

**(Expression of Interest (EOI) for Helmet Mounted Display & Sight  
(HMDS) System**

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**Part 1****1. Introduction**

- a) Aeronautical Development Agency (ADA) under Department of Defence Research and Development of India's Ministry of Defence was established at Bangalore in 1984. ADA is nodal agency to oversee the development of the nation's Light Combat Aircraft (LCA) programme. LCA-Tejas Mk1 has successfully completed Final Operational Clearance (FOC) in 2019 and two squadrons are operational with Indian Air Force (IAF). ADA is entrusted with development of current aircraft programmes.
- b) ADA proposes to float an EOI to determine proven product capable of meeting the operational and technical requirements for a Helmet Mounted Display and Sight (HMDS) system for current aircraft programmes of ADA. The Expression of Interest (EOI) define at the first instant is being issued with no cost no commitment (NC/NC) basis and ADA reserves the right to change or vary any part thereof at any stage. The EOI does not promise to issue a Request for Proposal (RFP) in the future.
- c) The Objective of this EOI is to gather additional information towards finalization of technical specifications for procurement and integration of HMDS for the current aircraft programs of ADA. Vendor shall provide cost breakup as follows:
  - 10 sets of HMDS systems as standard product,
  - Tools & testers
  - Additional developmental / NRE cost explicitly mentioned against each task

**2. Broad Scope of work**

The broad scope of work is as follows:

- a) Supply, aircraft adaptation, integration & certification of Helmet Mounted Display & Sight (HMDS) with sub-system and tools
- b) Hardware airworthiness qualification as per DO-254
- c) Software airworthiness qualification as per DO-178B.
- d) Environmental qualification as per e-map specified.
- e) Airworthiness certification

- f) Flight test support
- g) Addressing of flight test observations

### **3. Pre-requisite**

- a) Vendor's offered HMDS system flown prior on other fighter platform.
- b) Vendor's offered product should have proven Line of Sight Computation results on other fighter aircraft platform.
- c) Vendor shall demonstrate physically at ADA premises the product offered with respect to EOI.
- d) Vendors should go through requirements specified in Annexure –A and shall provide details / compliance / noncompliance against each requirement.
- e) Vendor shall provide company and other details as per Annexure – B.

### **4. General Instructions**

- 4.1 All copies of documents submitted along with EOI should be clear, legible and self-certified by the authorized representative of the applicant.
- 4.2 ADA reserves the right to physically check the original documents/certificates, the copies of which are submitted along with the EOI.
- 4.3 The applicant language of communication for all activities connected to the EOI and tasks thereof shall be in English.
- 4.4 ADA reserves the right to cancel this process of EOI at any time without any financial or otherwise liability and without assigning any reasons thereof.
- 4.5 The applicant must give a declaration stating that under the existing regulations of their country, there is no bar or restrictions on the applicant for participation in this EOI.
- 4.6 It may be noted that shortlisted applicant will be required to sign a Non-Disclosure Agreement (NDA) and Integrity Pact (IP) at a later date as required by ADA.
- 4.7 The applicant must meet the minimum criteria regarding the applicants specific and particular experience, specified in this document, as demonstrated by the applicant's responses provided in the Forms at Part 2 other requested documentation.
- 4.8 The applicants may note that mere meeting of the minimum criteria does not entitle any company/firm/organization the right for award of the contract.
- 4.9 ADA will not be responsible/ liable to any party in any way for costs associated in preparation & submission of EOI.

- 4.10 This notice is issued only to elicit an Expression of Interest (EOI) from parties interested in the collaboration and does not constitute any binding/commitment from Labs/Estt to invite any or all of the parties in any of the subsequent process.
- 4.11 ADA is also not obliged to share clarification related questions with other respondents than the one who seeks clarification.
- 4.12 ADA reserves the right to accept or reject any EOI proposal without showing any reasons whatsoever.
- 4.13 This EOI is being issued with no commitments and ADA reserves the right to withdraw the EOI and change or vary any part thereof or foreclose the EOI at any stage.
- 4.14 Submission of Information/ Documents:
- 4.15 Information should be submitted in the formats specified in this document. The Prequalification documents shall be submitted as follows:
- Two (hard) copies with all supporting documents.
  - One digital copy (on CD) of entire documentation.
  - With covering letter duly signed by Authorized Representative of the company with company's seal. Document in support of authorization granted to authorize representative to be submitted.
- 4.16 Failure by the applicant to provide information/documents, which is essential to evaluate the applicant's qualifications, or to provide timely clarification or substantiation of the information supplied may result in disqualification of the applicant.
- 4.17 Any information/ clarification regarding this subject matter can be obtained from on email or over phone

Person Name	Email Id & Contact details
Mr. Gurusewak Singh, Sc 'E'	<a href="mailto:gurusewak-pawar.ada@gov.in">gurusewak-pawar.ada@gov.in</a> 080-25087823
Ms. Arunima Singh, Sc 'G'	<a href="mailto:asingh.ada@gov.in">asingh.ada@gov.in</a> 080-25087826

**Annexure – A****1. Product Specifications:**

Vendor should be able to supply, adapt and integrate HMDs system with following specifications:

**i) Functional:**

Requirements	Remarks
1. Reduced weight, low power consumption & no cooling requirement for aircraft interface unit.	
2. No moulded fitment, a personal liner for fitting.	
3. Integrated Spatial (stereo L & R) Audio with Active noise cancellation & colour display.	
4. Opto-inertial tracker without a/c mapping.	
5. Integrated Gen III Class B/C Night Vision Goggle.	
6. Internal / External HMDs sub-system with Electronics for symbology generation as per ARINC661 CDS format protocol over 1553B/TSN/Ethernet as runtime command received from UA.	
7. Power On Self-Test (POST), continuous built-in-test (CBIT) and initiated built-in-test (IBIT) capability to isolate internal sub-system's failures.	

**ii) Power, cooling and sub-systems:**

Requirements	Remarks
1. Aircraft input power requirement as per MIL-STD 704D and minimum power consumption	

**iii) Aircraft interfaces:**

Requirements	Remarks
1. Mil Bus 1553B/ TSN / Ethernet for data communication and ARINC 818 Fiber for Raster Video input	
2. Debrief camera compressed camera output on ethernet	

**iv) Display:**

Requirements	Remarks
1. Monocular or binocular display with minimum instantaneous field of view of 20 degree.	
2. Minimum display resolution per eye of 1024 x 768 pixels.	
3. Display stability from -3G to +9G	

**v) Physical:**

Requirements	Remarks
1. Minimized dimension of all sub-systems for aircraft installation.	
2. Helmet interface cable quick disconnect minimized in size for integration with pilot Personal Equipment Connector. Connector part number, shell size, aircraft wiring and connection mechanism force details.	

**vi) Line of Sight accuracy:**

Requirements	Remarks
1. Minimum Line of Sight accuracy 5 mrad in forward zone.	
2. Minimum LOS update rate to Avionics 20 msec.	

**vii) Safety:**

Requirements	Remarks
1. Helmet safety cleared for up to 600 KEAS windblast velocity.	

**viii) Reliability:**

Requirements	Remarks
1. MTBF not less than 9100 hrs.	

**ix) Qualification:**

- EMI/EMC test as per MIL-STD-461G/ MIL-STD-461C:

S/N	Test	Description
1.	CE102	Conducted emission frequency Potential, Power Leads. The test is applicable from 10 KHz to 10 MHz for all power leads including returns



2.	CE07	Conducted emission, power leads, Transient spikes, Time domain (As per MIL-STD-461C)
3.	CS101	Conducted susceptibility, power leads 30 Hz to 150 kHz
4.	CS114	Conducted susceptibility, power leads, Bulk cable injection, 10 KHz to 200 MHz
5.	CS115	Conducted Susceptibility, to withstand impulse signals coupled onto EUT associated cabling at a 30 Hz rate for one minute.
6.	CS116	Conducted Susceptibility, Bulk Cable Injection from 10 kHz to 100 MHz
7.	CS118	Conducted Susceptibility, Personal Borne Electrostatic Discharge
8.	RE102	Radiated emission electric field, 2 MHz to 40 GHz
9.	RS103	Radiated susceptibility electric field level 100 V/m.

**Table 1 – EMI-EMC tests**

- Power supply test as per MIL-STD-704D & MIL-HDBK-704-8

S/N	Test	Description
1.	LDC101	Load Measurements
2.	LDC103	Voltage Distortion Spectrum
3.	LDC104	Total Ripple
4.	LDC105	Normal Voltage Transients
5.	LDC201	Power Interrupt
6.	LDC301	Abnormal Steady State Limits for Voltage
7.	LDC302	Abnormal Voltage Transients
8.	LDC401	Emergency Limits for Voltage
9.	LDC602	Polarity Reversal

**Table 2 – Power Supply tests**

- Environmental Tests as Per MIL-STD-810H

S/N	TYPE OF TEST	SEVERITY	DURATION	REMARKS
1.	Altitude Test	Pressure corresponding to 60000 $\pm$ 100 ft (~18 km) altitude. (i.e. 72.26 mbars/ $\approx$ 54.2 mm of Hg)	One hour soak operational	Rate of change of altitude = 150 m/sec with positive Temperature (25°C)

S/N	TYPE OF TEST	SEVERITY	DURATION	REMARKS
2.	Rapid Decompression	From 23000 ft (7KM) to 60,000 ft in 15 secs	Hold for 10 min at 60,000 ft.	I. Equipment shall be in the normal operational condition II. There shall be no visual damage and no failure to the equipment under test.
3.	High temperature storage cum operating	From 35°C to 71°C diurnal cycle as given in Error! Reference source not found..		Carry out one operational check at the maximum temperature of 71°C for the test item after allowing stabilization during 1st, 4th and 7th cycles as indicated in Error! Reference source not found..
4.	Low temperature – Storage cum Operating	Soak (Storage) at -55°C +0°C - 2°C		I. The Low temperature storage tests shall be followed by low temperature operational tests to be conducted at -40°C -2°C for the test items as in installed condition. II. The rate of change of temperature of the chamber shall be less than 3°C/min Soak test item at -40°C for the duration of 2 hrs. following temperature stabilization. III. Carry out visual examination and operational checks with equipment still at -40°C.
		Stabilize (Operational) at -40°C+0°C - 2°C	2 hours	
5.	Thermal shock	Stabilize at T1 = -55°C - 2°C soak for 1 hour. Transfer and stabilize at T2 = +71°C + 2°C and soak it for 1 hour. Transfer it to T1 = -55°C - 2°C, and soak it for 1 hour. This constitutes 1 cycle.	3 cycles	Equipment shall be in non-operating condition. Transfer from low temperature chamber to high temperature chamber and vice versa to be affected within 1 min.
6.	Solar Radiation (Actinic effect)	Accelerated intensity of heat flux @1120W/m <sup>2</sup> (±4% or 15 W/m <sup>2</sup> ,	10 Cycles	ON time of 20 hrs, and OFF time of 4 hrs, constitutes one cycle.



S/N	TYPE TEST	OF	SEVERITY	DURATION	REMARKS
			whichever greater), at chamber temperature of 43°C + 2°C.		
7.	Rain Drip		Volume flow rate 250 to 280 lit/m <sup>2</sup> /hour. Droplet Size > 4.5mm Dispenser placed approximately 1 meter above equipment. (Configuration as installed on the A/C)	Drip for 30 min followed by operating for 1 hour.	The unit shall be subjected to visual internal inspection by removing adequate and sufficient covers/panels for evidence of water penetration. Accumulated water if any, should be collected by using syringe.
8.	Humidity		Temp. 30°C to 60°C, RH 85 to 95%, temp. Humidity Test Cycle as per Error! Reference source not found..	10 cycles	Functional checks during 1st, 5th and 10th cycle to be carried out. Functional checks to be carried out within recovery period.
9.	Fungus (Mould Growth) Direct Effect		The spore suspension will be prepared using following fungi: I. Aspergillus Flavas II. Trichoderma Virens III. Talaromyces pinophilus (Pencillum Funiculosum) IV. Chaetomium Globosum V. Aspergillus Brasiliensis (Aspergillus Niger) (Alternatively, fungi as per JSS55555 can be used)	Wet the entire surface of the test item with spore suspension in 10 min. Incubation period: 28 days at 30°C and 95% RH.	I. This test can be carried out on representative samples of parts used. II. The fungal growth be verified on the cotton strips every 7th day during the 28 days test duration. III. Visual inspection shall be carried out after 4 hrs of removal from the chamber taking human safety into considerations. Note: if material analysis reveals that the material is not a nutrient to any of fungi listed, then this test can be dispensed with

S/N	TYPE OF TEST	SEVERITY	DURATION	REMARKS
10.	Salt Fog	Salt Solution of 5+1% concentration. Ambient temperature $35 \pm 2^{\circ}\text{C}$ Ensure the fallout is between 1 and 3 ml/80 cm <sup>2</sup> with pH between 6.5 and 7.2. 24 hours exposure and 24 hours drying constitute one cycle.	2 cycles (96 Hrs)	<p>I. Composition of salt for preparation of solution shall be with sodium chloride containing not greater than 0.1%. Sodium Iodide and not greater than 0.5% impurities.</p> <p>II. Drying shall be at prevailing ambient conditions.</p> <p>III. There shall be no evidence of any corrosion during visual examination.</p> <p>IV. Functional checks to be carried out after the salt fog test.</p>
11.	Sand and Dust	Blowing Dust Air velocity 1.5 m/s to 8.9 m/s, RH $\leq$ 30% Dust Concentration $10.6 \pm 7$ g/m <sup>3</sup>	6 hours at $23^{\circ}\text{C}$	Carryout the visual examination after ensuring stabilized conditions are achieved. (Note: Alternatively the test procedure as per JSS-55555 can be used)
12.	Fluid contamination (occasional contamination)	<p>Test temperature <math>71^{\circ}\text{C} \pm 3^{\circ}\text{C}</math>, Test fluids:</p> <p>I. Fuel Jet A-1 (IS1571)/JP-8 (MIL-T-83133)/JP-5 (MIL-T-5624)/AVTUR (DEF-STAN-91-91/5-2)</p> <p>II. Hydraulic Fluid: (MIL-H-5606)</p> <p>III. c) LubOil mixtures: MIL-PRF-23699 Rev G. Class C/I.</p> <p>IV. Soap Water: MIL-PRF-</p>	7 days/test fluid	The test is to be carried out on representative samples of the parts used.

S/N	TYPE OF TEST	SEVERITY	DURATION	REMARKS		
		87937D, type IV				
13.	Acceleration - Functional	10g in all 6 directions OR	1 min. along each direction	The equipment shall be operational during the test.		
					+ive	-ive
		X-Axis			9.95 g	-4g
		Y-Axis			4.92 g	- 4.92 g
	Z-Axis	13.2 4g	- 9.39 g			
	Acceleration - Structural	1.5 times of given above.	1 min. along each direction	The equipment should not be operational during the test.		
14.	Vibration Sinusoidal (Resonance Search)	Resonance search from 5Hz to 2000Hz at 1g.  In all 3 axes with 3 sweeps/axis.	Limited to duration of frequency sweep of 5 to 2000Hz.	The test shall be conducted before and after Random vibration, with equipment in OFF condition. No resonance shall be observed up to 200Hz. <b>Note:</b> If the resonance frequency is less than 200 Hz, the unit shall be dwelled for 15 mins, at resonance frequency		
	Vibration Random – Flight Envelope	Random vibration level from 15 Hz to 2000 Hz as per profile given in Error! Reference source not found..	1 hour/axis in all three axes.	The equipment shall be operational and performance should be monitored during this test.  <b>Note:</b> Any test interruption due to failure of the vibration system, recover the system and continue the vibration test from point of failure.		
15.	Shock - Functional	20g saw tooth (or 15g half sine) 11 milliseconds pulse	3 shocks in each axes	The equipment shall be operational and monitored during the test.		

S/N	TYPE OF TEST	SEVERITY	DURATION	REMARKS
	Crash Hazard	40g saw tooth (Or 30g half sine) 11 milliseconds	2 shocks in each axes	Equipment shall be installed in unpacked condition, in non-functional state and unit function shall be verified after test.
	Transit drop	Height of drop 122 cm	26 drops (1 drop/each face, edge and corner)	The equipment shall be kept in its normal packed condition in transit case during test. test item is kept in its normal packed condition during this test.
	Bench handling	Raise one edge by 10 cm or 45° whichever is less and dropped on a wooden bench.	4 drops on each face	Equipment shall be in unpacked condition during the test.
16.	Combined Altitude Temperature and Humidity	Profile as per <b>Table 4</b> given below and Error! Reference source not found..	10 cycles	

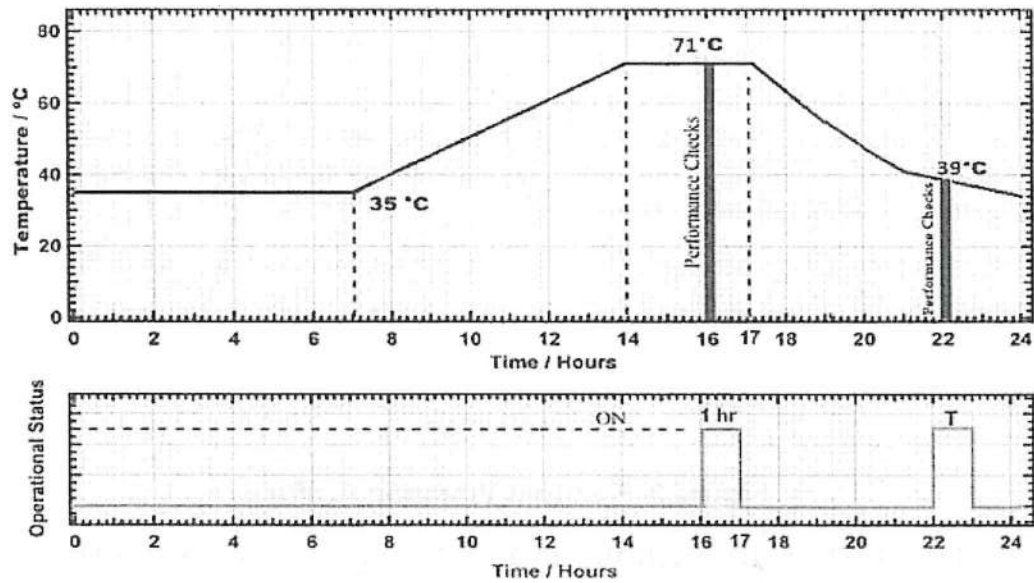
Table 4 – Environmental tests

Time (Hours)	Temperature (°C)	Altitude (Km)	Humidity (%)	Equipment ON/OFF
0 - 1.2 ± 10%	-55	ground		ON (0.5 – 1.2)
1.2 – 2 ± 10%	47	ground	95	OFF
2 - 2.8 ± 10%	-55	15		ON
2.8 - 4.8 ± 10%	47	ground	95	ON
4.8 – 9.2 ± 10%	71	ground		ON (5.0 Hrs. onwards)
9.2 – 10 ± 10%	71 to 20	15		ON
10 – 12 ± 10%	20	10		ON

Note:

The amount of time to ramp temperature is dependent upon the test facility change rate and shall not exceed 5°C / min

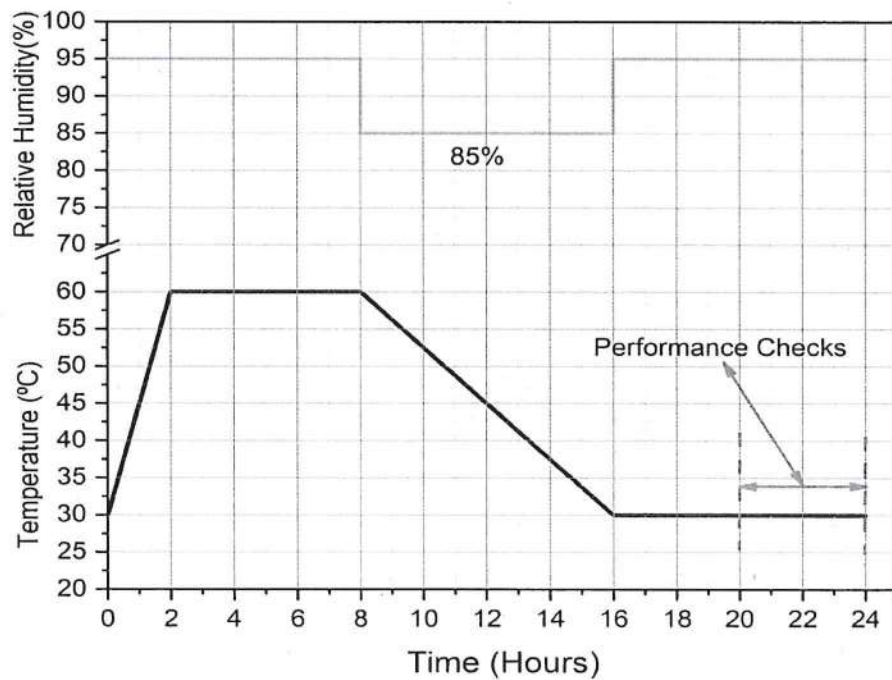
Table 4 - Combined Altitude, Temperature &amp; Humidity



T: Duration for performance checks depends on LRUs as applicable

**Note:** Supplementary cooled shall be supplied with cooling air as per the LRUs specification requirement with the cooling air being ducted

**Figure 1-High Temperature Storage cum Operating Diurnal Cycle**



**Figure 2 - Humidity Test Cycle**



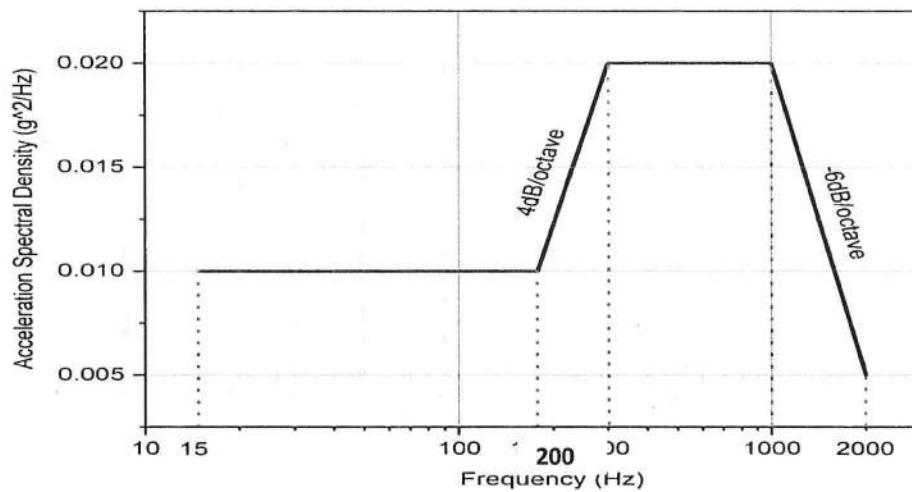
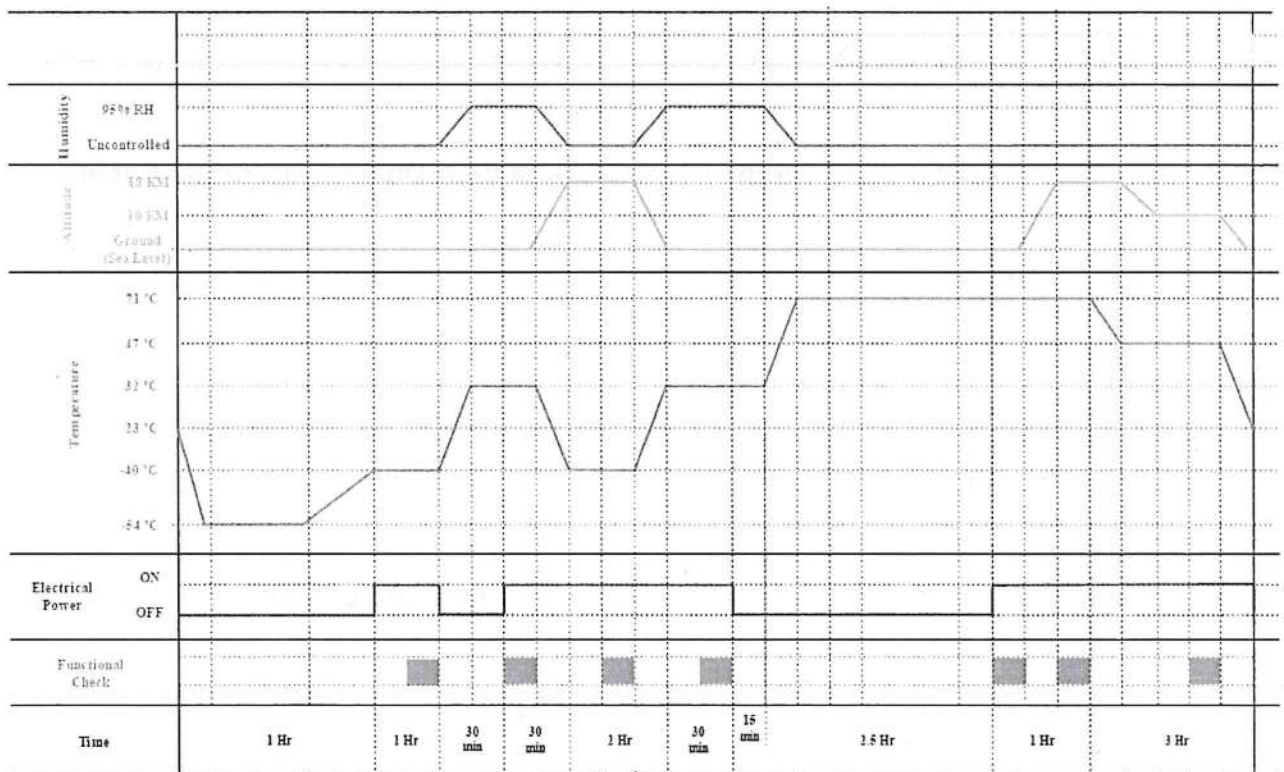


Figure 3- Random Vibration Profile

COMBINED ALTITUDE, HUMIDITY AND TEMPERATURE (CATH) PROFILE



Note: Figure not to scale, Time scale should be as per Table 1

Figure 4: Combined Altitude, Temperature & Humidity



**Annexure B****Information Format to be filled by Vendors for supply, adaptation, integration of HMDS****a) Company Details**

<b>Sl.No.</b>	<b>Description of company &amp; details</b>	<b>Remarks</b>
1.	Name & Address of the firm/Company a. Local office b. Head office	
2.	Telephone No. & Contact Person: a. Local office b. Head office	
3.	Fax No.: a. Local office b. Head office	
4.	E-mail Address: a. Local office b. Head office	
5.	Inception/Brief History with year of establishment, total capital employed	
6.	Whether Private owned/Public Listed	
7.	Willingness to carry out work for ADA for 10 years	

**b) Financial capability**

- The Applicant shall furnish complete audited annual financial years statements for last 10 years including balance sheets, profit & loss account statement, Audit Reports and all other schedules of immediate preceding financial year, self-certification of being not under liquidation, court receivership or similar proceeding.
- **Applicant** should provide financial information to demonstrate firm's capability for assessment of the financial status by Lab/Estt. If necessary, use separate sheets to provide complete banker information.
- Applicant should have positive net worth.

Banker	Name of Banker(s)	
	Address of Banker(s)	
	Telephone	Contact name and title of Senior Bank official
	Fax	E-mail

**c) Litigation/Arbitration History**

Applicant should provide information on history of Court litigation or arbitration proceedings resulting from contracts executed in the last 5 years or currently under execution. The information should also be provided for any significant sub-contractors.

Year	Decree/ Award for or against Applicant	Name of client, cause of litigation, and matter in dispute	Disputed amount (current value)

**d) Willingness/ Undertaking Format**

(To be enclosed as part of Expression of Interest proposal on the letterhead of the company)

To  
Director – ADA

Date

Reference: Expression of Interest No.

Dear Sir,

We hereby confirm that we have examined the lab/Estt EOI document No. ----- dated -----

We hereby confirm the following:

- i) That we agree to all terms and conditions of the EOI document.
- ii) ...
- iii) ...

Yours faithfully,

(Authorised Signature)