**AUGMENTED REALITY (AR) BASED HEAD MOUNTED DISPLAY SYSTEM TO MAKE FAIR WEATHER GBADWS, SUCH AS IGLA-1M AND ZU-23 WEAPON SYSTEMS**

1. **Name of the Project.** Augmented Reality (AR) based head mounted display (HMD) sys to make fair weather GBADWS such as Igla-1M and Zu-23 weapon sys all weather.

2. **Brief**. To provide an AR based HMD to display tgt data from new generation TC Radars like 3D-TCR so that the drawbacks of fair weather AD wpn sys, such as the Igla-1M Sys and Zu-23 mm gun sys, can be negated thereby ensuring all weather emp and incr mission eff:-

(a) **Reqmt / Relevance**.

(i) **Mission Effectiveness**. Mission eff of ageing Gun & Msl Sys is incr manifold.

(ii) **Fair Weather to All Weather**. The wpn sys are made all weather. **This can prove to be a game changer as far as AD in the TBA is concerned.**

1. **Eff Engagement : Igla 1M**.

(aa) Optimum engagement rg is achieved as the (Launch Zone) **LZ is computed correctly** based upon dynamic tgt characteristics which is impossible to do manually.

(ab) As engagements can be undertaken at **extended rgs** with the proposed system, the **ac is** **forced to undertake evasive maneouvers earlier** (much before the WRL) thereby incr the protection to the VA/VP.

(ac) **Head on mode engagements are possible** through the sys. In spite of the reduced IR & visual signature of tgts, engagements in head-on mode are made possible via the **synthetic representation of tgt** based upon radar tr data.

(iv) **Adaptability**. Through minor mod, the proposed sys can be suitably adapted for various other fair weather AD wpn sys such as Strela-10M, Schilka in Mode-IV or L/70 at LPC.

(v) **Trg Applications.** The sys can be used to train msl firers by generation of simulated tgts through a PC based software. In this case, mod has to be made to the Launching Tube and Launching Mechanism so that the activity of locking onto tgt and generation of requisite audio/video signals can be simulated as that of an op msl.

-2-

(b) **State of Readiness Tech**. A No of venders have evinced interest in the proj. Dimensions NXG Pvt Ltd has expressed willingness to demonstrate proof of concept upon approval of proj.

 (c) **Auth / Held state of Corresponding Eqpt**. For all AD Regts equipped with Igla-1M missiles & Zu-23 mm guns. Scaling being worked out.

3. **Broad Specifications**.

 (a) **Functional Parameters**.

(i) Ruggedized cmptr/laptop for extraction of tgt data from TDR over RS-232 link on J4 port of TDR.

(ii) In-built software to carry out fwg functions:-

(aa) Calculate LZ and instants of various actions as specified.

(ab) Facility for recording of engagements and actions by the firer for post engagement analysis.

 (iii) Wireless link with redundancy between cmptr/laptop and HMD.

 (iv) Ruggedized Head/HMD system with fwg facilities :-

(a) In-built gyro, digital compass, orientation sensor, tilt sensor with roll/pitch/yaw sensing capabilities.

(b) In-ear/over-the-ear audio output (only to left ear).

(c) Changeable visors for different weather conditions.

(d) Approx 4 hrs battery life on continuous op, easily changeable btys, separate charging facility for btys in terms of charging port/pedestal/unit and NOT a genr.

 (v) The min desirable accuracy is 95% between actual tgt loc and faithful representation of synthetic tgt to the opr.

 (vi) The sys will NOT be connected to the internet either for operation or for updation of software and will work entirely in offline mode.

(vii) **Redundancies Reqd**.

(aa) **Jamming Iden & Isolation**. If the rdr is jammed and integrity of tgt info is suspect, the rdr opr should be able suppress info to msl/gun loc and send a sig to sw to manual/autonomous mode for info of firer.

(ab) **Comn Link Integrity Iden & Isolation**. Through a periodic check signal, the system should iden comn link integrity and in case of a failure, generate a sig at msl/gun loc for the firer/crew to sw to manual/ autonomous mode. Simultaneously, a comn integrity check will continue in the background and the sys will pass info to firer/crew if link is good.

 (b) **Physical Dimensions**.

(i) Sys variant will be a tech and concept demonstrator. The cmptr/laptop may be of standard size and dimensions. The AR Display sys may be a head mtd variant.

 (ii) Sys variants B and further will be an entirely ruggedized sys with a foldable/retractable HMD. The HMD sys should be ergonomic for field use with even weight distr.

-3-

 (c) **Envt Reqmts**.

(i) Sys variant a should be well adapted for outdoor use with requisite IP standards but complete functionality as desired.

(ii) Sys variants B and further should be able to operate in all terrain and climatic conditions including light drizzle and temperatures ranging from -10ºC to +45ºC. The HMD sys should be ergonomic for field use with even weight distr.

(d) **Reliability and Maintainability.** Easy to maint in fd conditions. Reliability of 90% or more. Easy to change/replace modular design concept.

4. **Tentative Qty**. For equipping all Igla-1M missiles & Zu-23 mm guns. Scaling being worked out.

5. **Time Lines as Appreciated**.

1. **Make-II Project**

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| --- | --- | --- | --- | --- |
| **Ser/ No** | **Stage** | **Time Frame** | **Running Time** | **Remarks** |
| (i) | AIP | 4 Weeks | 4 Weeks |  |
| (ii) | Feasibility Study | 4 Weeks | 8 Weeks |  |
| (iii) | Formulation of PSQR  | 6 Weeks | 14 Weeks |  |
| (iv) | Scaling | 4 Weeks | 18 Weeks  |  |
| (v) | Prep of EoI | 6 Weeks  | 24 Weeks |  |
| (vi) | EoI Response Evaluation | 8 Weeks | 32 Weeks |  |
| (vii) | Devp of Proto type | 24 Weeks | 56 Weeks |  |
| (viii) | Testing  | 4 Weeks | 60 Weeks |  |
| (ix) | DGQA & User Evaluation | 10 Weeks | 70 Weeks |  |

6. **Misc Aspects**. The proposed system is designed to extract parallax corrected target data from **TDR** of **3D-TCR Rdr** anddisplayitto the missile operator via **HMD** for **targeting assist, launch assist and display of ancillary data.**

 (i) AR Headset.

 (ii) Target Data Receiver (TDR).

 (aa) Parallax correction.

 (ab) Target Designation.

 (iii) **Computer**.

 (aa) **Calculation of Launch Zone (LZ)** based on target speed, attack profile, direction, attitude etc.

 (ab) **Estimation of target position** in relation to the calculated/computed LZ of the missile in head-on & tail-on mode.

 (ac) Generation of **audio & visual alert signals** for the AR headset of missile operator when certain conditions are met (target data is received from radar, target approaching LZ etc).

 (ad) **Calculation of instants** for commencement of actions of launch sequence of the missile and time of launch before target enters LZ.