EXPRESSION OF INTEREST

FOR

PROCUREMENT OF VTOL AUTONOMOUS UNMANNED AERIAL VEHICLE SYSTEM FOR CARRYING 100 to 115 kg PAYLOAD

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH
NATIONAL AEROSPACE LABORATORIES
P.B. NO.1779, HAL AIRPORT ROAD, KODIHALLI,
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EXPRESSION OF INTEREST

CSIR- National Aerospace Laboratories (NAL), Bengaluru, India is one of the premier Laboratories under Council of Scientific and Industrial Research, an autonomous body under Department of Scientific and Industrial Research (Government of India), New Delhi. CSIR-NAL is a Science and Knowledge based Research, Development and Consulting Organization. It is internationally known for its excellence in Scientific Research in Aerospace Engineering.

An Expression of Interest (EoI) is initiated at CSIR-National Aerospace Laboratories (CSIR-NAL) with the prospective manufacturers, their authorized channel partners or agents/suppliers and system integrators to discuss with the Technical Committees on the aspects of utility, technology, feature, literature, design, technical parameters, clientele and other related issues of the equipment and material for the following items to be procured for CSIR-NAL.

Sl. No.	File No.	Item Description
01.	NAL/PUR/MAV(UAV)/022/19-Z	Procurement of VTOL Autonomous Unmanned Aerial Vehicle System for carrying 100 to 115kg Payload

1. The address for submission of EOI Bids and for obtaining further information:
   Stores & Purchase Officer
   Purchase Section
   CSIR- National Aerospace Laboratories
   PB No.1779, HAL Airport Road, Kodihalli, Bengaluru – 560017
   Karnataka-India
   Tel # : 080 25086040/6041/6044
   Fax # : 080 25269611
   Email : purchasek@nal.res.in, mkala@nal.res.in

2. The EOI document can be downloaded free of cost directly from Central Public Procurement Portal (CPPP) of Government of India website http://eprocure.gov.in/epublish/app and CSIR-NAL website www.nal.res.in.

3. The prospective EOI Bidders should adhere to due dates specified in Tender Details corresponding to this Tender.

4. The Schedule for Submission and Opening of EOI Bids is as follows: -

Date & Time of Submission of Bid		Date and Time of Opening of Bid	
Date	Time (IST)	Date	Time (IST)
17-May-2019	**10:00 Hrs**	**17-May-2019**	**11:00 Hrs**

5. EOI Bidders are requested to fill specifications (offered by them) in the **"Reply from EOI Bidders"** column in the tables given under **Clause No.4.1 to 4.8**.

6. A brief description of the procurement is appended herewith. The EOI Bidders are requested to submit documentary evidence to prove technical capabilities, client list, experience and credentials as per Annexure-I enclosed.

7. The Technical Committee shall finalize specifications after knowing/obtaining details about relevant/available technology in the market suiting to the requirement and R&D needs of our Laboratory.

8. For evaluating the responses, CSIR-NAL may call the EOI Bidders for presentation of their case. Presentation can be considered via Skype/Video Conferencing also.

9. The Director, CSIR-National Aerospace Laboratories (NAL), Bengaluru, India reserves the right to accept or reject any or all tenders / offers / EOI either in part or in full or withdraw or to annul the tender process at any stage or to split the order without assigning any reasons there for. Such an event would not cause obligation of any kind to CSIR-NAL.

Sd/-
Stores & Purchase Officer

1. INTRODUCTION

CSIR-National Aerospace Laboratories along with other CSIR laboratories is developing a UAV based surveillance system to carry out survey applications in forests, hilly terrains and less populated area.

2. OBJECTIVE

The objective of this EOI is to solicit specifications, technology, feature, literature, design, technical parameters, clientele and other related issues of the equipment and material from the EOI Bidders for supplying existing VTOL Unmanned Aerial Vehicle (UAV) that can carry payload of 100 to 115 kg. The selected Bidder after RFP/RFQ process subsequent to the EOI shall provide required support during integration of on-board payload (≈16kg) and under slung payload (≈95 kg) and flight testing. They shall provide artefacts for vehicle's flight worthiness and No Permission No Take Off (NPNT) compliance (Defined by Indian DGCA).

3. SCOPE OF WORK

EOI Bidders are requested to submit technical proposal for supplying the following:

1	Vertical Take Off and Landing (VTOL) capability Unmanned Aerial Vehicle (UAV) that can carry of 100 to 115 kg payload
2	Additional on-board Power supply of 65AH @ 24 Volts for powering on board payload electronics
3	Laser altimeter
4	DGPS / RTK GPS system integrated with the Aircraft Autopilot
5	Ground Control Station
6	Support in Integration of Slung Load & Flight clearance
7	Training on maintenance and operation of the UAV
8	Documentation

4. SPECIFICATIONS

Proposed UAV will be used for survey applications in forests, hilly terrains and less populated areas. During surveying the targeted area, UAV has to fly at an altitude of 35.0 Meters Above the Ground Level (AGL) (better to specify the maximum operating altitude to fly as AMSL) and the under-slung load will be at 15 meters below the UAV. This under slung is a transmitter coil and generates a 'Magnetic field' of 537 nT. The payload system requires calibration before the survey operations and the calibration is carried out at an altitude of 1.0 Km AGL.

The Schematic representation of field operations is depicted in Figure 1.

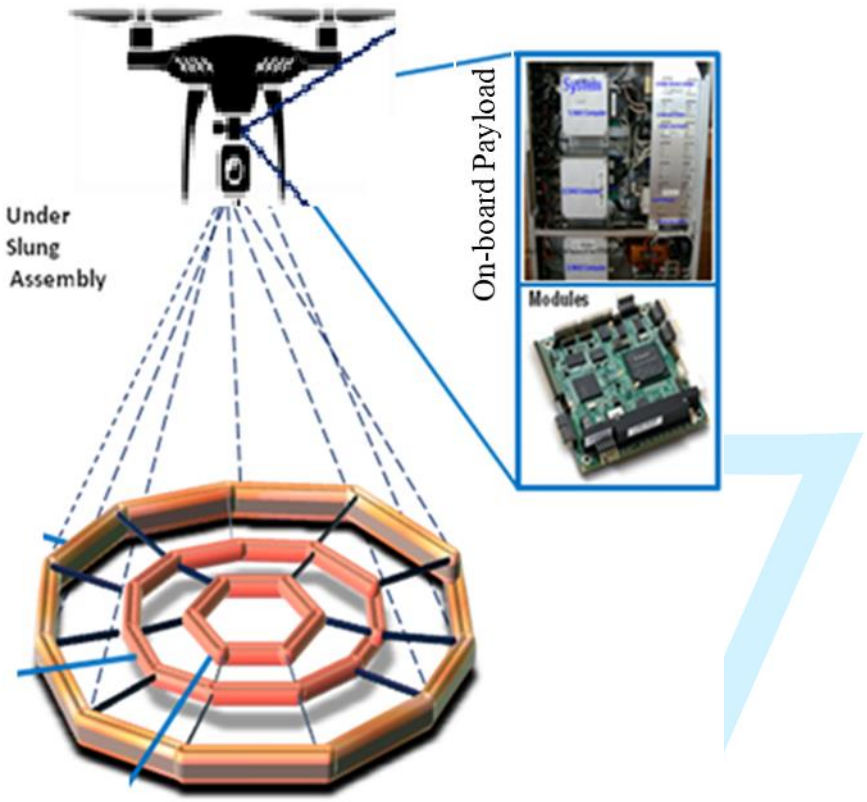

Figure 1: Schematic representation of the Field operations

4.1 SPECIFICATIONS OF UAV

Parameter	Description	Reply From EOI Bidders	Remarks (Value/Specification)
Mission requirements			
Survey Mission	Shall Take off vertically up to an altitude of 35.0 Meters AGL with the under slung load and scan the intended area within10Kms range.		
Payload Calibration Requirements	UAV Shall Take off vertically and carry the slung load up to an altitude of 1000.0 Meters AGL and hover for 5 minutes approximately.		Should be capable of taking off from ground altitude of 2000m AMSL to 1000m AGL from this point
Performance requirements			
Take-off and Landing	Vertical Take-off and Landing		To Take off& Land from/on a level ground
Speeds	operating ground speed at sea level		36 KMPH- 40 KMPH in the presence of steady winds of 10KMPH

Range	Maximum Range in still Air		At least 10.0 Km
Endurance	Mission		Minimum 45 minutes
Altitude	Maximum Take-off altitude (Launch altitude) (ISA+20 deg C)		2.0 Km (AMSL)
	Maximum attainable height above the ground level		1.0 Km
Stability & Control	Stable flight Envelope without pilot input		Autonomous operation
Manual pilot operation	Emergency conditions Pilot can takeover with ease		Ease of operation
Winds	UAV should be able to fly in 10 knots cross winds.		Unexpected cross winds handling
Payload	On Board Aircraft - **16.0 kg** Under Slung Assembly- **95.0 kg** (15m below the UAV)		Suitable mounting arrangement for on-board and underslung payload
Navigation	While surveying, UAV needs to follow a predefined raster scan way points autonomously.		Waypoint navigation with varying terrain profile (not a flat ground)
Interface to on-board equipment	UAV should provide required interfaces to send UAV flight data along with GPS / Laser altimeter to another Data Acquisition System (Part of the onboard payload).		Required for data fusing and time stamping the GPS/Laser sensor data with the payload sensor data
Mechanical interface to payload	Provision for integration of under slung payload along with a weak link mechanism and electronic quick release mechanism should be provided on the UAV.		Mounting holes for attaching the under slung payload. Emergency release mechanism for releasing the payload either automatically or electronically.

AUTOPILOT SYSTEM			
Autopilot Parameter	**Specification**	**Reply from EOI Bidders**	**Remarks**
Redundancy	Minimum Duplex Redundancy		Inbuilt Safety feature
Waypoint Navigation	Interface to DGPS/RTK		Navigational Accuracy. Raster scan flying
Altitude	Interface to Laser Altimeter		To send accurate flight altitude information to DAQ
Data Transfer	Real time data transfer to Data Acquisition Hardware		For DAC data fusion of payload sensor data fusion
Safety Feature (Low Battery)	Return to Home		Power monitoring and safety feature
Safety Feature (Comm Loss)	Return to Home		safety
Safety Feature (Manual Take over)	Remote Piloting		Pilot take over in case of emergency. Release of payload, manual landing, etc..
Safety Feature (Payload Release)	Quick Release Mechanism		To automatically release the payload in case of emergency like payload gets stuck on a tree.
COMMUNICATION SYSTEM			
Communication Frequency	2.4 GHz LOS / EOI Bidders may suggest frequency		For 10km LOS Operation and real time data transmission to GCS for monitoring the flight parameters during a typical mission
Other Essential instruments			
Additional Equipment / Feature	Flashing Anti-collision Strobe lights		To give warning in air
	ADS-B Out		Transceiver
	Detect and avoid capability		May be Part of autopilot / GCS
Flight Data	Flight data logging		Data should be logged on the onboard memory and on the GCS for access after the mission. (mandatory)

STRUCTURE			
FOS	Factor of safety for the airframe structure		1.5 times the maximum load
Clearances & Safety	Minimum clearance of the propeller blade from structure and/or components and from the ground		Safety
Landing	Landing gear		Landing gear shall not fail but shall yield in a test showing its reserved energy absorption capacity
POWER PLANT			
Propulsion	Electric / IC engine /Hybrid		Maximum Endurance with the payload & Easily available fuel in case of engine
No Permission No Take-off (DGCA Regulation)			
Autopilot Communication Modem	Firmware		On-board computer shall have the protections against tampering (Software) Shall have safe and secure methodology for firmware update Shall have authentication procedure to change flight parameter
	Hardware		On-board computer shall have protection from tampering A well-established mechanism to replace hardware like Radio, GPS and Flight controller

4.2 Additional on-board Power supply of 65AH @ 24 Volts DC

Additional Battery Parameter	Battery Spec	Reply from EOI Bidders	Remarks
Voltage	24 volts DC		The on-board payload is required to generate high current pulses that will excite the slung load. A separate data acquisition system developed by the user is also part of the on-board payload. These units need to be powered by UAV.
Capacity	65 AH		

4.3 Laser Altimeter

Parameter	Desirable	Reply from EOI Bidders	Remarks
Range	0.1 to 120m (Natural Targets)		To have accurate flying at 35m AGL
Resolution	1 centimetre		Same as above
Update Rate	16 readings / second		
Accuracy	± 1 centimetre (70% reflective target @ 20°C)		
Outputs and Interfaces	Serial, I2C & Analog		To send altimeter data to the Autopilot and external payload for data fusion

4.4 DGPS / RTK GPS system

Parameter	Reply from EOI Bidders	Desirable
Type		RTK or DGPS
Accuracy		Centimetre level Accuracy
GNSS		BeiDou, GLONASS, GPS / QZSS, Any other type
Interface		UART/USB/SPT/DDC(I2C)
Data Logging		Yes
Programmable Flash Memory		Yes

4.5 Ground Control Station

Parameter	Feature Required	Reply from EOI Bidders	Remarks
Case features	Rugged plastic case, side handles, carry handle, wheels, pressure purge valve, shoulder strap (optional)		Rugged box for transport and use
Antenna Connections	Multiple		
Battery Type	Lithium Ion		
Battery Operation Time	2 hrs typical		For continuous operation at the field
Connections	2 serial (RS-232), 5 USB, 2 Ethernet, 1 Composite Video in (IMPERX video device needed),1 VGA in (optional), 1 Microphone in, 1 Audio out, PCMCIA slot, HDMI		To have provision for all types of connection and communication options
Display	17" to 21" TFT (Touch optional)		Viewing screen
Brightness	1600 nits		To view in daylight and sunny day
Signal Source	Selectable		
Accessories	AC/DC adapter 110 - 240 VAC to 24 VDC		Universal power source specs.

Ground Control Station Software Specifications			
Parameter	**Feature Required**	**Reply from EOI Bidders**	**Remarks**
Artificial Horizon	Displays aircraft Attitude, Altitude, Speed etc		Heads Up Display
Quick command buttons	Take-off, Altitude Change, Land, Home etc		For Quick Operations and Safety feature
Map View for mission planning	Selectable form main map sources (google maps, mac, open maps…) or customizable using JPG / PNG images		Global
Route Planning	Intuitive user interface for waypoint & route creation and Inflight mission edit.		Simple user interface
Status Displays	Status information of Battery, GPS, communication etc		Quick information display on GCS
Live Plots	Plotting of transmitted parameters for in flight analysis and gain tuning		Trajectory plotting
Gain Tuning	In flight change of aircraft parameters and gains through telemetry		Handlers to tune the UAV if needed.
Battery & Charging			
Charger	To be provided		For GCS battery charging

4.6 Support in Integration of Slung Load & Flight clearance

UAV shall able to fly in the presence of the magnetic field generated by the under slung load at 15m blow the UAV. The under slung load consists of 3 circular / polygonal shape concentric rings of diameter 8m, 2m and 1m. All these rings are connected using ropes and finally slung to the UAV. Typical length of the ropes is about 15m from UAV to the rings. These 3 concentric rings along with ropes and electrical wiring may weigh around 95 kg Preliminary calculations show that a Drag force of 5 kg is exerted by the slung load when UAV flies at 15 m/sec.

Support	**Area Specific**	**Reply from EOI Bidders**	**Remark**
Integration	Integration of the slung load onto the UAV for establishing stabilized UAV flight with the slung load.		Under slung payload integration
	DAC integration with Autopilot		On-board payload integration

4.7 Training

EOI Bidders shall provide training for flight testing team on maintenance and operation of the UAV in Bangalore, India.

Training	Area Specific	Reply from EOI Bidders	Remark
UAV	Installation & Integration Procedures,		For UAV setup
Mission	Pre Flight Checks, Flight Programming, Mission monitoring,		Procedures for Flight
Maintenance	Maintenance Procedures, Repairs and Service		Scheduled Maintenance
Training Location	Bangalore		Training to CSIR team

4.8 Documentation

Documentation Standard	Specification	Reply from EOI Bidders	Remark
UAV needs to qualify minimum requirements laid down by Director General of Civil Aviation (DGCA)	CIVIL AVIATION REQUIREMENTS SECTION 3 – AIR TRANSPORT, SERIES X, PART I		Mandatory (Artefacts of flight worthiness from equivalent certification agencies acceptable)
Documents required for submitting the same to Indian DGCA	No-permission No-Take off (NPNT) compliance		Mandatory

5. Eligibility Criteria

5.1 Technical

5.1.1 EOI Bidders should have already supplied UAVs that can carry heavy payloads (50 kg or more)

5.1.2 EOI Bidders should ensure availability of spare parts for next 5 years

5.1.3 The EOI Bidders shall provide required support during initial integration, ground and flight testing.

5.1.4 EOI Bidders shall also provide artefacts (Test documents) to be submitted to DGCA for NPNT compliance.

5.1.5 The EOI Bidders shall indicate the timelines necessary for providing the items under Scope of Work.

5.1.6 The EOI Bidders shall provide the complete technical information

5.1.7 Similar Work Experience Details:

Sl. No.	Name of the work with location	Date & Ref. no of completion certificate (If available)	Date of start Cost of work	Reference document (Work Order/ Work Completion Certificate) to be attached, mention page no

5.2 Commercial

5.2.1 The EOI Bidders should be a company having an average turnover of Rs.5 Crore for each of the last Three financial year ending on 31st March 2019.
(a) Audited Balance sheets.
(b) CA Certificate with CA's Registration number/Seal. Indicating required turnover

5.2.2 Average Net Worth: The Tangible Net Worth of the EOI Bidders should be positive. CA Certificate with CA's Registration number/Seal.

5.2.3 The EOI Bidders shall enclose the following documents:
(a) Copy of Company registration certificate issued by statutory authority (duly attested by Notary Public).
(b) Copy of Memorandum and Article of Association (duly attested by Notary Public).

5.2.4 Legal Entity: The EOI Bidders should submit the following:
(a) Company Profile
(b) Memorandum & Articles of Association
(c) Copy of Certificate of Incorporation

5.2.5 Blacklisting: Declaration that the EOI Bidders has not been banned or delisted by any Govt. of India or Quasi Govt. Agencies or PSUs. If banned / delisted, the fact must be clearly stated. Self-Declaration on company letter head.

5.2.6 The EOI Bidders may submit a Budgetary Estimate for all the items under the Scope of Work. The Budgetary Estimates shall be held confidential and will not be disclosed to other EOI Bidders after the EOI responses are opened.

5.2.8 Bid Validity Period: The offered bid shall be valid for a period of 90 days from the date of submission of Bids as per Tender Document.

6. Other Terms

6.1 Expression of Interest

In order to fine-tune the technical specifications for carrying out Procurement of VTOL Autonomous Unmanned Aerial Vehicle System for carrying 100 to 115 kg Payload. Expression of Interest is being sought from internationally reputed and competent EOI Bidders/consulting firms. EOI Bidders are requested to submit all the required documents for EOI Bidders evaluation as per Pre-qualification criteria.

6.2 Purchase of EOI Document

The Expression of Interest document shall be downloaded from Central Public Procurement Portal (CPPP) of Government of India website http://eprocure.gov.in/epublish/app and CSIR-NAL Website www.nal.res.in at free of cost.

6.3 Clarifications on the EOI Document

Any clarification in the EOI document may be sent in writing to the following address or through email:

Stores & Purchase Officer
Purchase Section
CSIR- National Aerospace Laboratories
PB No.1779, HAL Airport Road, Kodihalli,
Bengaluru – 560017, Karnataka-India
Tel # : 080 25086040/6041/6044
Fax # : 080 25269611
Email purchasek@nal.res.iln, mkala@nal.res.in

However, no extension of the time or date of EOI submitted will be provided on the ground that CSIR-NAL has not responded to any query/clarification raised by any EOI Bidders.

6.4 Amendment of Terms and Conditions of EOI

6.4.1 CSIR-NAL may at its discretion or as a result of a query, suggestion or comment of a EOI Bidders, may modify the EOI document by issuing an amendment or a corrigendum at any time before opening the EOI. Any such Addendum or Corrigendum will be uploaded on CPPP Portal http://eprocure.gov.in/epublish/app and CSIR-NAL's website www.nal.res.in and the same will be binding on all the EOI Bidders, as the case may be.

6.4.2 CSIR-NAL at its discretion may extend the due date of submission of EOI and the decision of CSIR-NAL in this respect would be final and binding on the respondents. In the event of changes in the time schedule, CSIR-NAL shall notify the same only through its CSIR-NAL website www.nal.res.in. Interested EOI Bidders are advised to check the above website regularly for corrigendum / addendum, if any, which will be published only in the web site.

6.4.3 No oral modification or interpretation of any provisions of this EOI shall be valid. Written communication shall be issued by CSIR-NAL when changes, clarifications or amendments to the EOI document are deemed necessary by CSIR-NAL at its sole discretion.

6.5 EOI submission should be in English language. EOI response should be free from correction, over writing, erasures etc. Duly authorized representative of the Applicant shall sign on each page of the EOI documents. EOI documents should be prepared in such a way so as to provide a straight forward, concise description of Applicant and capabilities to satisfy the requirements of this EOI.

6.6 If at any time during the examination, evaluation and comparison of EOI, CSIR-NAL at its discretion can ask the EOI Bidders for the clarification of its EOI. The request for clarification and the response shall be in writing. However, no post submission of EOI, clarification at the initiative of the EOI Bidders shall be entertained.

6.7 Canvassing by respondents in any form, including unsolicited letters on EOI submitted or post corrections shall render their EOI response liable for summarily rejection.

6.8 The cost or charges incurred in preparation and submission of EOI response shall not be entitled by any respondent.

6.9 Conditional offers will be summarily rejected. EOI which is found to be incomplete in content and / or attachments and / or authentication etc. is liable to be rejected.

6.10 No Agent/Agents or third party/parties are engaged by CSIR-NAL in this process.

6.11 CSIR-NAL is not responsible for any firm/agency expression or representing to express himself/herself/themselves to be the agent or third party representing CSIR-NAL in this process.

6.12 It is advised to deal directly with CSIR-NAL representative who is the signatory to this document.

6.13 Disregard of any instruction may result in offer being ignored.

6.14 EOI that are incomplete in any respect or those that nor consistent with the requirements as specified in this document may be considered non-responsive and may be liable for rejection and no further correspondence will be entertained with such EOI Bidders.

6.15 All cost and expenses associated with submission of EOI shall be borne by the EOI Bidders while submitting the EOI. CSIR-NAL shall have no liability, in any manner in this regard, or if it decides to terminate the process of short listing for any reason whatsoever.

6.16 CSIR-NAL is not obligated to issue RFP/RFQ to those who have submitted EOI Bids. CSIR-NAL may proceed on Global /Open tender for inviting RFP / RFQ.

ANNEXURE-I

The following details should be submitted along with EOI.

Sr. No.	Documents	Compliance [Yes / No]
A	**Company Profile**	
1	Name of the Organization: Website	
2	Name of the Contact Person: a) Name: b) Address c) Telephone: d) Fax: e) E-Mail:	
3	Year of Incorporation	
4	Type of Organization a) Public Sector/ Limited/Private Limited/ Partnership/ Proprietary/ Society/ Any other b) Whether 'Foreign Equity Participation (Please give name of foreign equity participant and percentage thereof) c) Names of Directors of the Board/ Proprietors d) Name and address of NRI(s), if any	
5	Category of the firm: Large/Medium/Small scale unit	
6	Address of the Registered Office:	
7	Number of Offices with addresses (Excluding Registered Office): a) India b) Abroad	
8	Certificate of registration as a manufacturing unit	
9	Permanent Account Number	
10	GST Number	
11	Status of ISO Certification	

B.	ESSENTIAL REQUIREMENTS	
12	The turnover is to be supported by financial statement of accounts/ Annual reports duly certified by a Chartered accountant/ Balance sheets of last 3 years/ Income tax returns for the last 3 years period.	
13	Details of absorption of technology for a product/ knowhow that has been taken up on production scale in the past may also be given	
14	List of products/technologies worked with as regular activity in last three years. Give the list of products/technologies with general specifications and the customers.	

Signature with Name & Seal:

Place:
Date: