

वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद्  
Council of Scientific & Industrial Research  
राष्ट्रीय वांतरिक्ष प्रयोगशालाएं  
National Aerospace Laboratories



CSIR - NAL Estd. 1959  
ISO 9001 : 2015  
Certified Organization

Tender No. NAL/PUR/FMCD/413/20-Y

Date: 13-Sep-2021

Dear Sirs,

CSIR- National Aerospace Laboratories (NAL), Bengaluru, India is one of the premier laboratories under Council of Scientific and Industrial Research (CSIR), 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.

The Director, CSIR-NAL invites Sealed quotation for procurement of the following item(s) for day to day research work.

Sl. No	Brief Description of items	Unit	Qty.	Single / Two Bid
1	Angle of attack Vane Sensor (1 set of 2 Nos) – Aircraft Grade (Please refer annexure for detailed specification)	Set	03	Single
Note	Bid Security Declaration should be enclosed with quotation			

1. The address for submission of bids and for obtaining further information:

Controller of Stores & Purchase,  
Purchase Section,  
CSIR- National Aerospace Laboratories,  
PB No.1779, HAL Airport Road, Kodihalli,  
Bengaluru – 560 017, Karnataka, India.  
Tel # : 080 25086040 / 6041,  
Email : [purchasек@nal.res.in](mailto:purchasек@nal.res.in)

2. Bids must be delivered to the above office at the date and time indicated below. In the event of the date specified for bid receipt and opening being declared as a closed holiday, the due date for submission of bid and opening of bid will be the following working day at the appointed time.
3. The Schedule for Submission of Quotation / Proforma Invoice is as follows: -

	Date	Time in hours (IST)	Venue
Submission of Bid	07-Oct-2021	Up to 10.00 Hrs (IST)	Detailed as per Sr. No.1
Opening of Bid	08-Oct-2021	11.00 Hrs (IST)	

4. Either the Indian Agent on behalf of the Foreign principal or the Foreign principal can bid directly in a tender but not both. However, the offer of the Indian Agent should also accompany the authorization letter from their principal. To maintain sanctity of tendering system, one Indian Agent cannot represent two different Foreign principals in one tender.

The Indian Agent of Foreign Bidders should be enlisted with DGS&D and relevant certificate should be submitted. Please refer our website [www.nal.res.in](http://www.nal.res.in) for further information

5. Unsolicited / conditional / unsigned tenders (Quotations) shall not be considered. Quotations received after the due date and time shall be summarily rejected.

पी बी सं. 1779, एचएएल एयरपोर्ट रोड, कोडिहल्ली, बेंगलुरु - 560 017, भारत,  
P B No 1779, HAL Airport Road, Kodihalli, Bengaluru - 560 017, INDIA  
फोन / Phone : ( का./ Off ) : +91 - 80 - 2508 6040 - 45, फैक्स / FAX : +91-80-2526 9611



<http://www.nal.res.in>



[purchasек@nal.res.in](mailto:purchasек@nal.res.in)



## CSIR-National Aerospace Laboratories, Bengaluru-560 017, INDIA

6. The bids would be opened in the presence of the bidders who choose to attend the bid opening. The representative should bring with them a letter of authority from the corresponding Bidder, without which, they shall not be permitted to attend the bid opening.
7. The bid prepared by the Bidder shall include the following: -
- |   |                             |
|---|-----------------------------|
| A | Warranty                    |
| B | Annual Maintenance Contract |
| C | Delivery Schedule           |
| D | Delivery Term               |
| E | Port of Destination         |
| F | Final Destination           |
8. The bids of those Bidders failing to comply with the following clauses will be summarily rejected.
- a. The Bidders proposing to supply finished products directly/indirectly from vendors of countries sharing the land border with India should submit copy of registration done with the Ministry of Home Affairs and Ministry of External Affairs.
- b. If the Products supplied are not from vendors of countries sharing land border with India, the Bidders have to enclose a declaration to that effect.
9. Bidders are requested to refer to the instruction regarding Procurement Policies for Make in India issued by Ministry of Commerce and Industry, Department of Industrial Policy and Promotion dated. 28-May-2018 and 4-Jun-2020 and guidelines as and when issued.
10. For Tender terms and conditions, the prospective bidders are requested to refer to the Standard Tender Document available on NAL Internet ([www.nal.res.in](http://www.nal.res.in)) under the icon Tender-Purchase before formulating and submitting their bids.
11. The Bidder shall comply the terms and conditions of the tender, failing which, the offer shall be liable for rejection.
12. The Director, CSIR- National Aerospace Laboratories (NAL), Bengaluru, India reserves the right to accept any or all tenders either in part or in full or to split the order without assigning any reasons there for.

Thanking you,

Yours sincerely,

  
Section Officer (S&P)  
For and on behalf of CSIR

## 1. Technical Specifications

SARAS Mk2 is a twin-engine turboprop 19 seater multi role transport aircraft that is being developed by CSIR-NAL.

SARAS Mk2's primary flight control system (PFCS) consists of ailerons, for roll control mounted on the wing, elevators on the horizontal stabilizer for pitch control, and a rudder mounted on the vertical fin for directional control. The PFCS consists of mechanical linkages (cables and push pull rods) connecting the pilot yoke and pedals to each of the respective control surfaces and is reversible. In addition to the primary control surfaces, the aircraft has a trim tab on the elevator, aileron and the rudder for trimming the control forces in the three axes.

SARAS Mk2 aircraft will be equipped with a limited authority Automatic Flight Control System (AFCS) to reduce the pilot workload. SARAS Mk2 AFCS will be designed to be certifiable for IFR and VFR operation and providing landing guidance and control up to CAT II minimum in compliance with FAR Part 23.

Towards the indigenous design and development of the SARAS AFCS the following Line Replaceable Unit (LRU) is required.

SI No.	Item Description	Quantity
1	Angle of attack Vane Sensor (1 set of 2 nos)	3 sets

### General Specifications:

1. The above mentioned LRU's shall be aircraft grade with the applicable TSO certifications.
2. The LRU shall be of high reliability and shall preferably have a digital interface, preferable ARINC 429 interface.
3. The software, if any, used shall adhere to RTCA DO-178C standards
4. If possible the vendor shall indicate the aircrafts the quoted LRU's are fitted and certified.
5. This LRU will be installed in SARAS MKII Aircraft with operational envelope of

Altitude : Sea level to 30,000 feet

Speed : upto 250-300 knots, Mach No : less than 0.5

SARAS AFCS computer hosts a Stall Warning module (SW) which has Stall annunciation and Stall prevention functionality. The function of the SW module is to give a reliable and accurate indication of the aircraft Angle of Attack (AOA) and alert the crew members by tactile means of the imminent stall. The major LRU of the SW module is the Angle-of-Attack (AOA) Vane Transducer.

The specifications for Angle-of-Attack (AOA) Vane Transducers are as follows.

**1.1 Angle of attack (AOA) Vane Transducer Specifications**

- Shall comply with FAR Part 23 and Part 25 aircraft requirements
- Shall comply with FAA TSO-C54 regulations for use in civil aircraft
- Operating AOA range: atleast  $\pm 50$  deg Angle of attack
- • Damping: Max overshoot less than 0.5 degs for a 3 deg displacement input.
- • Accuracy: Better than  $\pm 0.25$  deg at 100 knots
- Operating temperature range: Typically  $-55^{\circ}$  C to  $75^{\circ}$  C
- Weight: less than 2 kg
- • Should have both self-regulating Vane heater and case heater
- Case and Vane Heater power supply: 18-32 VDC, nominal 28VDC
- No of potentiometer cups: minimum 3 nos
- Excitation voltage – 30 VDC maximum
- Load Impedance: 100K Ohms Nominal
- Tolerance: 10% of full scale
- Output interface: Potentiometer output/ Synchro/Resolver/RVDT (Desirable ARINC 429 Digital bus interface)
- • Reliability: MTBF > 10,000 hours
- • Physical dimensions
 

○	Vane Base	Vane
▪	Depth – 2 to 5 inch	Thickness – less than 1 inch
▪	Width – 2 to 5 inch	Width – 2 to 5 inch
▪	Length – 2 to 5 inch	Length – 2 to 5 inch
- Connector: Case Mounted MIL STD connector
- Total technical life (TTL) > 25 years
- Assurance for maintenance and spares support for the product during the next 25 years
- The Supplier/Vendor shall provide a minimum of 5 years of warranty of the LRU items supplied.
- • The LRU's shall meet the environmental qualifications as detailed in Annexure A. In case of non-compliance this should be part of the technical proposal for evaluation.

**Annexure A**

Note: Category "X" represents that corresponding category qualification is not required

Description	RTCA DO-160 Section	Category Requirement	Remarks
Temperature and Altitude	4.0	C4	Operating Low Temperature: -40 deg C Ground Survival Low Temperature: -40 deg C Operating High Temperature: +55 deg C Ground Survival High Temperature: +70 deg C Short Time operating high Temperature: +55 deg C Loss of Cooling: +40 deg C Decompression test – NOT APPLICABLE Overpressure test – NOT APPLICABLE Altitude = 30000 feet
Temperature variation	5.0	B	Rate of change of Temp :5 deg C minimum per minute.
Humidity	6.0	C	
Operation shock and crash safety	7.0	B	Category B (Standard operational shock and crash safety) Operational Shock: 6g and 11ms. 3 shocks in each orientation. Crash Safety (Impulse): 20g and 11ms. 1 shock in each of the six equipment orientations (total 6 shocks). Crash Safety Sustained Test Levels. Up: 3.0g, down: N/A, forward: 18.0, aft: N/A, side (left & right): 4.5g – for fixed orientation OR 18.0 g in all directions for random orientation.
Vibration	8.0	S	Curve L
Explosive Atmosphere	9.0	X	Not applicable
Water Proofness	10.0	R	R
Fluid susceptibility	11.0	X	Not applicable
Sand and Dust	12.0	S	

Fungus Resistance	13.0	F/X	<b>Note:</b> If all materials used in the construction of the equipment can be shown to be non-nutrients for the growth of fungi, either through their composition or through previous testing, this test is not required.
Salt Fog/Salt Spray	14.0	T	
Magnetic Effect	15.0	B	
Power Input	16.0	B/Z	
Voltage Spike	17.0	A	
Audio Frequency and Conducted Susceptibility	18.0	B/Z	
Induced Signal Susceptibility	19.0	Z/ZC/ZCE	Z as per DO-160D ZC/ZCE as per DO-160G <b>Note:</b> E is required only if installation has a non-metallic enclosure
Radio Frequency Susceptibility	20.0	R	
Emission of Radio Frequency Energy	21.0	H	
Lightning Induced Transient Susceptibility	22.0	A3XX/ A3XXXX	A3XX as per DO-160D A3XXXX as per DO-160G
Lightning Direct Effects	23.0	ZZ2A	
Icing	24.0	C	
Electrostatic Discharge	25.0	A	
Fire Flammability	26.0	C	

**BID-SECURING DECLARATION FORM**

Date: \_\_\_\_\_

Bid No. \_\_\_\_\_

To (insert complete name and address of the purchaser)

I/We. The undersigned, declare that:

I/We understand that, according to your conditions, bids must be supported by a Bid Securing Declaration.

I/We accept that I/We may be disqualified from bidding for any contract with you for a period of one year from the date of notification if I am /We are in a breach of any obligation under the bid conditions, because I/We

(a)	have withdrawn/modified/amended, impairs or derogates from the tender, my/our Bid during the period of bid validity specified in the form of Bid; or
(b)	having been notified of the acceptance of our Bid by the purchaser during the period of bid validity
	(i) fail or refuse to execute the contract, if required, or
	(ii) fail or refuse to furnish the Performance Security, in accordance with the Instructions to Bidders.

I/We understand this Bid Securing Declaration shall cease to be valid if I am/we are not the successful Bidder, upon the earlier of (i) the receipt of your notification of the name of the successful Bidder; or (ii) thirty days after the expiration of the validity of my/our Bid.

Signed: (insert signature of person whose name and capacity are shown)  
in the capacity of (insert legal capacity of person signing the Bid Securing Declaration).

Name: (insert complete name of person signing the Bid Securing Declaration)

Duly authorized to sign the bid for an on behalf of: (insert complete name of Bidder)

Dated on \_\_\_\_\_ day of \_\_\_\_\_ (insert date of signing)

Corporate Seal (where appropriate)

Note:

1. In case of a Joint Venture, the Bid Securing Declaration must be in the name of all partners to the Joint Venture that submits the bid.
2. Bid Security declaration must be signed in by the Proprietor/CEO/MD or equivalent level of Officer of the company.