EXPRESSION OF INTEREST

FOR

PROCUREMENT OF ENVIRONMENTAL CONTROL SYSTEM (ECS) OF THE AIRCRAFT

COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH
NATIONAL AEROSPACE LABORATORIES
P.B. NO.1779, HAL AIRPORT ROAD, KODIHALLI,
BENGALURU-560017

Council of Scientific and Industrial Research
NATIONAL AEROSPACE LABORATORIES
P.B. No. 1779, HAL Airport Road, Kodihalli, Bengaluru – 560 017
Phone: +91-80-25086040/41/44 Fax: +91-80-25269611
E-mail: purchasek@nal.res.in

ISO:9001:2015
Certified

EOI No.:NAL/PUR/CAD/409/19-Z **27-Jan-2020**

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/CAD/409/19-Z	Procurement of Environmental Control System (ECS) of the Aircraft

1. The address for submission of document and for obtaining further information:
   Controller of Stores & Purchase
   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, spo@nal.res.in

2. The Bidding 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 bidders shall adhere to due dates specified in Tender Details corresponding to this Tender.

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

Date & Time of Submission of Bid		Date and Time of Opening of Bid	
Date	Time (IST)	Date	Time (IST)
17-Mar-2020	10:00 Hrs	17-Mar-2020	11:00 Hrs

5. Date and Time for receipt of hard copy of proposals: The proposals in hard copy should reach the tender box on or before the date and time mentioned at Sr. No.4 for submission of proposals. Late/delayed proposals will not be considered. Postal/Courier delays will not be accepted as an excuse. In case the last date and time is declared a holiday at a late date, then the due date and time for receipt, opening will be shifted to the next working date and time automatically. No corrigendum will be issued in this regard.

6. A brief description of the procurement is appended herewith. The Participants are requested to submit documentary evidence to prove technical capabilities, client list, experience and credentials as per Annexure 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 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 EOI notification/tenders/offers or withdraw the Notice at any stage of processing without assigning any reasons whatsoever, such an event would not cause obligation of any kind to CSIR-NAL.

Controller of Stores & Purchase
For and behalf of CSIR

1. INTRODUCTION

CSIR NAL is developing a Commuter Category Airplane with 19 passengers under FAR 23/25 category.

2. OBJECTIVE

The objective of this EOI is to select suitable Bidders to supply the Environmental Control System (ECS) already installed and civil certified on any FAR 23/25 certified Aircraft. The Bidder shall also provide required support during installation, flight testing and certification from Certifying Regulatory Bodies on the offered Environmental Control System (ECS) for CSIR-NAL Civil 19 seater Commuter Category Aircraft.

3. SCOPE OF WORK

Bidder is requested to submit technical proposal for the Scope of work which includes the following:

Sl. No.	Item
3.1	Supply of 4 set of Environmental Control System (ECS)
3.2	System Design Reviews
3.3	Training
3.4	Documentation
3.5	Product Support

CSIR-NAL Responsibilities:

1)	Aircraft System Level Specifications and Requirements.
2)	Aircraft System Level Architecture (Preferred).
3)	Aircraft flight conditions and Engine Bleed conditions.
4)	Review of Performance report of system supplied by Bidder/Vendor.
5)	System components/LRUs Pre installation/Functional tests.
6)	System Installation design and Integration on aircraft.
7)	Aircraft System level performance tests on ground and in flight.
8)	Certification of system on aircraft in coordination with certifying regulatory authorities.

Bidders/Vendor Responsibilities:

1)	Aircraft System Level Architecture finalization by both CSIR-NAL and Vendor.
2)	Supply of Performance report of system for the flight conditions and Engine Bleed conditions provided by CSIR-NAL.
3)	Supply of 4 set of Environmental Control System (ECS). (Preference to be given to incorporate LRUs with long lead service life and on condition)
4)	Supply of System components/LRUs Specification, ATP, ATR, QTP, QTR, Envelope/ installation drawing, Performance data, DDP, Pre installation test schedule, Details of Shelf life, TBO, Service life etc.
5)	Supply of System level and LRU level Electrical Wiring Diagrams with installation details
6)	Supply of Documents of System COC/FAA/EASA approvals of system/LRUs, Reliability Analysis (RBA), Failure Hazard Analysis (FHA), Failure Mode Effects and Criticality Analysis (FMECA) and Fault Tree Analysis (FTA).
7)	Review of System Installation design and Integration on aircraft.

8)	Review of Aircraft System level performance test schedules and reports on ground and in flight.
9)	Technical Support during Certification of system on aircraft in coordination with certification regulatory authorities.
10)	Supply of Sub systems/ LRUs of ECS and Support for Service of LRUs on need basis.

3.1 Specification of ECS

1.	Environmental Control System shall meet current FAR-23/25 requirements.	
2.	• Cabin temperature shall be maintained at mean temperature of 24 deg C. • Cabin temperature shall be adjustable between 18˚C and 30˚C automatically and manually, applicable at ambient air temperatures from -55˚C to +55˚C • A minimum fresh air of 0.55 lb/min per person to be supplied to the cabin at all flight conditions as per FAR 23.831/FAR 25.831	
3.	Number of passenger & crew	19 + 2
4.	Volume	28.82 m^3 (838 cu.ft)
5.	Surface area	67 m^2 (721 sq.ft)
6.	Window area - total panel	1.69 m^2 (18.19 sq.ft)
7.	Total windshield panel area	2.23 m^2 (24 sq.ft)
8.	Cabin mean temperature range desirable	18^{o}C to 30^{o}C (nominal 24^{o}C)
9.	Aircraft maximum altitude	9.14 km (30000 feet)
10.	Aircraft normal operating altitude range	7.62 km (25000 ft) to 9.14 km (30000 feet)
11.	For aircraft altitude of 9.14 km (30000 ft)	cabin altitude 2.4 km (8000 ft.)
12.	Cabin differential pressure	0.457 kg/cm2 (6.5 psid) at aircraft altitude 9.14 km (30000 ft)
13.	Maximum cabin differential pressure	0.485 kg/cm2 (6.9 psid) at aircraft altitude 9.14 km (30000 ft)
14.	Max. ambient humidity at S/L	0.022 kg/kg (0.022 lb/lb) dry air
15.	Percentage of the total cabin area would be insulated.	80%
16.	Max. speed at 7.62 km (25000 ft) altitude	550 kmph
17.	Cruise speed at 7.62 km (25000 ft) altitude	400 kmph

18.	The max. Engine compressor delivery available	
	H.P Port, Pressure (max)	9.93 bar (144 psia)
	H.P Port, Temperature (max)	405°C
	L.P Port, Pressure (max)	3.79 bar (55 psia)
	L.P Port, Temperature (max)	246°C
19.	Bleed mass flow (each engine) at Flight Idle: on ground H.P Port, Pressure 34 psia;	12 lbs/min (7 lb/min to ECS; 5 lb/min to Engine Oil cooler Ejector)
	Bleed mass flow (each engine) at Allowable rating: in flight H.P Port/LP Port;	10 lbs/min to ECS

3.1.1 Requirements

The ECS should incorporate the following sub-systems:

- ECS - Normal System
- ECS - Emergency Backup Pressurization System
- ECS - Ram Air Ventilation System

The ECS- Normal system:

The ECS - Normal system should incorporate the following features:

a) **The compact single cooling pack** shall consist of boot strap cold air unit, dual heat exchanger, condenser/water separator, turbine inlet control valve, pneumatic temperature sensor, over temperature switch and with suitable inter connecting piping assembled in one single pack with a suitable mounting platform.

b) High efficiency boot strap system with air bearing cold air unit (2 wheel or 3 wheel CAU).

c) High pressure water separation system with dew point control for humidity.

d) The system shall provide automatic switching to L.P bleed or H.P bleed depending upon the bleed pressure and temperature in order to minimize the engine bleed air requirement.

e) The system shall consist of a cabin re-circulation fan to mix cabin air with sub-zero pack outlet air supply to reduce bleed flow requirement.

f) The system shall have a ground cooling fan to supply coolant air to the primary/secondary combined heat exchanger during ground operation.

g) There shall be pre-cooler heat exchanger secondary section to cool the hot bleed air before entering the primary heat exchanger.

h) The system shall have suitable over pressure and over temperature switches in order to protect the system.

i) A warning light in connection with over temperature switch in the cold air unit shall be provided to close the shut-off valve when the CAU compressor discharge temperature goes beyond the pre-set value.

j) Provision to be made to provide suitable ground charging connection to supply cooling air to cabin from ground cooling trolley when the engines are not running on the ground.

k) The ground charging connection can be used to check the cabin pressurization in-situ.

l) An emergency backup pressurization system shall be incorporated to maintain cabin pressurization in the unlikely event of ECS pack failure.

m) Qualification tests of the system components/LRUs to conform to RTCA/DO-160G.

n) Mating connections (like V flanges and pipe clamps) of all components shall be given.

o) Electrical receptacle of all components shall be supplied.

p) Electrical details like voltage and power consumption along with electrical wiring diagram shall be given.

q) The proposed system shall be based on components in service and as far as possible shall be off - the - shelf items.

The ECS - Emergency Backup Pressurization system:

The ECS - Emergency Backup Pressurization system should incorporate the following features:

1)	In the event of ECS pack failure, there shall be emergency system to maintain pressurisation inside the cabin. In each engine, there will be a dedicated HP bleed port to supply bleed air to the emergency system. The OEM shall propose emergency system for SARAS Mk2.
2)	Mating connections (like V flanges and pipe clamps) of all components shall be given
3)	Electrical receptacle of all components shall be supplied.
4)	Electrical details like voltage and power consumption along with electrical wiring diagram shall be given.
5)	The proposed system shall be based on components in service and as far as possible shall be off - the - shelf items.

The ECS – Ram Air Ventilation system:

The ECS – Ram Air ventilation system should incorporate the following features:

1)	When aircraft in static and before engines are ON and during the aircraft in Take-off condition, Ram air ventilation system shall be operated.
2)	In flight cabin ventilation by an emergency backup pressurization system, aircraft shall be decent to below 10000 feet altitude and Ram air ventilation system shall be operated.
3)	The atmospheric air shall be allowed inside the cabin by fan through control valves during ground static operations and in flight below 10000 feet altitude atmospheric air shall be allowed inside the cabin by flush intake scoop through control valves.
4)	Mating connections (like V flanges and pipe clamps) of all components shall be given
5)	Electrical receptacle of all components shall be supplied.
6)	Electrical details like voltage and power consumption along with electrical wiring diagram shall be given.
7)	The proposed system shall be based on components in service and as far as possible shall be off - the - shelf items.

The following are the Indian climatic conditions for baseline design performance;

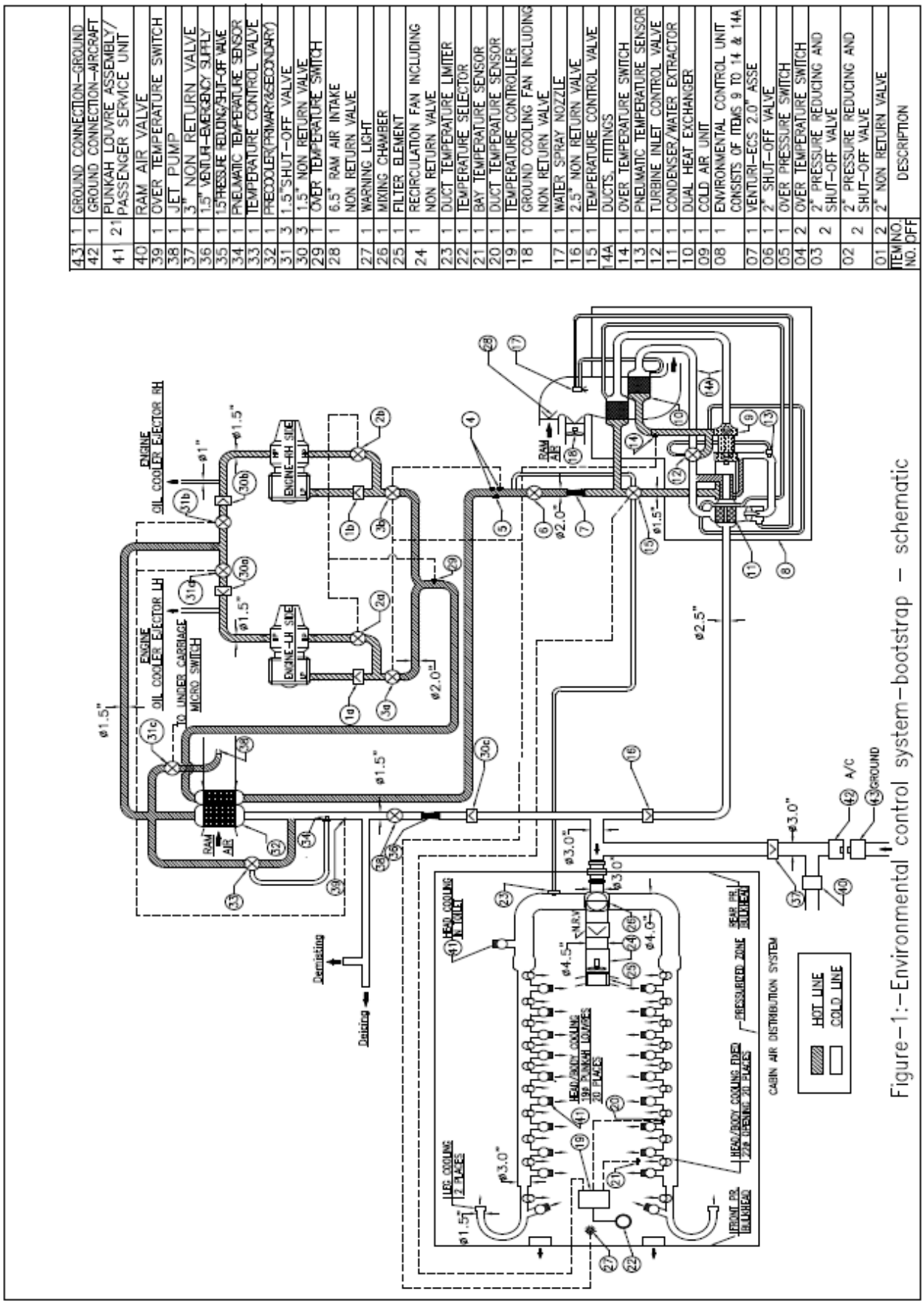
Hot day ground static;

Altitude	Sea level
Ambient pressure	14.7 psia
Ambient temperature(max)	50 deg. C as per ISA+35 Deg C
Specific humidity (max.)	0.022 lbs/lb of dry air
No. of occupants	19+2
Max. Total heat load	7.69 kw (estimated)

3.1.2 Engine Bleed Conditions for typical flight cases:

Sl No.	Aircraft Mode	Altitude (ft)	Aircraft Mach No.	Ambient Conditions		Engine LP characteristics (bleed)		Engine HP characteristics (bleed)		Max available bleed flow from HP/LP port per Engine
				Temp °C	Pressure (PSIA)	P2.5 (PSIA)	T2.5 (°C)	P3 (PSIA)	T3 (°C)	m(Lb/min)
1	STATIC	0	0.00	50	14.7	21.5	142.9	39.9	246.9	7
2	STATIC	10000	0.00	30.2	10.1	17.5	146.0	39.8	276.7	7
3	CRUISE	10000	0.39	30.2	10.1	37.1	225.8	92.8	379.7	10
4	CRUISE	30000	0.33	-19.4	4.4	13.9	150.9	37.0	285.8	10

3.1.3 System Architecture (Preferred)



3.1.4 Certification Requirements

Qualification tests of the system components/LRUs to conform to RTCA/DO-160G or higher

The OEM/Bidders shall provide the

- Technical proposal with all LRUs they deem fit for certification of FAR 23/25 aircraft
- Detailed ECS Integration & its architecture
- Reliability
- Component data
- Performance

3.2 System Design Review

Bidder shall participate in Preliminary Design Review, Critical Design Review and all other stages of review from time to time. They shall carry out customization as per requirements of NAL Civil 19 seater Commuter Category Aircraft.

3.3 Training

Bidder shall provide training to NAL ground crew and flight test crew on the maintenance and operating procedures of the ECS.

3.4 Documentation

Bidder shall provide documentation related to ECS being supplied. The broad categories of documents are:

a)	Installation Manuals
b)	LRU level test schedules to carry out pre and post installation checks for proper functioning of all mechanical, electrical and electronic components.
c)	Electrical Wiring Diagrams with installation details
d)	Copy of FAA/EASA/DGCA approvals for systems installed on another aircraft
e)	System Reliability Analysis (RBA)
f)	Failure Hazard Analysis (FHA)
g)	Failure Mode Effects and Criticality Analysis (FMECA)
h)	Fault Tree Analysis (FTA)
i)	Any other as deemed necessary

3.5 Product Support

Bidder shall provide on-site and off-site product support for technical inputs to certification and ground test, flight test activities.

4. Eligibility Criteria

4.1 Technical

4.1.1 Original Equipment Manufacturers (OEMs) / Environmental Control System (ECS) Integrators who have proven expertise in successful integration of the Environmental Control System (ECS) on any FAR 23/25 certified aircraft followed by certification of the systems of the ECS from FAA/EASA/DGCA for such aircraft.

4.1.2 Bidder shall ensure all quoted ECS parts/LRUs shall be available for more than 20 years.

4.1.3 The Bidder shall provide required support during initial integration, ground and flight testing and certification from DGCA on the offered ECS for NAL Civil Commuter Category 19 Passenger Capacity Aircraft.

4.1.4 Technical Capability Bidder shall have successfully completed/executing a similar scope of work of supply and installation in Government organizations in India.

a)	Relevant support certificates to be submitted.
b)	Copies of supply order & Project completion / Phase completion report.
c)	The bidder shall have direct authorization from the Original Equipment
d)	Manufacturer (OEM) for supply, installation and maintenance of similar system.
e)	Valid MAF issued by OEM's for all components quoted by the Bidder to be submitted.

4.1.5 The Bidder shall indicate the timelines necessary for providing the items under Scope of Work.

4.1.6 The Bidder shall provide the complete technical information (without any IP related material) with specific OEM name, Model Number and ROM

4.1.7 The Bidder shall provide the complete LRUs/Systems for FAR23/25 compliant ECS architecture as required for International Certification.

4.1.8 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

4.2 Commercial

4.2.1 The Bidder shall 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

4.2.2 Average Net Worth the Tangible Net Worth of the bidder shall be positive CA Certificate with CA's Registration number/Seal.

4.2.3 The Bidder 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).

4.2.4 Legal Entity: The bidder must be a registered company in India, registered under the Companies Act 1956/2013 (if any).
(a) Company Profile
(b) Memorandum & Articles of Association
(c) Copy of Certificate of Incorporation

4.2.5 Tax Registration & clearance The Bidder shall have valid PAN and GSTIN.
Copy of GSTIN & of PAN to enclosed (if any).

4.2.5 Blacklisting Declaration that the bidder 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.

4.2.6 The Bidder 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 Bidders after the EOI responses are opened.

4.2.8 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.

5. Other Terms

5.1 Expression of Interest

In order to fine-tune the technical specifications for carrying out **Supply, Integration and Certification of Environmental Control System (ECS) for Aircraft** and for short-listing of potential Bidders, Expression of Interest is being sought from internationally reputed and competent Bidders/consulting firms. Bidders are requested to submit all the required documents for Bidder evaluation as per Pre-qualification criteria.

5.2 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.

5.3 Clarifications on the EOI Document

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

Controller of Stores & Purchase
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, spo@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 Bidder.

5.4 Amendment of Terms and Conditions of EOI

5.4.1 CSIR-NAL may at its discretion or as a result of a query, suggestion or comment of an Bidder, 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 Bidders, as the case may be.

5.4.2 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 Bidders are advised to check the above website regularly for corrigendum / addendum, if any, which will be published only in the web site.

5.4.3 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.

5.5 EOI submission shall be in English language. EOI response shall 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 shall 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.

5.6 If at any time during the examination, evaluation and comparison of EOI, CSIR-NAL at its discretion can ask the Bidder 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 Bidder shall be entertained.

5.7 All cost and expenses associated with preparation and submission of EOI response shall be borne by the Bidder 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.

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

5.9 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.

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

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

5.12 This EOI and subsequent tender is governed by TERMS AND CONDITIONS of CSIR-NAL.

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

5.14 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.

5.15 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 Bidders.

5.16 **The responses from firms submitted the EOI only will be considered on our subsequent CPPP enquires.**

5.17 CSIR-NAL reserves the right to accept a response to EOI notification or reject any or all of them or withdraw the Notice at any stage of processing without assigning any reason whatsoever. Such an event would not cause obligation of any kind to CSIR-NAL.

5.18 Bidder evaluation criteria

5.18.1 Bidder evaluation will be made by a Committee constituted by the Director, CSIR-NAL for Supply, Integration and Certification of Cabin Pressure Control System for Aircraft.

EOI No.:NAL/PUR/CAD/409/19-Z ANNEXURE-I

The following details shall 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	
12	Black Listing Declaration	
13	Validity of the response	

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: