies given and it was informed that the corrections/additions/ clarifications given, as discussed during the Pre-bid Conference would be hosted on the website of CSIR-NAL and all prospective bidders are required to take cognizance of the proceedings of the Pre-Bid Conference before formulating and submitting their bids as stipulated in the RFP document.

As per the request of bidders the last date for submission of the Technical proposals has been extended till 19th December 2024 upto 4 PM. The date of opening of Technical Bid is 20th December 2024 at 11 AM.

Sd/-

Head, PBMD & Head, UAV

Annexure-1

Industry delegates attended the Pre-Bid Conference

SL No	Company Name	Details of participants	E mail
1	Adani Defence Systems & Technologies Limited, Hyderabad	Vijay Kumar pandey	Vijay.Pandey2@ada ni.com
2	Alpha Design Technologies Pvt Ltd, New Delhi		savita.b@adtl.co.in
3	Anadrone Systems Private Limited	Wing Commander Ajit Manohar Pal (Retd.), Senior Program Manager	ajit@anadrone.com
4	Apex Aerospace Pvt. Ltd., Bhubaneswar	PKC Dash, Director	apexaerospacepvtlt d@gmail.com
5	Apollo Computing Laboratories, Hyderabad/Bengaluru,	 B Jaipal Reddy, Managing Director, 2. Ajay Kumar Sharma, Vice President Shekhar Ghosh, General Manager, 4. Johnson Verghese, GM(Partnership) 	aksharma@apolloco mputing.com
6	Applied Electro Magnetics Pvt LTd, Noida	 1. Vikrant Satya 2. Suresh Kumar Antil 3. Ashish Anand 	ashish.anand@aemi ndia.com
7	Ayaan Autonomous Systems Private Limited, Pune	 Nikhil Gupta, Manager, Business Development Atul Chaudhari, Founder and CEO 	nikhil.gupta@ayaan. ai
8	BEL	 Yogeesh S S, Manager Toran kumar, Manager Subramanya R, Manager 	sunilkumarsingh@b el.co.in;
9	BEML Limited	1. Ritesh Kumar Tandekar, DGM, 2. Ranganath R, Sr. Manager, 3. Kishore G A 4. Pallavi Ghormare, Asst. Manager	ritesh.tandekar@be mlltd.in
10	Bharat Forge Limited, Pune	1. Ajay Sharma 2. Sanket Inamdar 3. Nisha Dube	Sanket.Inamdar@ka Iyanistrat.com; AjayR.Sharma@bhar atforge.com

SL	Company Name	Details of participants	E mail	
INO	L			
11	BotLab Dynamics Pvt Ltd, New Delhi	 Gp Capt Manjit Singh Sidhu (Retd), Head-Defence and Internal Security Kshitij Kaikeya, Marketing Head 	manjit.singh.sidhu@ botlabdynamics.com	
12	Centre for Development of Advance Computing CDAC,Strategic Electronics Group Trivandrum	1. Shibu R M, Scientist F 2. Rajesh R, Scientist E	rrajesh@cdac.in;	
13	DELOPT	Gururaj Subhedar	gururaj.s@delopt.co. in	
14	Dhaksha Unmanned Systems Pvt. Ltd.	1. C. U. HARI, SeniorConsultant2. K. V. SRINIVASAN, SeniorConsultant3.Dr. G. RAMESH, SeniorConsultant4. Dr. R Krishnakumar	KrishnaKumarR@dh aksha.murugappa.c om	
15	Drogo Drones Private Limited	1. Shivadhar Soma, COO	shivadhar@drogodro nes.com	
16	Dynamatic-Oldland Aerospace, Bangalore	1. Mukund Jha,GM 2. Gousalajam Mohammad,DGM	gmohammad@dyna matics.net	
17	Economic Explosives Limited, NAGPUR	1. Dr. Rahul Dixit, Head R&D	eel.defence@solargr oup.com	
18	Falcon Victor Private Limited	1. S K Singh	sks@fvgroups.com	
19	FLYING WEDGE Defence & Aerospace Technologies	Sharathkumar YC	sharath@fwdefence. com	
20	Focus Industries (Ref . Rinku Abbani)	Lakshmikanthaiah Raghu rao	lakshmikanth2104 @gmail.com	
21	Gopalan Aerospace India Pvt Ltd	 Bhaskara Rao - CEO Karthikeyan - Vice President Rajesh K - Business Development 	bdm@gopalanaeros pace.com;	
22	HFCL DEFENSE	Arun M.L	arun.ml@hfcl.com	
23	Ideaforge Technology Itd	Akhilesh Kumar Dy. Manager-Mobility Solutions	akhilesh.kumar@ide aforgetech.com;	
24	Indowings Pvt. Ltd., Noida , UP	1. Vandit Hurra, BDM 2. Aadarsh Gejage	aadarsh@indowings. com	
25	Jatayu Unmanned Technologies Pvt. Ltd., Mumbai	Pradhyut Bhandari, COO	info@jus-tech.in;	
26	Kadet Defence Systems Pvt Ltd	1. Avdesh Khaitan	a.khaitan@kadet- uav.com	

SL	Company Name	Details of participants	E mail	
INO				
27	Lakshmi Machine works Ltd., Coimbatore	 Suresh Kumar Mishra, GM-Operations (Composites) Sivaraman, Deputy Manager (Design And Analysis) Karthick V, Sr. Engineer- 	karthick.v1@lmw.co. in	
	<u> </u>	(Business Development)		
28	Magic Myna Pvt Limited	1. Sunil Nair, MD	sunil@magicmyna.in	
29	Maini Precision Products Ltd.(Aerospace Division), Bangalore	1. Sandeep Kumar, Sr.Manager,HOD- Sales and Marketing	pavankumar.k@mai nimail.com	
		2. Sum Kumar Singh, Project Leader Sales and Marketing 3. Pavan Kumar, Key Account Manager, Sales and Marketing 4. Nishalini Periyasamy, Business Analyst		
30	Metrolab Engineering Pune	Mr. Yogesh Amte (Director,), Mr. Ajit Singh (Senior Manager-Business Development, Metrolab Engineering Pune)	ajit.singh@metrolab. engineering;	
31	MICRONEL Global Engineers Pvt Ltd.,	1. Ashwani Kumar – COO 2. Mohammed Shariff – BD- GH 3. Priya Ashok – GH	mp@micronel.net;	
32	Veerangana Solutions LLP	1. A K Chaudhri	veeranganallp@gma il.com;	
33	Nabhdrishti Aerospace	1) Arjun Srivatsa 2) Rohit Chouhan	arjun.srivatsa@nabh drishti.in	
34	NASH Industries, Bangalore	 Prabhakar Munirathnam, Head, BD, Hariharan M, Costing Engineer 	hariharan.m@nashi ndia.com	
35	NextLeap Aeronautics Pvt Ltd	1. Thaariq Ahmad Rafiq	thaariq.rafiq@nextle ap-aeronautics.com	
36	Nomistar Defence & Technology Pvt. Ltd.	1. Rajeev Mathur	info@nomistardefe nce.com;	
37	Optimized Solutions, Bengaluru	 Mr. Rajesh Puranik,VP of Sales & Marketing, Mr. Prabakaran T, Business Development Manager 	rajesh.puranik@opti mized.solutions, prabakaran.t@optim ized.solutions	

SL No	Company Name	Details of participants	E mail
38	Proteck Machinery Pvt Ltd, Bengaluru	1. Sriharsha K, General Manager 2. Chandramma R, Sales Coordinator	keshav@proteck.co.i n, sriharsha.k@prot eck.co.in
39	PTC Industries Limited, Lucknow	1. P R Agarwal	marketing1@ptcil.co m
40	Raghu Vamsi Group of Companies	1. Ravindra Naidu VP Defence 2. Akshay Kale,Manager BD	ravindranaidu@ragh uvamsiaerospace.co m
41	Redon Systems Pvt Ltd, Hyderabad	 Ranjith Reddy M,Director & COO Brig. Anjum Shahab,Head Defence Sales, 	anjum.shahab@redo nsystems.in, ranjith@redonsyste ms.in
42	Royal India Corporation Limited,	1. Colonel Ajay Singh Rajawat (Retd.)	projects@ricl.in
43	Safran Data Systems India Pvt Ltd	1. Mondeep Duarah 2.Somnath	sharadha@captronic systems.com;
44	Sagar Defence Engg Pvt Ltd	Amit Singla	amitsingla@sagarde fence.com
45	Shirvanthe Technologies Pvt Ltd	Yogesh Bhat	yogesh.bhat@shirva nthetechnologies.co m
46	Tata Adavanced Systems Ltd, New Delhi	 Arijit Ghosh - VP Nachiket Kale - AVP Karkada Purushothama Bhat - GM Vinod Yadav - AVP Sudarshan - Head (Manufacturing) Pradeep Karanam- Deputy Manager Chethan Vasanth - Deputy Manager Desh Raj Singh Gr. Captain Arun 	deshrajsingh@tataa dvancedsystems.co m
47	TATA Elxsi	Vignesh, Delivery Manager	vigneswaran.s@tata elxsi.co.in
48	Tisa Aerospace, Hyderabad	Kiran kumar Vagga, Founder & CEO	kiran.vagga@tisaaer ospace.com
49	Triveni Engineering & Industries Ltd., Mysuru	SHASHI KIRAN, DGM, BD	shashikiran@ptb.triv enigroup.com
50	TSAW Drones	Madhav Gupta	madhav@tsaw.tech

SL No	Company Name	Details of participants	E mail
51	Tunga Aerospace Industries (P) Ltd	 M V K V Prasad, Executive, Vice Chairman Cdr Ramesh Madhavan (Retd), Cofounder & COO 	ramesh.madhavan@ tungasystems.com
52	Ushtara Engineering Pvt. Ltd., Bangalore	Sunil Sundar	sunil@ushtara.com
53	VEM Technologies Pvt Ltd.,Hyderabad	 B P Babu, Sr. General Manager V V Rakesh Varma, Exe- Manager-Marketing K Bhavani 	kbhavani@vemtech nologies.com
54	YOTTEC SYSTEMS LLP	1. Air Cmde CB Shenoy- General Manager-Project , 2.Harshil Kumar Anand - Senior UAV Pilot, 3. Poornima Teggi	poornima.t@yottec.c om



QUERIES & CLARIFICATION

RFP No. Item Description : CSIR-NAL/PNMD/LM-UAV RFP-02/2024, dt.23rd August 2024 : Joint collaboration in R&D, Manufacturing and Commercialization of 150 kgs category Loitering Munition (LM) UAV.

A. Queries from Prospective Bidders During the Pre-Bid Meeting 23.09.2024

Sr. No.	Query / Clarification Sought	Clarification/Amendment
1 2	 What is the control of vehicle, whether it is RC controlled or fully autonomous? Firm: - Optic Value Pvt Ltd. a) Is any battery available on the vehicle, any alternator? b) Will single GCS or multiple GCS be operated? 	 Fully Autonomous Alternator is planned on the vehicle It is planned to have one GCS and one MCS (within the range of 200 Kms of LMs)
3	 Firm: - Daksha Unmanned Systems a) Have we attempted with this type of prototype? b) We have put max 900 kms with 9 hours' endurance or any cutoff is decided? c) In case of Electro-optic payload weight is defined as 10 kg, but DIR (Detection, Identification and Recognition) of target requirements defer with altitude and that specs should be taken into consideration. It should be driven by requirements of detection? d) Do we have Image based tracking expertise in CSIR-NAL? Firm: - Dr. Manjit Singh, BotLab Dynamics Pvt. Ltd 	 Not yet. However, configuration design is completed It is aimed to design either 900 Kms range or 9 hours of endurance at 2-3 kms altitude above MSL. In our survey EO/IR cameras with required zoom capability to meet DIR requirements from 3 Kms altitude is available within 10Kgs weight. Yes. Image processing capability for identification and tracking is available with the team
4	 a) Design requirements of Propeller? What is the role of Industry? b) Design of warhead? Warhead type and details? c) For EO-IR payload, actuators, details are not provided? Has some industry identified with specifications? Firm: - Rahul Dixit, Economic Explosive 	 NAL will design the required propeller. First few prototypes will be manufactured by NAL itself. ToT will be given to industry to make another 10 propellers and later on as per the sales. Industries are identified to supply the equipment which meet the mission and flight requirements.

5	 What kind of on-board intelligence is expected? Whether whole intelligence is on-board or on GCS? Is it only optical tracking is the only intelligence? What type of processing going on-board and GCS? Firm: - Col. Abhishek, HFCL Defence 	 Image processing software for Object detection, recognition and identification will be part of the on- board processor. However, decision lies with the command controller (MCS).
6	For canister launch, does aircraft design has kept into consideration foldable wings?	 Airframe is designed to have foldable wings
	Firm: - Kshitij BotLab Dynamics Pvt. Ltd	
7	 a) Camera, Laser Designator Pod should be cost-effective and also consider the weight? b) For canister launch, the wings should be foldable from the start. c) Related to CDR, so from start our team and CSIR sit together and take on the ground work like control logic etc. d) Take CEMILAC Certification from the start? e) Camera, Type of attack should be defined? Camera capability has to be defined from starting. If we are engaging mobile target, camera has to be effective, basically camera guidance attacking? f) If Link loss using SATCOM during GPS spoofing, can we abort the mission? 	 As explained earlier, Integrated module is identified and it is less than 10 Kgs. As explained earlier, Airframe is designed to have foldable wings Whole aim of this RFP is to involve industry right from the beginning of the project to have the following: Take industry experience to have a design for manufacture concept and to address operational issues. To involve industry in each design step for seamless ToT Will initiate discussions with CEMILAC after formal launch of the project A separate team is looking into the camera related work. Initially it is planned to verify the whole system with the existing UAVs of NAL.
	Firm: - Group Captain Modak, Adani Aerospace	• Navigation in GPS denied environment is part of the program.
8	 a) What type of Launcher CSIR will be developing – canister or pneumatic? Will it be joint development or manufacturing? b) For stealth features, is CSIR looking for industrial partner? Firm: - Mr. Vandit, BDM, Indowings Pvt. Ltd. 	 NAL will develop hydro-pneumatic launcher. ToT will be given to industry. However, if user demands canister based launching, we can explore joint development along with industry and DRDO NAL has a core team working on stealth features for fighter aircraft. The same team is going to work on this project.

9	How canister launch will the engine ignited, how the take-off planned? Firm: - Avadesh, Director, Kadet Defence System	• A clutch mechanism is being worked out. Details will be provided to the selected industrial partner.
10	Is it downscaled or full-scale UAV? How CSIR is helping in flight testing? How teams will be working at private company or at CSIR office? Whether testing facility will be provided by partner or CSIR? Firm: - Air Cmde C B Shenoy (Retd.), Yottec System LLP	• It is a full scale UAV. Industry will be part of the CSIR team during the integration and flight testing of first 5 units developed by NAL. In this phase NAL will lead the flight testing. In the later part of the program Industry will lead the flight demos to the probable customers (1 st customer) while NAL will be part of the joint activity.
11	 a) What type of Propellant for warhead for LM-UAV? b) Target weight is 150 kg so reducing it to 120 kg, how weight reduction will be taken care, how much contribution of engine, frame and propellant? c) Related to Testing facility, I'm leading Triveni, we can start testing for assembly loads? Do we have to setup at our end or we can use government facilities? Firm: - Rajesh, Pune (ANSPL) 	 NAL has very limited data regarding warhead. It is planned to develop along with DRDO. Details will be shared to identified industry. It is planned to restrict the weight around 120 Kgs. However, due to payload variations, the maximum weight shall not exceed 150 Kgs. Weight beak down will be shared at a later stage. NAL will set up the test facilities. Industry can use them. For few tests, we may use DRDO facilities.
12	 a) What is propeller size? b) Dimensions of Engine size and Thrust? Firm: - Mohammad S (MS), Ragrael Group 	 In our first cut design, a 29-inch propeller is found to be suitable. 30 HP Wankel engine: 216 CC, Max thrust at sea level is more than 40Kgf.
13	 a) What is ceiling/operating altitude for engine? b) Is the engine developed or any testing done and certified by CSIR/Agency? c) If we want to test engine on our bird, can we use it? Firm: - Anuj Rathod, Ikran Aerospace	 Operating altitude for the UAV is 2-3 Kms and Ceiling altitude of the engine is more than 5.0 Kms AMSL. Engine is developed by NAL and required ground tests are completed. CEMILAC certified the engine and cleared it for flight tests.

14	Can you share engine design documents with the final partner?	 Not at this stage. Initially, NAL plans to test on its own.
	Firm: - Shivadhar, Drogo Drones	 ToT will be given to the selected partner.
15	a) Will the vehicle have integral metallic tank and what is the capacity of the fuel tank?b) Is there any other alternative to canister launcher?	 It is not planned to have metallic fuel tanks. Bags will be used. It is the standard industry practise. Initially, it is planned to have Hydropneumatic Launcher.
	Firm: - Air Cmd Shenoy (Retd), Yottec Systems	
16	a) Though designing the UAV for fire and forget system, Parachute packaging, deployment not taken into account. With the Parachute Recovery, nowhere the parachute design details are mentioned? As compared to Nagastra, parachute deployment should be taken care?	• Observation is well taken. NAL shall come out with the parachute system in a while. All mentioned points will be considered during the design.
	 b) Benchmarking with imported system should be done? It will replace the import issue, right from beginning it should be clear that which imported UAV we are targeting to replace? 	• We appreciate the important observation made. Specs are being discussed with the probable users. It will be finalized by PDR time.
	Firm: - Dr. Manjit Singh (EEL)	EAS
17	 a) What is the communication range and frequency band of operation? b) Live streaming and target identified processing has to be relayed onto Ground Control Station? Does communication system need to take care of on-board image processing? 	 It is planned to provide communication range of 200 Kms. Frequency will be decided by the user. Identified targets have to be relayed to command & Controller. He is the final authority for initiating track
	Firm: - Akhilesh, Idea Forge Technology	and attack. There is a separate processor for image processing.
18	Is CSIR-NAL having capability of stealth features? The details of LM-UAV should be frozen in the start?	• Core competency for stealth design exists with NAL. The team is participating in the shape optimization.
	Firm: - Vikrant Satya, Applied Electro Magnetics	

19	Communication Range is 200 km LOS, so what is concept of operation for 900 km? At terminal guidance level, who is controlling it for the attack? Is this range too much, are we not putting too high range and will it create problem later in proofing our concept of operation? If vendor is not able to deliver the vehicle in time, will he be penalized? Firm: - Akshay, Raghu Vamshi Group	 LM will be launched using Ground Control station after planning the mission. LM will have no communication with GCS. However, it will be acquired by MCS when it reaches in the range of 200 Kms. CONOPS will be discussed at a later stage. Endurance and range are estimated based on the engine and LM cruise drag. About delivery from the industrial partner, penalty & exit clause will be included in the joint collaborative agreement to be signed with the successful bidder.
20	Similar products are acquired through emergency procurement requirement by Armed Forces. Is CSIR aware of this?	• CSIR believes in scaling of the production of LM UAVs as they are expendable in nature.
	Firm: - Sampath (HFCL)	• The LM-UAV will have the upper edge due to its indigenous content more than 70%
21	Which countries are you looking for import? Firm: Suesh Kumar, LMW Ltd.	• As any export strategic in nature requires the sensitivity & security clearance from the Govt. of India before exporting to any country.
22	Has anyone given specific requirement for 1000 LM?	Yes. Make II program of Indian Air Force.
	Firm: Ritesh Kumar, BEML	レポンポレ
23	I need a partner to choose for consortium as time given is just a month. Can the time be extended for two months?	• The request for time extension will be put-up to Competent Authority, CSIR-NAL for consideration and the same will be declared in the
	Firm: Ashok, Triveni Engineering	proceedings.
24	We have digital certification, but not CEMILAC, can we participate? Firm: Sujna Singh – Endurance Pvt. Ltd.	• Firms can participate, however as per RFP, CEMILAC certification will be an added advantage and carries weightage in the technical evaluation.

25	As a start-up if we want to be at the forefront, how to go ahead? Firm – Brig. Anjum Shahab (Retd) Redon Systems Pvt. Ltd.	 As per RFP requirement, the lead agency shall have the core competencies for the design & development of LM-UAV and others with related sub-systems and mission requirement expertise can join the lead firm
26	From public domain how do you price the aircraft and where you place it? Firm: Ritesh Kumar, BEML	• The target price of the LM-UAV is expected to be 1/2 of the similar class of imported vehicle.
27	Production line of engine will be set up. Will it be a part of industry? Or NAL will provide space? Firm: Sagar Shah, Ahmedabad	 Series production is part of the industry workshare.
28	Once, the industry partner is selected, where does the Company operate? Will NAL provide space? Firm: Suresh Mishra, LMW	• There will be joint team working on the project and can be decided mutually depending on the needs of the project.
29	Will the industry be a part of the development of initial 5- LM UAVs?	• Yes. Industry will be part of the development.
30	Aerospace Will lead integrator can get details of engine components? Firm: Avdesh, Kadet Defence System	• ToT for production of engine with design, drawings etc, will be provided to the successful lead firm in the commercial bid. The IP of the engine rests with CSIR-NAL.
21	(a) Someone is good in engine, some in	
31	propulsion – how will NAL consider the lead agency?	 As explained above, engine is from CSIR-NAL, the lead agency shall have the core competencies in
	(b) What is the indigenous content is expected from the industry partner in the development of LM-UAV ?	design and development of similar type of UAVs fulfilling the mission requirement.
	Firm: Somnath Chattopadhya, Safran Data Systems India	 Indian industries at least shall have the expertise and capabilities to produce 70 % of the indigenous systems, subsystems etc,

32	a) How much time will NAL take for evaluation after 23 rd Oct?	• It's a parallel process, the preliminary design activities have started.
	b) How will NAL handle so many companies who have joined together to form a consortium?	• CSIR-NAL will have joint collaborative agreement only with the lead firm have successfully qualified in the technical and commercial bid.
	Firm : Ritesh Kumar, BEML Ltd.,	
		• The lead firm intern may have collaboration with their own terms and conditions for which CSIR-NAL will not enter any tripartite agreement
33	What is included in the Project Cost of Rs.102 crores?	• The collaborative project cost of Rs. 102 crore includes building 5 prototypes from CSIR-NAL and 10
	Firm: Arjit Ghosh, TASL	Limited Series Production vehicles from the industry.
		Launcher – 2 units



Presentation Made during the Pre-Bid Conference

A. Technical Presentation

OVERVIEW Loitering Munition with Stealth Features (~150 Kg Class)

Parameters	Proposed CSIR UAV	
Wing Span	3.5 m	
Wing Area	3.5 m ²	
Aspect Ratio	3.5	
AUW	~ 120 kg-f	
Cruise Speed	40 m/s (143 kmph)	N/
Dive Speed	100 m/s (360 kmph)	A CONTRACT OF A
Cruise Drag	16 kg (estimated)	

✓ Equipped with EO/IR/Laser designator and explosive warheads.

✓ To be powered by NAL in-house developed 30 HP Wankel Engine

Loitering Munition – Stealth UAV 150 Kg Class

LM- UAV KEY FEATURES

Parameter	Specification
Maximum Take of weight	<150 Kg
Maximum Payload	Warhead ~ 15 Kg Sensing ~ 10 Kg
Endurance	6-9 Hours
Cruise Speed (CAS)	40 m/s
Dive Speed (CAS)	100 m/s
Communication Range	200 Km
Maximum Range	900 Km
Ceiling Altitude	5000 m (ASL)
RCS	<0.5 m ²
Autonomy	Fully independent flight
Launch	Assisted Launch Using (Rocket booster / Pneumatic Launcher)
Recovery	Parachute (Option for trial flights)
GPS Outage	Continues to fly to the next waypoint
Object Detection and Tracking	Featured in the UAV

Power Plant & Fuel System

Description	22.3 KW (30 HP) Wankel engine	~
Туре	Single rotor Wankel engine	
Thermodynamic cycle	Otto cycle	
Power	30-hp (22.4 kW) @ 7000 rpm at ISA-sea level	
Max propeller speed	7000 rpm (Direct drive)	
Cylinder capacity	216 cc	
Compression ratio	9.2	
Housing Cooling	Ram air	
Rotor cooling	Ram air	
Lubrication	Total loss forced lubrication system	
Ignition	CDI system	
Fuel used	AV GAS- 100LL/ Unleaded gasoline	
Fuel supply	Carburettor- Diaphragm type	
Specific fuel consumption	335 to 365 g/ kWh, (0.55 to 0.60 lb/ hp/ h)	
Engine installed weight	< 15 kg	

Loitering Munition – Stealth UAV 150 Kg Class

Power Plant & Fuel System: Static Thrust Data

Scope of collaborative Work

- Manufacturing of 32bit ARM Cortex-M7 processor based embedded hardware boards or similar embedded boards for UAV autopilot applications.
- b) Implementation of flight control algorithms on Embedded hardware.
- c) GUI based ground control station software development.
- d) Sensing payloads such as 2-axis /3-axis gimbal based Electro-Optical/IR / Laser designator seeker units.
- e) Communication system.
- f) Electro-Mechanical Servo actuators.
- g) Production of CSIR-NAL designed IC Engines.
- h) Tooling, jigs and production of composite UAV airframe.
- i) Flight testing and user demonstrations

Loitering Munition – Stealth UAV 150 Kg Class

Role of Industrial Partner

	Description	Responsibility
1	32bit ARM Cortex-M7 processor based embedded hardware boards or similar embedded boards for UAV autopilot applications	Expected to source the components as per CSIR-NAL design and assemble the units to realize flight worthy autopilot hardware
2	Embedded Software development	Expected to develop flight worthy software based on algorithms supplied by CSIR-NAL
3	Ground Control Station Software	Shall design & develop the software jointly with CSIR-NAL team
4	Sensing payloads	Shall design & develop flight worthy 2/3-axis gimbal with EO/IR/Laser designator seeker with required zooming features
5	Communication system (200 kms LOS)	Shall design & develop flight worthy communication system
6	Electro-Mechanical Servo actuators	Shall design, develop and supply flight worthy Electro-Mechanical servo actuators
7	IC Engines	Shall produce required number of Wankel engines along with accessories for the LM project
8	Tooling and jigs and production of composite UAV airframes	Shall manufacture Tooling and jigs as per CSIR-NAL drawings and produce required number composite airframes for the LM project
	Loitering Munitie	on – Stealth UAV 150 Kg Class

Role of Industrial Partner

	Description	Responsibility
9	Flight testing	Expected to jointly conduct flight tests
10	Flight demonstrations to User	Expected to demonstrate flight capabilities to the user community : Initially – Jointly with NAL Later – Independently
11	Complete take over	After successful development & User acceptance

Loitering Munition – Stealth UAV 150 Kg Class

Investment Requirements

Sl.No	Module	Quantity from Industry
1	CSIR's Wankel Engine Production	10 No.s
2	Autopilot hardware Manufacturing	10 No.s
3	Autopilot software development and porting on to the hardware	Joint Activity with CSIR Team
4	Ground Control Station development	Joint Activity with CSIR Team
5	Gimballed payload (EO,IR & Laser designator)	10 Numbers
6	Actuators	10 sets
7	Vision processing hardware	10 Sets
8	Jigs & Fixtures	1 Set
9	LM UAV frames	10
10	Warhead	10 units
11	Launcher	2 units
11	Launcher	2 units

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REQUIREMENT OF TECHNICAL EXPERTSIE

- ٠ Manufacturing capability of 32 bit ARM Cortex processor based embedded hardware boards or similar embedded boards for control applications
- Embedded Software development capability
- GUI based ground control station software development
- Assembly of sensing payloads such as 2-axis / 3-axis gimbal based Electro-Optical and * IR camera units
- Manufacturing of Electro-Mechanical Servo actuators
- Manufacturing capability of IC Engines or similar systems
- Manufacturing capability of composite airframes
- Manufacturing capability of Jigs and fixtures

Loitering Munition – Stealth UAV 150 Kg Class

Workshare & Responsibilities

SI.		CSIR-NAL Workshare	Wo	rkshare
No			CSIR	Industry
		Aircraft configuration design	\checkmark	-
1	Configuration and Design	Aerodata generation (CFD/ Wind Tunnel testing)	\checkmark	-
		Wankel Engine technology & propeller development; First 5 prototype units	1	-
2	wankel Engine	Wankel Engine manufacturing (10 units) Propeller Manufacturing	-	V
3	UAV Simulation & CLAW	Aircraft Simulation, Autopilot flight control algorithms	V	-
		Autopilot hardware design	V	-
4	Autopilot	Autopilot hardware development & Manufacturing (10 units)	V	\checkmark
		Autopilot software development and porting onto the hardware	-	V
5	Ground Control Station	Design & development of Ground Control Station development	~	\checkmark
6	GPS denied Navigation	Design and development of GPS denied Navigation algorithms	V	-
7	Gimballed payload	(EO,IR , Laser designator)-10 units	-	\checkmark
		Design and development of object detection and tracking algorithms	V	-
8	AI based vision algorithms for object detection and tracking	Vision algorithms processing hardware design and development (with GPU cores)	-	V
		Vision algorithms software development & porting on the hardware	\checkmark	1
	Л	Loitering Munition – Stealth UAV 150 Kg Class		

Project Milestone (Time T0 – from the date of Signing the Agreement)

	то-тз	Т4-Т9	T10-T15	T16-21	T22-T27	T28-T33	T33-T36
Prototype- 1	PDR	Proto type – 1 Manufacturing COTS components procurement	Integration & Flight testing without launcher UAV Performance checks				
Prototype- 2				Manufacturing of Prototype-2 with stealth features	 Flight testing PT-2, without launcher, Object Identification and tracking, stealth , GPS denied environment 		
Production Standard Airframe					CDR	 Launcher Testing Manufacturing of PSA aircraft Engine from ToT partner 	Flight testing PS-Airframe with launcher Terminal attack User Demonstration
2	Loitering Munition – Stealth UAV 150 Kg Class						

THANK YOU

B. Collaborative & Commercial Presentation

Clarifications on Hansa-3(NG) RFP

✓ It is a **TWO STAGE BIDDING** – NOT TWO BID SYSTEM

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- ✓ IN THE FIRST STAGE : The bidder is expected to carryout a detailed survey or investigation and undertake a comprehensive assessment of risks, costs and obligations associated with the particular procurement.
- ✓ All the eligible Technical Capability Bids will be evaluated by a Technical Sub-Committee including site visits to verify the facts as per the terms of the RFP.
- ✓ Any amendments to the RFP after the pre-bid conference will be uploaded in the NAL Tender web page and will be informed on the same.
- ✓ FIRMS ARE NOT TO SUBMIT THE COMMERCIAL OFFER IN THE FIRST STAGE TECHNICAL BID
- ✓ Those firms QUALIFY IN THE TECHNICAL CAPABILITY BID WILL BE ISSUED COMMERCIAL BID FOR SUBMISSION within a specified time. RFP gives a broad criteria of Commercial Bid.

Market Assessment and Demand Forecast for LM-UAV (Source : Fortune Business Insights 2024) FORTUNE **Market Segmentation** Loitering Munition System Market By Geography North America • U.S. • Canada Middle East & Africa Israel UAE Ву Туре U.K. Rest of Middle East & Africa Short Range (Upto 150km) Navy Force ous Identification and g Loitering Munition S ten . dium Range (150km to 650km) Land Force Manual Positioning Loitering Munition Long Range (Above 650km) Air Force Rest of E Copyright © 2024, Fortune Business Insights 19

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Global Ma	rket F	orecas	st, By I	Regio	n									
	Ta	ible 04: Gl	obal Loite	ring Muni	tion Syste	m Market	Revenue	(USD Mil	lion) Fore	ecast, By F	Region, 20	019–2032		
Region	2019A	2020A	2021A	2022A	2023E	2024F	2025F	2026F	2027F	2028F	2029F	2030F	2031F	203
North America	241.2	244.8	281.1	336.2	419.9	530.6	672.3	867.0	1107.7	1394.8	1715.0	2099.5	2542.4	304
Europe	168.2	170.7	196.1	234.5	292.9	367.8	463.1	593.6	753.7	943.2	1152.6	1402.3	1687.6	200
Asia Pacific	203.6	206.6	237.2	283.6	354.1	452.2	579.0	754.6	974.0	1238.8	1538.3	1901.5	2324.7	280
Middle East & Africa	140.2	142.4	163.6	195.8	244.6	303.9	378.6	480.0	602.8	745.8	901.0	1083.5	1288.6	15
Latin America	82.8	81.9	91.7	106.9	130.0	160.0	197.4	247.8	307.9	376.9	450.2	535.1	628.6	72
TOTAL	835.9	846.4	969.6	1157.1	1441.6	1814.5	2290.5	2943.0	3746.2	4699.6	5757.0	7021.8	8471.8	100

Technical Capabilities Evaluation Criteria

Sl.no	Pre-qualification Criteria	Supporting Compliance Document	Reference
1	The firm shall be a Company registered under the Indian Company Act, 1956	Copy of certificate of Incorporation	
2	The firm has to be profitable in its field of business and should not have incurred loss in the last three financial years and have not incurred any loss in more than 2 years during last 5 financial years subject to force majeure situation.	Profit & Loss Statement and Balance Sheet	
3	The firm should have a minimum average annual turnover of INR 50 CRORE in the last three (3) financial years.	Profit & Loss Statement and Balance Sheet certified by CA	
4	The firm shall have past experience (more than 5 years), during the last three years in executing similar type of related assignments in Central Government / State Government / PSUs/Autonomous Bodies/Private Sector in India or Abroad	Copy of work order from the Department /Organization is to be enclosed	
5	Certification of the firm by the statutory authorities like DGCA,CEMILAC etc. will be an added advantage/given preference	Copy of Certificate(s)	
6	The firm should not be black listed by any Central Government / State Government / PSU /Government Bodies / Autonomous Bodies / Private Sector	Self-declaration signed by the Authorized signatory	

Technical Capabilities Evaluation Criteria

7	The firm should have indigenous design and development capabilities and should not offer finished products of foreign OEMs to this project.	Self-declaration signed by the Authorized signatory
8	The firm should have skilled workers/professionals / experts in relevant Clause 3 & 5 pf the RFP. This is essential of the pre-qualification criteria as hiring entirely new manpower and training/upgrading their skills is not only time consuming but makes the proposal un-viable.	Copy of Certificate by Statutory Auditor or Company Secretary of the firm and subject to audit by CSIR-NAL team to verify the HR skills available for the RFP deliverables
9	The firm should have minimum basic facilities for LM UAV manufacturing facility, assembly, integration & equipping facility as per Clause 3 & 5. This is essential of the pre-qualification criteria as setting-up new facility and getting certification etc., not only cost & time consuming but makes the proposal un-viable.	Proof of existing facilities subject to inspection by CSIR-NAL team

Technical Evaluation Methodology

SI. No	Criteria		
	Sub-criteria	Criteria Total	
1	Past experience of the firm/industry partner (track record)	50%	
2	Existing infrastructure & facilities (as per 7.3.2)	20%	
3	General profile of qualification, experience and number of key staff (not individual CVs)	20%	
4	Overall financial strength of the firm in terms of turnover, profitability and cash flow (liquid assets) situation	10%	
	Total	100%	

- a) The CSIR-NAL shall shortlist all the firms who secure a minimum of 70% marks
- b) Decision of Technical Evaluating Committee in ascertaining 'Similar Nature" and "Similar Assignment" and the site will be final.
- c) Please also provide as an Annexure to this form a Capability Statement of no more than 5 pages in font size Arial Narrow 12, which provides the necessary details as per guidelines given in section 7.3.4.

Indicative Commercial Bid Evaluation Criteria

Note:	: The Commercial Offer format will be prepa	red by CSIR-NAL team and sent only to the		
Firms who qualify in the Technical Capabilities Offer				

SI. No.	Criteria	CSIR- NAL Terms	BIDDER	Remarks
1.	Source of funding	The firm should provide details and documentary evidence for source of funding of Rs. 38 Crores (RoM) for the development of the project	Acceptance to CSIR-NAL terms	
2.	The partner capability produce the subsystems as per the final design and detailed in Clause 3	Expect the industry partner to produce & supply the Subsystems meeting the final design	Acceptance to CSIR-NAL terms	
3.	Meeting the requirement of technical expertise as detailed in Clause 5	Industry partner to have technical expertise to meet the project objectives and deliverables	Acceptance to CSIR-NAL terms	
4.	Facility and manpower having capability to deliver 10 LM-UAVs within the project approved PDC time from the date of signing of the agreement with CSIR- NAL.	Plz. Refer clause 4.9 & 4.10	Acceptance to CSIR-NAL terms	
5.	Royalty payment to CSIR-NAL	Min. expected 5% on ex-factory sales	Bidder offer Of Ex-factory sale	

Indicative Commercial Bid Evaluation Criteria

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6.	Acceptance to make investment as per RoM cost and sharing risk in the project	Must have good financial strength/Cash-flow/ Turnover to commit funds for the project	Acceptance to CSIR-NAL terms	
7.	Readiness of mass production Facility at Bidders premises.	Within 6 months from the PDC of the project	Acceptance to CSIR-NAL terms	
8.	Obtaining necessary certification from DGCA & CEMILAC for prototype production as well as series production	Within 6 months from the date of signing of the agreement	Acceptance to CSIR-NAL terms	
9.	Acknowledgement for the product: LM-UAV	The name shall be displayed on each of manufactured UAV with "Technology of CSIR-NAL"	Acceptance to CSIR-NAL terms	

