

INVITATION FOR EXPRESSION OF INTEREST (EoI) FOR AUGMENTED REALITY

HEAD MOUNTED DISPLAY (ARHMD) SYSTEM

1. **Introduction** The Augmented Reality Head Mounted Display System is conceived as a capability enhancement to Land Based Air Defence Weapon Systems such as IGLA shoulder fired IR Homing AD Missile System and ZU 23mm 2B AD Gun System by providing the operator with **radar and thermal imaging sight outputs as overlays** on the real life view of surroundings and the sky via **Augmented Reality Head Mounted Display (ARHMD) System**. The proposed system intends to enhance the capability of Land Based Air Defence Weapon Systems so that engagements of hostile aerial targets are possible during night and conditions of inclement weather. At the same time, day-time engagements are intended to be enhanced through increased reaction times, data computation for decision support, and integration of output of Thermal Imaging sights.

2. **Objective** The objective of this invitation of Expression of Interest (EoI) is to seek willingness of Indian Vendors to participate in the Make II Project ARHMD System, in accordance with provision of DPP 2016 (reference Chapter III A). Indian Vendors meeting the Technical, Commercial and Project Requirements laid out in the EoI will be issued a 'Project Sanction Order' to develop a prototype as per provisions of Chapter III A of DPP – 2016.

3. **Layout** The EoI has been covered under following parts:-

- (a) Part I : General Information.
- (b) Part II : Scope of the Project.
- (c) Part III : Evaluation Criteria.
- (d) Part IV : Procedure for submission of response to the EoI.
- (e) Part V : Miscellaneous.

PART I : GENERAL INFORMATION

4. **Nomenclature**. Augmented Reality Head Mounted Display (ARHMD) System.

5. **Categorisation**. In accordance with **Para 25 of Chapter IIIA, DPP-2016 (incorporating all amendments upto 01 Nov 2019) the design and development of the system must be indigenous**. The project is further categorized as under :-

- (a) **Prototype Development Phase**. "Make-II (Industry Funded)' in accordance with Para 6 of Chapter III-A of DPP-2016.

(b) **Procurement Phase.** 'Buy (Indian-IDDM)' in accordance with Para 5 of Chapter III-A of DPP-2016.

6. **Quantities.** The quantities sought for the project are :-

(a) **Prototype Development Phase.** Following equipment are required :-

<u>Ser No</u>	<u>ARHMD System</u>	<u>Qty</u>	
		<u>Igla</u>	<u>Gun</u>
(i)	ARHMD.	01	01
(ii)	Module for Extraction of Data from Thermal Imaging Sight & Target Data Receiver (TDR).	01	01
(iii)	Computing Module.	01	01
(iv)	Hand Gesture Module.	01	01
(v)	Power Back Up including Internal battery (one) & External Batteries(three) per ARHMD system.	01 (Internal batteries) and 03 (external batteries)	01 (Internal batteries) and 03 (external batteries)
(vi)	Simulator Software for operator training.	01	01

(b) **Procurement Phase.** Following equipment are required :-

<u>Ser No</u>	<u>ARHMD System</u>	<u>Qty</u>	
		<u>Igla</u>	<u>Gun</u>
(i)	ARHMD.	354	202
(ii)	Module for Extraction of Data from Thermal Imaging Sight & Target Data Receiver (TDR).	354	202
(iii)	Computing Module.	354	202
(iv)	Hand Gesture Module.	354	202
(v)	Power Back Up including Internal battery (one) & External Batteries(three) per ARHMD system.	354 (Internal batteries) and 1062 (external batteries)	202 (Internal batteries) and 606 (external batteries)
(vi)	Simulator Software for operator training.	354	202

7. **Make-II Procedure.** Make-II Procedure duly amended upto 01 Nov 2019, is available at Chapter III-A of DPP-2016. DPP-2016 (incorporating all the amendments upto 01 Nov 2019), will be referred to hereinafter in the case and a copy of the same is available on MoD website.

PART II : SCOPE OF THE PROJECT

8. **Scope** The Augmented Reality Head Mounted Display (ARHMD) System is conceived as a capability enhancement to Land Based Air Defence Weapon Systems and will be developed by the Indian Industry. This project is aimed at meeting this requirement indigenously.

9. **Preliminary Services Qualitative Requirements (PSQR) of the Proposed System.** PSQR of the Augmented Reality Head Mounted Display (ARHMD) System is attached as **Appendix 'A'**.

Time Line And Milestones

10. Time Line

- (a) Prototype development - 52 weeks from the date of issue of Project Sanction Order.
- (b) Production of complete 556 Nos of ARHMD in procurement phase as under :- - 36 Months from the date of issue of SO.

<u>Ser No</u>	<u>Goods or Service</u>	<u>Total Qty</u>	<u>'To' + 18 Months</u>	<u>'To' + 36 Months</u>	<u>Remarks</u>
(i)	ARHMD.	556	300 (200 ARHMD for Iglā Msl, 100 for Zu Guns)	256 (154 ARHMD for Iglā Msl, 102 for Zu Guns)	'To' is the contract effective start date/date of down payment. Batteries should be commercially available.
(ii)	Module for Extraction of Data from Thermal Imaging Sight & Target Data Receiver (TDR).	556	300	256	
(iii)	Computing Module.	556	300	256	
(iv)	Hand Gesture Module	556	300	256	
(v)	Power Back Up including Internal battery (one) & External Batteries (three) per ARHMD system.	556	300 (internal batteries) and 900 (external batteries)	256 (internal batteries) and 768 (external batteries)	
(vi)	Simulator Software for operator training.	556	300	256	

11. **Milestones.** Major activities in the procurement are given below :-

<u>SN</u>	<u>Activity</u>	<u>Remarks</u>	<u>Timelines</u>
(a)	Issue of EoI	By PFT	T _o
(b)	Pre EoI Response Meeting	By PFT with EoI respondents	T _o + 3 weeks
(c)	EoI Responses Submission	By EoI respondents (Indian Vendors)	T _o + 6 weeks
(d)	EoI Responses Evaluation	By PFT	T _o + 11 weeks
(e)	Issue of Project Sanction Order for Development of Prototype	To selected DAs, those meeting evaluation criteria	T _o + 13 weeks
(f)	Design and Development of Prototype	Selected DAs will develop the prototype	T _o + 65 weeks
(g)	1-2 Intermediate meetings to check the progress and direction of the project to be planned.	-	As required and mutually accepted (T _o + (20-50) weeks)
(h)	Conversion of PSQRs to SQRS / Solicitation of Commercial Officer	-	T _o + 69 weeks
(j)	User Trial and Staff Evaluation	A commercial Request for Proposal (RFP) for "Buy(Indian-IDDM)" phase will be issued to all DAs for submission of commercial offer prior to commencement of User Trials	T _o + 73 weeks - T _o + 91 weeks

Development of Prototype and Trials

12. All possible and reasonable assistance and any clarification related to functional or operational aspect of development as sought by DAs will be provided by Project Facilitation Team.

13. After the prototype has been developed as per PSQR given at Appendix 'A' the PFT would carry out User Trials Readiness Review of the Prototype(s) and freeze the Technical Specifications before conduct of User Trials on NCNC basis. Evaluation of the equipment will be carried out during the User Trials (Field Evaluation Trials) to validate the performance of the equipment against the Final Technical Specifications. Service HQ will formulate the 'Trial Directive' which will incorporate the parameters for validating the 'Essential Parameters'. Necessary technical literature pertaining to the design and material will be provided by the DAs for the User Trial Readiness Review and conduct of User Trials on the prototype.

Solicitation of Commercial Offers

14. A commercial Request for Proposal (RFP) for 'Buy (Indian-IDDM)' phase would be issued to DA(s) prior to commencement of User Trials for soliciting their commercial offers. **Additional technical information / documentation, as may be necessary including those related to Indigenous Content and IPRs would also be required to be provided by the vendor prior to the issue of Commercial RFP.**

Deliverable

15. Details of tools, accessories, literature, training etc required at the procurement stage will be specified in the RFP.

16. An appropriate Engineering Support Package (ESP) will be required for repair & maintenance of the equipment to include spares, Special Test Equipment / Special Maintenance Tool, Training and Technical literature to include user hand book, preservation instructions, Complete Equipment Schedule, Repair Manual and Technical Manuals. These will be provided with the equipment during the procurement phase. Details will be further amplified in the Request for Proposal (RFP).

Details of Trials

17. The following trials will be conducted / assistance will be provided :-

(a) **Trials**. The trials will be conducted in two stages :-

(i) **Stage -I : User Trials Readiness Review**. Development of prototype and bring the ARHMD to user trial level and facilitate DA(s) and ensure that the system meets the critical parameters and safety standards.

(ii) **Stage-II : User Trials (Field Evaluation Trials)**. To evaluate the performance and assess the suitability of ARHMD system to meet operational, technical and safety aspects, **User Trials, DGQA Trials, EMI / EMC Trials and Maintainability Evaluation Trials (MET)** on **NCNC basis** will be conducted. Details of the same will be included in the RFP.

Intellectual Property Rights (IPRs)

18. As per provisions of **Para 47, Chapter III-A of DPP-2016**. The 'IPR Agreement' will be furnished by each Eol respondent at the time of submission of Eol responses as per format given at Appendix B. Further, based on the development of the prototype, a comprehensive list of design documents (to be informed subsequently) will need to be submitted by the development agencies for verification by a Committee of Experts.

PART III : EVALUATION CRITERIA

Commercial Evaluation Criteria

19. EoI respondents will furnish their responses to the Commercial Evaluation Criteria as per Appendix C. Indian entity satisfying criteria given at Appendix A to Chapter IIIA of DPP-2016 (Incorporating all the amendments up to 01 Nov 2019) of the Make-II Procedure will be considered as an eligible “Indian Vendor” for the project and the criteria required are reproduced below :-

- (a) Public limited company, private limited company, partnership firms, limited liability partnership, one person company, sole proprietorship registered as per applicable Indian laws. In addition, such entity shall also possess or be in the process of acquiring a license/ development of products if the product under project requires license as per DIPP’s licensing policy.
- (b) The entity has to be owned and controlled by resident Indian citizens; entity with excess of 49% foreign investment will not be eligible to take part in ‘Make’ category of acquisition.
- (c) For projects having cost of development phase \leq Rs. 3 Cr and cost of procurement phase \leq Rs. 50 Cr/year based on delivery schedule at the time of seeking AoN, there will be no commercial and financial criteria.
- (d) For all cases having cost of prototype development phase $>$ Rs. 3 Cr and/or procurement cost $>$ Rs. 50 Cr/ year based on delivery schedule at the time of seeking AoN, the entity should have : -
 - (i) Average annual turnover of the applicant company for the last three financial years ending 31st March of the previous financial year, should not be less than 5% of the estimated cost of the project.
 - (ii) Net worth of the entities ending 31st March of the previous financial year should be “Positive”.
- (e) Other Technical criteria will be spelt out by concerned SHQ based on the project requirement.
- (f) The ‘Start-up’ recognized by Department for Promotion of Industry and Internal Trade (DPIIT) from time to time, shall be eligible to participate under ‘Make-II’.

Technical Evaluation Criteria

20. The respondents to this EoI are required to furnish information about their Technical Capability as per Appendix D. Compliance / information as per Annexure to Appendix D is also required to be submitted as per the proposed solution offered by the DA against PSQR of the equipment.

21. **Indigenous Content.**

(a) **Prototype Development Stage.** More than 40% Indigenous Content as per DPP 2016 with indigenous design and development.

(b) **Procurement Phase.** Post successful development of prototype(s), further procurement will be as per the 'Buy (Indian-IDDMM)' procedure with an Indigenous Content of more than 40% as per DPP 2016.

22. **Additional Information.** Additional information required to be furnished as part of the EoI response is given at Appendix E.

23. **Foreign Collaboration.** If the DA is collaborating / plans to collaborate with a foreign technology provider, the nature of such collaboration and the technology areas being transferred must be stated in the response (please refer paragraphs 12 & 13 of Appendix E. All relevant delivery made under contract shall be accompanied by a "Certificate of IC" issued by the Chief Financial Officer (CFO) of the Prime / Main Contractor. All final deliveries under contract shall be accompanied, in addition to the certificate issued by the CFO of the prime (main) contractor as aforesaid, by its Company Auditors Certificate.

PART IV : PROCEDURE FOR SUBMISSION OF RESPONSE TO THE EoI

24. The response to the EoI shall be submitted as per formats given at Appendix 'B' to Appendix G.

25. **Guidelines for Submitting EoI Responses.**

(a) The responses should be submitted strictly as per the formats given in respective Appendices. Should a vendor need to mention any other information, a separate column / row may be added.

(b) All responses and Appendices should be submitted in a single file / folder. Supporting documents / additional references should be submitted in a separate folder with proper reference mentioned against each parameter / sub parameter in respective appendices.

(c) Any supporting document / evidence without any reference to specific parameter of criteria will not form part of the assessment.

26. **Rejection Criteria for Selection as DAs.** The following may lead to rejection of EoI response :-

(a) Failure to meet Commercial Evaluation Criteria given at Para 19.

(b) Failure to meet / comply with the Technical Evaluation Criteria specifications give at Para 20.

(c) Failure to offer compliance to any of the terms and conditions given in the EoI.

(d) Any other parameter of the response considered inadequate by the MoD, Government of India.

27. The Eol respondent shall submit three (03) copies of response to the Eol, clearly marking one copy as '**Original Copy**' and second & third as '**Duplicate Copy and Triplicate Copy**'. In the event of any discrepancy between them, the original copy shall govern/ prevail. Each page of the response will bear the signatures of the authorised signatory of the company. The DA shall also submit a soft copy of the response to this Eol in a CD/ DVD.

28. The nodal officer for the project for all queries/ clarification/ coordination will be secretary, Project Facilitation Team. Address and contact details of the nodal officer is as given below :-

Col Samudra Vijay Sarma, Col AD (ET & Make), AAD-9,
Secretary, Project Facilitation Team
Army Air Defence Directorate/ AAD-9
Integrated HQ of MoD (Army)
Room No 608, D1 Wing
Sena Bhawan
DHQ PO, New Delhi – 110011
email id – skycoord94@nic.in
Tele No – 34884

29. **The envelops shall be addressed as under :-**

Col Samudra Vijay Sarma, Col AD (ET & Make), AAD-9,
Secretary, Project Facilitation Team
Augmented Reality Head Mounted Display (ARHMD)
Army Air Defence Directorate/ AAD-9
Integrated HQ of MoD (Army)
Room No 608, D1 Wing
Sena Bhawan
DHQ PO, New Delhi – 110011
email id – skycoord94@nic.in
Tele No – 34884

30. The responses to this Eol must be submitted by 28 Sep 2020 at the above mentioned address.

31. The company will be required to sign and honour the 'Confidentiality Agreement' with MoD Govt of India. The 'Confidentiality Agreement' will be furnished by each Eol respondent at the time of submission of Eol responses as per format given at Appendix F.

PART V : MISCELLANEOUS

32. Copy of MoUs with consortium partners , to be submitted if applicable.

33. All other relevant documents/ information with respect to IC aspects, Product support post approval of prototype, Manufacturing/ ToT, QA & Testing, ownership and other relevant aspects, **may be** submitted along with the proposal.

34. **Pre Eol Responses Meeting** A pre-response meeting will be held on 07 Sep 2020 at 1100hrs Army Air Defence Directorate, AAD-9 Eqpt Br, New Delhi-11011. Vendors are required to submit their queries / clarifications / amplifications in writing to this office by 28 Aug 2020.

35. Guidelines for penalties in business dealings with entities as promulgated by Government from time to time, will be applicable on procurement process & bidders.

36. The Pre-Contract Integrity Pact (PCIP), listed as detailed in paragraph 92 of Chapter II of DPP-2016, shall apply mutatis mutandis to the 'Buy (Indian-IDDM)' phase of 'Make' project.

37. Respondent would be subject to disqualifications if they make false, incorrect, or misleading claims in their response to this Eol. A 'Correctness Certificate' As per the format at Appx G will be furnished as part of the response.

38. Please acknowledge the receipt of this invitation for Eol.

File No :50078/MAKE/ARHMD/GS/AAD-9

Dated : 2020

(Samudra Vijay Sarma)
Colonel
Secretary, Project Facilitation Team
Augmented Reality Head Mounted
Display (ARHMD) System

Enclosures : **Appendices A to G**

PRELIMINARY STAFF QUALITATIVE REQUIREMENTS FOR AUGMENTED REALITY HEAD MOUNTED DISPLAY (ARHMD) SYSTEM

User requirements as set out in this Qualitative Requirement represent attainable ideals as foreseen by the Ministry of Defence. If their realization is likely to involve prolonged or extravagant development or if final production is likely to be unreasonably expensive and complex or it is difficult to maintain or use, it is requested that users be informed at the earliest possible date.

1. Reference to General Staff Policy Statement No	-	
2. Preliminary Staff Qualitative Requirement Number	-	71
3. Other Previous Qualitative Requirement	-	Nil
4. Reference GSEPC Mtg	-	11th (2019) GSEPC MEETING HELD ON 30 OCT 2019
5. Sponsor Directorate and File No	-	DG AAD 50078/MAKE/ ARHMD/GS/AAD-9
6. Nomenclature	-	AUGMENTED REALITY HEAD MOUNTED DISPLAY (ARHMD) SYSTEM
7. Security Classification	-	RESTRICTED
8. Priority of Development	-	IMMEDIATE
9. GSQR Reviewed/ Modified on	-	NA
10. Next review due	-	
11. PDC	-	
12. Date Equipment Intro into service	-	

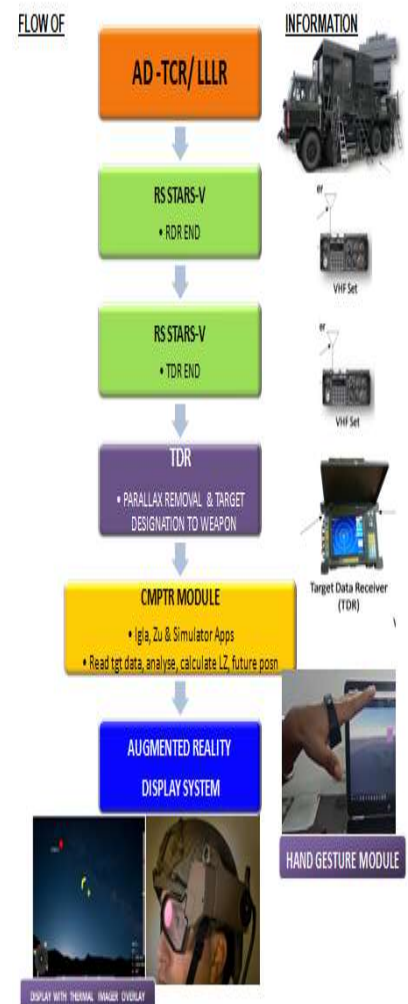
PART I – Description of the Equipment

10. **Introduction** The Augmented Reality Head Mounted Display System is conceived as a capability enhancement to Ground Based Air Defence Weapon Systems (GBADWS) such as IGLA shoulder fired IR Homing AD Missile System and ZU 23mm 2B AD Gun System by providing the operator with **radar and thermal imaging sight outputs as overlays** on the real life view of surroundings and the sky via **Augmented Reality Head Mounted Display (ARHMD) System**. The proposed system intends to enhanced the capability of GBADWS so that engagements of hostile aerial targets are possible during night and conditions of inclement weather. At the same time, day-time engagements are intended to be enhanced through increased reaction times, data computation for decision support, and integration of output of Thermal Imaging sights.

11. The proposed system is designed to extract parallax corrected target data from **Target Data Receiver (TDR)** of **AD Tactical Control Radar (TCR)** and integrate the **Thermal Imaging Sight** output of IGLA system and ZU 23 mm Gun System wherever available and display it to the weapon / missile operator via a wireless **HMD** for **Local Warning (LW)**, **assisted targeting**, **launch assist and display of ancillary data enhancing engagement efficacy**.

12. **Aim** To define Preliminary Staff Qualitative Requirement of Augmented Reality Head Mounted Display (ARHMD) System.

13. **Flow of Target Information.** The target information which is picked up by Air Defence-Tactical Control Radar/ Low Level Lightweight Radar will be passed to the Target Data Receiver through Radio Set STARS-V and will be parallax corrected at the Target Data Receiver end. The target information received from Target Data Receiver will be in the form of synthetic image and will be made available in the display of ARHMD system. The Thermal Imaging sight output of IglA system and ZU 23mm Gun system wherever available will be integrated with the target information received from Target Data Receiver. Once the operator aligns target blip with the Line Of Sight (LOS) reticule, the operator will be looking directly at the target. All this while, computer is calculating instantaneous position of target relative to firer. The operator thereafter aligns the Missile Peep Sight/ Gun Sight Crosshairs with LOS and keeps tracking the blip while waiting for engagement command. When target nears Launch Zone (LZ) /engagement range, computer presents command to initiate launch sequence/commence fire. In IGLA system, missile seeker tracks the target, buzzer on missile is sounded and missile fires in 'auto' mode. In ZU-23 mm 2B, gunner gets an 'aim-off' point which is used to lay the gun for firing. Head-on engagement is thus accomplished. Also a hand gesture module for user interaction with the Augmented Reality Module/ Software has been provided where the user should be able to define new functions / interactions through recording his hand movements and training the software.



14. The Augmented Reality HMD system shall consist of the following components :-

- (a) **ARHMD.**
- (b) **Module for Extraction of Data from Thermal Imaging Sight & Target Data Receiver (TDR).** TI Sight & TDR are available as WE Equipment however necessary module will be required to extract data from both and transfer the same to the AR Headset display automatically. The system will have requisite software to extract **target data** from **TDR of AD TCR and TI Sight** in a (mutually agreed protocols) suitable format.
- (c) **Computing Module.** A Laptop/ Palmtop module. It will be the interface between TDR & AR based Helmet Mounted Display (HMD).
- (d) **Hand Gesture Module.**
- (e) **Power Back Up including Internal & External Batteries.**
- (f) **Simulator Software for operator training.**

ESSENTIAL PARAMETERS
PART II – Physical Characteristics

15. The Augmented Reality Headset/HMD (ARHMD) System should have foldable/retractable Mounted Display with the flexibility of ergonomically fitting on Head, Turban and on standard Army issue helmets. The system should have the following physical characteristics :-

S No	Parameter	Requirement
<u>Physical Characteristics</u>		
(a)	Dimensions	Helmet mounted display adjustable to all head sizes including persons with turbans & standard army helmets.
(b)	Weight	Not more than 1 kg (Helmet mounted display sub component including brackets & accessories).
(c)	Appearance	External surface of a non-reflective olive green, sand or camouflage pattern.
(d)	Ease of use	The system should be ergonomic for use upto 7 (seven) hours. The fitting should be comfortable and compatible with existing battle fatigues & non sweat inducing. Accessories such as wires adaptors etc should not interfere with free movement of the operator.

PART III – Operational Parameters

16. **Augmented Reality Helmet Mounted Display (ARHMD)** System should be well adapted for outdoor use including High Altitude area up to 4500m, Deserts & Plains. It should comply with requisite mil grade standards having complete operational functionality as desired. The Augmented Reality Headset/HMD (ARHMD) system should have the following operational parameters / capabilities :-

Performance Characteristics		
(a)	Facilitation for Tgt Engagement	Tgt loc to be indicated in ARHMD display to facilitate alignment with sight axis
(b)	Internet Connectivity	The system will NOT be connected to the internet either for operation or for updation of software and will work entirely in offline mode.
(c)	Operating time	Minimum 7 hrs on one Internal and one external battery power source.
(d)	Power Source	(i) 3 Nos (three) of external batteries to be supplied as part of the system unit. (ii) 01 Nos (one) Internal battery should provide a standby time of minimum 60 minutes. (iii) Both internal and external batteries should be externally chargeable. The system should have a built-in battery and another attachable external battery pack. The built-in battery should cater for system up-time while the external battery is being replaced so as to ensure continuous operation. Attachable, rechargeable NiMH/Li-ion battery pack. External AC adapter and External AC-DC adapter.
(e)	Charging Facility	(i) Through the built in battery of TDR (DC-DC) (ii) Through commercial power supply. (iii) The battery should be modular similar to power banks for mobile phones so as to allow plug & play operation. (iv) Fast charging capability.
(f)	Power and 'Booting' Parameters	(i) System Booting From Off Mode : Not more than 60 seconds. (ii) Booting From standby Mode : Not more than 5 seconds. (iii) System should have optional settings to enter into standby mode automatically for saving battery life.
(g)	Reticules and On-Screen Displays	(i) Fixed Line of Sight (LOS) reticule. (ii) Arrow marker for Cue-To-Slew. (iii) Orientation & cardinal direction markers. (iv) Target Parameters, Weapon control Orders, IFF Status. (v) Other displays will be created during the

		R&D phase based on necessity. The display should not be blinded by bright light, similarly targets should not get 'masked'. (vi) System must be flexible to allow edit or add/delete markers by OEM incase desired by user. (vii) Field of View 40 Deg or more in Azimuth and 30 Deg or more in Elevation. (viii) Resolution more than 720X1280. (ix) Latency less than 20 ms. (x) Refresh rate more than 60 Hz
(h)	Target Depiction in Different colours	The AR head set should be able to display the targets in various colours depending on its range from the weapon end. Likely parameters (subject to further refinements) :- (a) Head on Mode. (i) Less than 2 KM - Red (Critical) (ii) 2 – 6 KM - Green (Engage) (iii) 6 – 10 KM - White (Observe) (b) Tail on Mode. (i) 0 – 3 KM - Green (Engage) (ii) 3 – 4.5 KM - Red (Critical) (iii) 5 – 10 KM - White Observe
(j)	Module for Data extraction from TDR and TI Sight.	The Module should have both options of wireless as well as wired connectivity with TDR and TI Sight to ensure adequate redundancy.
(k)	Laptop Based Simulator training Software module	The system should include simulator software usable on dedicated Laptop computers. The ARHMD system must be usable/compatible on these simulator installed Laptop computers for training of operators.
(l)	Storage Temperature	-15°C to + 55°C
(m)	Operating Temperature	Min Temp between minus 15°C to minus 5°C Max Temp between 40°C and 45°C

Individual Component Requirements

17. AR Headset/HMD.

(a) The headset will be used to display various **synthetic** images based on target data received from **radar, Thermal Imager** as well as systemic information such as BITE analysis, system health reports, coordination & orientation info, GPS and compass data etc.

(b) The headset/HMD should be **portable, man-pack, wireless (un-tethered) and mountable on Head, Turban & field helmets** of standard military variety. Connection to the Hand Gesture Module and the Battery Pack may be permitted to be over non-intrusive wires that do not hamper user's movements / actions.

- (c) The system should be ruggedized to military standards and have IP-6 or more water resistance.
- (d) In-built gyro, compass, orientation sensor, tilt sensor with roll/pitch/yaw sensing capabilities and other **sensors as deemed necessary** for the proper functioning of AR capabilities.
- (e) In-ear/over-the-ear/bone conduction audio output (only to left ear).
- (f) Changeable visors for different weather conditions. Alternatively, tint control for use in various lighting conditions may be incorporated.
- (g) Minimum 7 hrs battery life on continuous operation with one internal (one (01) hour back up) and one external battery (six (6) hours back up), easily changeable batteries, separate charging facility for batteries in terms of charging port/pedestal/unit.
- (h) The Helmet mounted display system should be ergonomic for field use with even weight distribution. The wired links & accessories should not hamper user's head/body movements.
- (j) The display should incorporate the following facets :-
 - (i) Fixed targeting Reticule for Line of Sight (LOS).
 - (ii) Synthetic target blip based on target data from Radar through TDR.
 - (iii) Cueing Arrow to show direction in which the head is to be moved to get the synthetic blip in view.
 - (iv) Orientation information through compass display (selectable in cardinal direction / degrees / mils).
 - (v) Weapon Control Orders as given by TDR.
 - (vi) Readouts of target ID, range, azimuth, elevation, heading and IFF status as given by TDR.
 - (vii) Other data as deemed necessary for the pre-engagement, engagement and post-engagement drills and procedures. These data representations will be crystallized during software development and testing phase. Once in use there are likely to be minimal fine tuning requirements to edit markers etc ,therefore the software should allow edit/delete/enhancing of markers (by OEM) as per fine tuning requirements of the user as part of routine product support.

(viii) Integration of the Thermal Imaging Sight for terminal targeting as an overlay on the AR display. **The user should be able to turn on or off either or both of these displays** based on the situation.

(ix) Refer **Appx A** for suggested representation of display.

18. **Module for Extraction of Data from TI Sight & Target Data Receiver (TDR).** The HMD and computing module (both worn on the person of the firer/gunner) should be able to communicate with the TDR un-tethered over wireless media and with optional wired media. The system should be capable of Wireless media connectivity (TDR to ARHMD) of up to 100 m and wired media connectivity range (coaxial/fibre optic/copper) of up to 2.0 km. The protocols of wireless communication should allow for non-jammable, encrypted, fail-safe, short-distance communication with built-in redundancy and communication link integrity check. The TDR & TI Sights are available with the 3D-TCR/ LLLR radar and IGLA (wherever modified). The TI Sight provides visual acquisition of targets in bad weather and low light conditions. The TDR on the other hand has the following functionalities important to appreciate and incorporate for the design of this Module Sub component :-

(a) **Parallax Correction.** Based on GPS data correlation between radar site and missile operator site will require parallax corrected target data at weapon end.

(b) **Target Designation.** Target data of a prioritized target can be (suggested) designated over RS-232 serial link through the J4 port of the TDR. This data will be extracted for computation subsequently displayed on the HMD.

19. **Computing Module.** This module should have the following software applications as independently selectable sub-modules, with a facility to add more sub-modules as development progresses. The software should be restorable in field. It should be adaptable to other weapon systems :-

(a) **IGLA Application.** To be selected for engagement of live hostile targets by **IGLA** missile firers.

(b) **ZU-23 MM 2B Gun Application.** To be selected for engagement of live hostile targets by ZU-23 mm 2B Gun Gunner.

(c) **Simulator / Training Application.** The simulator training software must be developed as integral part of the system; to **facilitate smooth transition** of operator from manual mode to now ARHMD system assisted engagement.

(i) The Simulator software must be able to simulate scenarios with various target situations replacing the requirement of TDR and TI sight during simulator training of operator.

(ii) Existing database to analyse and utilize Big-Data & AI tools to offer best course of engagement of aerial targets & assist in effective simulator training of operator.

20. **Common Facilities Desired in all Applications.** Ref **Appx B** for the working of the AR HMD Sys at the gunner/missile firer end.

- (a) Generation of **audio & visual alert signals** for the AR headset of missile operator/gunner when certain conditions are met (target data is received from radar, target approaching engagement zone etc).
- (b) Recording facility for post firing analysis. The recording can be either/both a video capture of the display as it is presented to the firer/gunner or a summary of time stamped instants of various actions.
- (c) Voice prompts by the software in English/Hindi wrt target location, IFF status, weapon control orders (WCO) and actions required to be carried out, similar to the existing drills and procedures being followed so that there is minimum change to established protocol and easier acceptability/understanding by the crew.

21. **Facilities Desired specific to IGLA Application.** In order to facilitate the IGLA firer there is a requirement for the proposed system to calculate critical timings. The timings are critical for commencement of actions of launch sequence of the missile and time of launch before target enters engagement zone.

- (a) **Calculation of Launch Zone (LZ).** Based on target speed, attack profile, direction, attitude and other weapon parameters. It is understood that computation of LZ is a complex task requiring sensor integration with weapon system and complex algorithms depending on various dynamic values of target and missile/weapon system.
- (b) **Estimation Of Target Position.** In relation to the calculated/computed LZ of the missile in head-on & tail-on mode the target position is required to be estimated.

22. **Facilities Desired specific to ZU-23MM 2B Gun Application.**

- (a) Display of **target speed, course (heading), angle of attack (computed) and range** on the AR Display. Presently these parameters are available from TDR and are fed onto the Course Setting Head by the gunner.
- (b) Calculation of **Lead Angle/Aim-Off/Future Position** of target and display of point of aim in the target's trajectory onto the AR Display.

23. **Hand Gesture Module.** This hardware module should be worn by the firer on the left wrist or back of the left hand while keeping the palm and fingers free for dexterity. The user interaction with the AR Module/Software shall be through the Hand Gesture Module. Through user definable gestures, the following functions should be able to be carried out :-

- (a) Select / interact with on-screen items/buttons/menus.
- (b) Bring up or minimize menus or other UI components.

- (c) Auto recording of time stamped instants of various actions by the user in the engagement sequence for post firing analysis.
- (d) Gesture initiated 30 sec countdown timer for IGLA GPSS function.
- (e) User should be able to define new functions / interactions through recording his hand movements and training the software.
- (f) In case of failure of Gesture Module or its link, a multiple option switch provided on the computing module should be able to control the various functions.

PART IV – Training and Maintenance

24. **Facilities Desired in Simulator / Training Application.** The simulator module should be selected for operator training. Enemy air raid should be depicted by generation of scenarios using the associated computing Module. Following facilities are critical and should essentially be incorporated in the module :-

- (a) Mission planning.
- (b) Entering Target parameters as per selected scenario.
- (c) Programmable Weather & light conditions.
- (d) Various operational conditions.
- (e) Facility for recording and exporting to file for analysis & debrief.
- (f) Marking system for quantifying user training status.

25. **Environmental Specifications.** The AR Headset/HMD system and associated systems should be able to operate in (and duly certified) in Indian Region Atmospheric (IRA) conditions. The system should comply to JSS 5855 as applicable.

26. **Storage and Transportation.** Weatherproof storage and transportation containers should be provided along with the system. The system should be able to be stored in field conditions (non-air-conditioned). The entire system should be ruggedized and modular in construction capable of being transported by road, rail, air, ship or manpack/ manportable. .

27. **Built-in Test Equipment (BITE).** The system should have BITE/Power On Self Test (POST) modes to support diagnostics and repairs through module replacement in field. Audio/Visual alarm be provided to indicate test failure.

28. **EMI/EMC Standards.** The system should conform to military EMI/EMC standards confirming to Para 461(e).

PART V – MISCELLANEOUS

29. **Redundancies Required.**

(a) **Jamming Identification & Isolation.** If the radar is jammed and integrity of target information is suspect, the Radar/TDR operator should be able suppress information to missile/gun location and send a signal to switch to manual/autonomous mode for information of firer.

(b) **Communication Link Integrity Identification & Isolation.** Through a periodic check signal, the system should identify communication link integrity and in case of a failure, generate a signal at missile/gun location for the firer/crew to switch to manual/autonomous mode. Simultaneously, a communication integrity check will continue in the background and the system will pass information to firer/crew if link is good.

30. **Integration with Future Acquisitions.** The entire system should be able to be ported to any future acquisition radars / guns / missiles / equipment after revisions / customizations in hardware and software.

DESIRABLE PARAMETER

31. **Desirable Parameter.** The desirable Field of View should be 90 Deg or more in Azimuth and 70 Deg or more in Elevation.

32. **Conclusion** No departure shall be made from this qualitative requirement without the prior authority, in writing, of the GSEPC.

33. **Operational/ Technical Specifications.** Operational/ Technical specifications for the eqpt are specified in Part III of the PSQR.

34. **Review.** The PSQR may be reviewed by user, if required, to cater for operational requirement and technological improvement/ up-gradation.

Details of Drafting Team

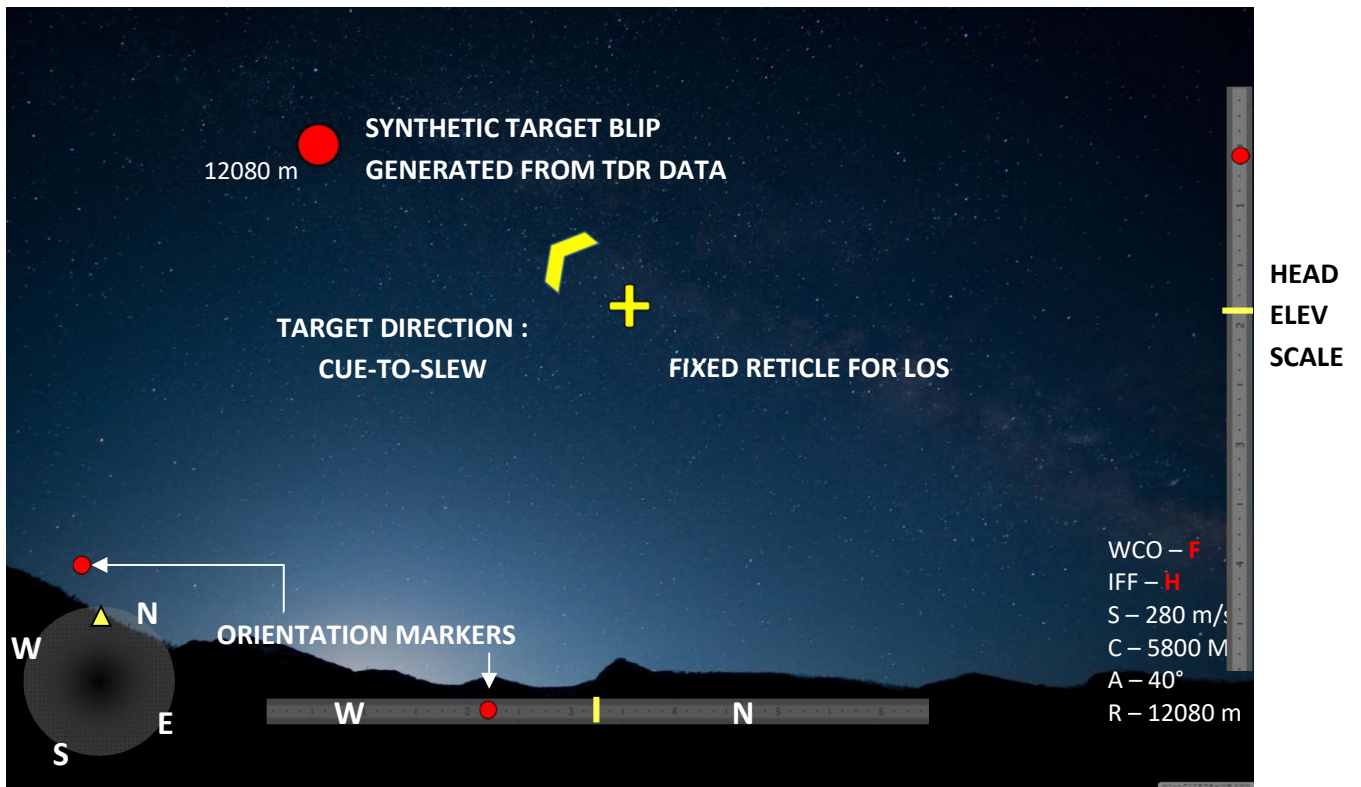
Prepared By : Col Samudra Vijay Sarma, Col AD (ET & Make)

Verified By : Brig Vikash Sharma, Brig AD (Proc & EM)

Address : DG AAD/ AAD-9,
Room No 608, D-1 Wing, Sena Bhawan

Contact Details : 34884

AUGMENTED REALITY HEADSET VIEW, RETICULES AND MARKERS



WORKING OF THE AR HMD SYSTEM AT MISSILEJ FIRER/GUNNER END

1. The system will display the target data as under and assist the missile firer/gunner in targeting and LZ/engagement range determination along with audio and video cue to initiate sequence of launching the missile/initiating fire.

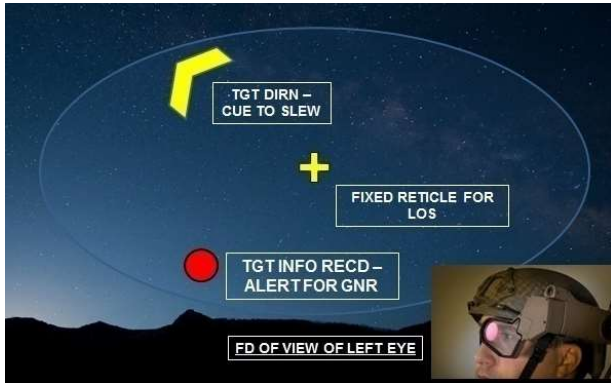


Fig 1: Fd of View (FOV) of left eye. Red dot – Target info has been received from Radar. Direction arrow shows direction in which head needs to turn in order to get the target in LOS.

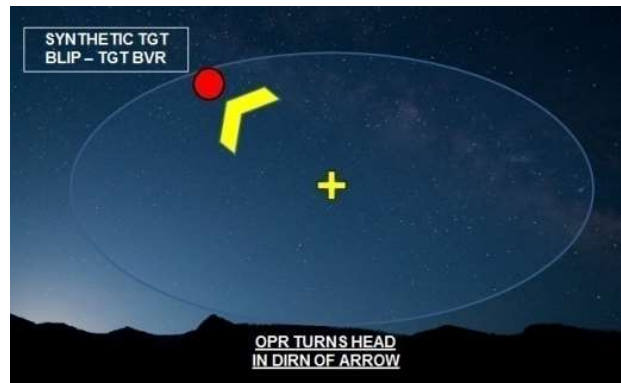


Fig 2: Operator turns head in direction of cue-to-slew arrow. A moving synthetic blip is presented to operator in his FOV representing the target. The target may be BVR at this point.



Fig 3 : Operator aligns target blip with the LOS reticle so that he is looking directly at the tgt. All this while, computer is calculating instantaneous position of target relative to firer.



Fig 4 : Operator now aligns the Missile Peep Sight/ Gun Sight Crosshairs with LOS & keeps tracking the blip while waiting for engagement cmd.

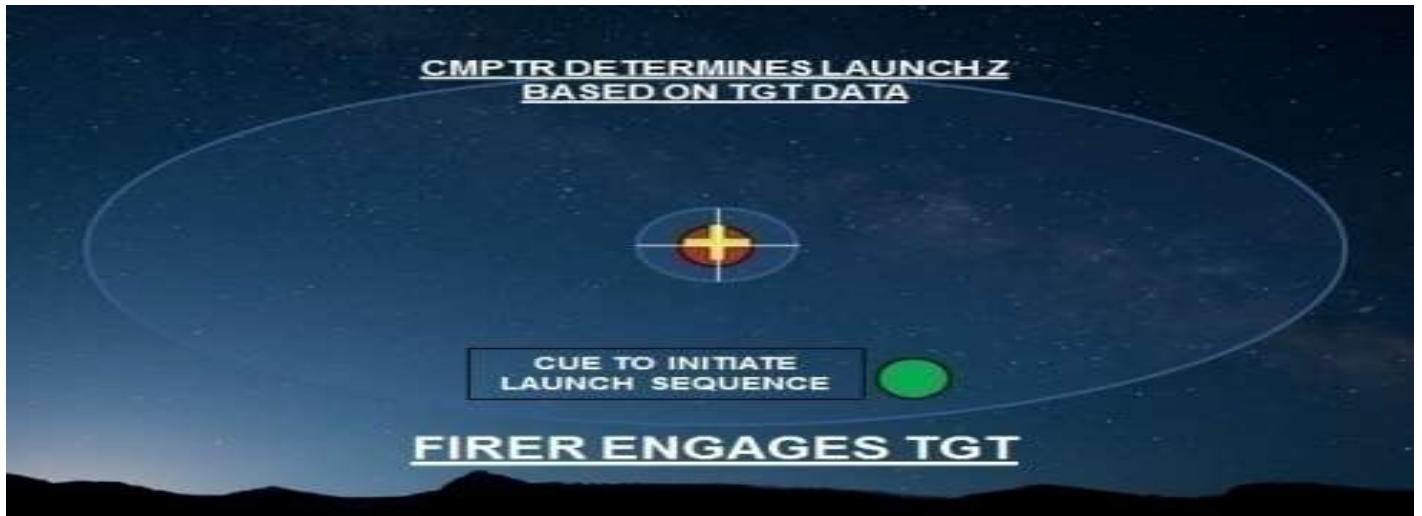


Fig 5: When target nears LZ/engagement range, computer presents command to initiate launch sequence/commence fire. In IGLA, missile seeker tracks the target, buzzer on missile is sounded and missile fires in 'auto' mode. In ZU-23 mm 2B, gunner gets an 'aim-off' point which is used to lay the gun for firing. Head-on engagement is thus accomplished.

INTELLECTUAL PROPERTY RIGHTS AGREEMENT

1. It is certified that 100% Intellectual Property Rights (IPR) in the intellectual property generated during the development of the Augmented Reality Head Mounted Display (ARHMD) System is the property of M/s_____. It is acknowledged that the company will be disqualified from further participation if any information provided is found to be incorrect.

COMMERCIAL EVALUATION CRITERIA

1. Name of the Vendor, _____
2. Evaluation Criteria

<u>Ser No</u>	<u>Criteria</u>	<u>Vendor Submission</u>	<u>Reference</u> (Reference against vendor claim /response must be flagged and mentioned in this column)	<u>Remarks (if Any)</u>
(a)	Nature of the Company (refer Para 2(a) of Appendix A of Chapter III-A of DPP-2016)			
(b)	Ownership status (refer Para 2(a) of Appendix A of Chapter III-A of DPP-2016)			
(c)	Category of Industry (Large / Medium / Small / Micro).			
(d)	Registration Details			
(e)	Credit Rating			
(f)	Net worth ending 31 st March of the previous financial year.			
(g)	Average annual turnover of the applicant company of the last three financial years ending 31 st mach of the previous financial year			
(h)	DIPP License details.			

Station :

Signature

Company Seal

Date :

Note :

1. All submission must be referenced documents duly authenticated.
2. Any input with incorrect or missing reference will not assessed.

TECHNICAL EVALUATION CRITERIA

1. Name of the Vendor,_____
2. Evaluation Criteria

<u>Ser No</u>	<u>Criteria and Sub Criteria</u>	<u>Vendor Submission</u>	<u>Reference</u> (Reference against vendor claim /response must be flagged and mentioned in this column)	<u>Remarks (if Any)</u>
(b)	Confirmation of capability to develop and provide equipment to meet user requirements specified in Appendix A (Technical Specifications).			
(c)	Proposed system configuration (broad design details).			
(d)	Timelines.			
	(i) Timelines (in weeks) for development of prototype after issue of Project Sanction Order. Developmental milestones/ stages be provided with planned activities in each stage			
	(ii) Timelines (in months) for production and supply of 556 Nos Augmented Reality Head Mounted Display (ARHMD) System (354 x Iгла, 202 x Gun alongwith associated eqpt) By 'Buy (Indian-IDD)' phase after conclusion of contract.			
(e)	Acceptance to all terms and conditions given in the EoI			

Station :

Signature

Company Seal

Date :

INFORMATION PERFORMA

1. Name of the Company.
2. Name of CEO with Designation.
3. Address of the Registered Office.
4. Address of the Factory / Factories.
5. Company Website(s).
6. Date of Incorporation.
7. Brief History of the Company.
8. Category of Industry (Large / Medium / Small / Micro).
9. Nature of Company (Public Limited/ Private Limited).
10. Nature of Business (Manufacture / Trader / Sole selling or Authorised Agent/ Dealer / Assembler / Processor / Re packer/ Service Provider). Please give broad product range as applicable
11. Details of Current Products :-
 - (a) Type / Description.
 - (b) Licensed / Installed Capacity.
 - (c) Annual Production for Preceding 3 Years.
12. Details of Foreign Collaborations if any planned for execution of project.
13. Technology Received from abroad and assimilated / planned for execution of project.
14. Products Already Supplied :-
 - (a) To Indian Army / Air Force / Navy.
 - (b) PSUs.
 - (c) DRDO and its Laboratories.
 - (d) Ordnance Factories.
 - (e) Any other Defence Organisation.

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- (f) To other Principal Customers.
- 15. Details of Developmental Facilities :-
 - (a) R&D Facilities Available.
 - (b) Number of Technical Manpower.
 - (c) Percentage of Total Turn-Over Spent on R&D during the Last Three Years.
- 16. Turn-Over during the last Three financial Years.
- 17. Any other relevant information.
- 18. Contact Details of the Executive nominated to co-ordinate with the Assessment Team (Please provide telephone, mobile and e-mail address).

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CONFIDENTIALITY AGREEMENT

1. It is certified that Expression of Interest document for the project of Augmented Reality Head Mounted Display (ARHMD) System will not be shared with any agency in part or full any other agency. Only relevant details, as applicable, will be shared with technology partners including foreign technology partners. However, the EoI document itself will not be shared with any technology partners.
2. The company understands the security sensitivity of such an operational systems and any information pertaining to deployment and usage of the system including system scaling will not be discussed with third party without a written permission from the Project Facilitation Team. The company understands that failure to observe this agreement will lead to disqualification from the project.

Signature with Company Seal

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Appendix 'G'
(Refer Para 34 of EoI)

CORRECTNESS CERTIFICATE

It is certified that information submitted in the documents as part of the response to Expression of Interest for the project of Augmented Reality Head Mounted Display (ARHMD) System is correct and complete in all respects. It is acknowledged that the company will be disqualified from further participation if any information provided is found to be incorrect.

Signature with Company Seal

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