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**MINISTRY OF DEFENCE ACQUISITION WING**  
**ADG ACQUISITION TECH (ARMY)**

**DRAFT POLICY GUIDELINES ON USE OF SOFTWARE BASED**  
**SIMULATION AND OTHER SIMULATION PLATFORMS IN TRIAL EVALUATION**  
**PROCESS OF DEFENCE EQUIPMENT**

1. The Draft Policy Guidelines on "Use of Software based Simulation and other Simulations Platforms in trial evaluation process of Defence Equipment" are uploaded on the MoD website.
2. Comments/ recommendations/ suggestions on the draft are solicited by **20 Aug 2021** at email ID [tmls-mod@nic.in](mailto:tmls-mod@nic.in).



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No \_\_\_\_\_  
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**Ministry of India**  
**Department of Defence**  
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South Block, New Delhi-110001

Dated \_\_\_\_\_

**OFFICE ORDER**

**Subject : Draft Policy Guidelines : Use of software based and other simulation platforms in trial evaluation process of Defence Equipment.**

**INTRODUCTION**

1. DAP 2020 has introduced numerous enabling provisions towards simplification of trial procedures and streamlining of Capital Acquisition process. These enabling provisions include policy decisions as well as procedural amendments. Few such provisions regarding use of simulation in trials/ testing in DAP 2020 are reiterated as under :-

(a) **RFI**. Inputs to be sought in RFI / Vendor interaction regarding trial parameters for which simulation is available.

(b) **Statement of Case**. In case where trials are not visualised / not feasible due to time/ terrain/ operational restrictions and possibility of evaluation through computer simulations/ documented historical data of validation of the parameters exists, the scope of trials by simulation / certification shall be included in SoC for AoN.

(c) **Trial Methodology**. Trial methodology to give extent of trial evaluation including parameters where trial by simulation is acceptable.

(d) **QA Aspects**. QA parameters where trials by simulation are accepted will be given out in QA instructions.

(e) **User Trials**. Conditions where probability of deployment is not high, simulation based testing may be resorted to wherever applicable.

2. **Concept of Trial Evaluation**. The concept of trial evaluation incorporating the use of simulation / certification needs to focus on timely and cost effective approach with systematic progress towards Simulation and Certification, as are the trends World over. Therefore, the basic approach towards trials should hinge upon the following:-

(a) **Integrity of Evaluation Process**. It is imperative that the integrity of the Trial evaluation process is maintained at all times.

(b) **Core and Critical Parameters**. Evaluation of Core & Critical parameters may be carried out by physical evaluation and the same may be supplemented by simulation/certification based evaluation process.

(c) **Non Critical Parameters.** Parameters other than Core and Critical parameters may be evaluated using Simulation Models or through Certification, in certain cases a combination of physical and Simulation /Certification.

(d) **Cost and Time.** The overall process would lead to considerable reduction in cost and time without compromising the evaluation process.

(e) **Infrastructure for Simulation and Certification.** Simulation and certification component in the trial evaluation process should get enhanced in a progressive manner with development of suitable infrastructure for simulation and certification.

3. **Aim.** To lay down guidelines for evaluation of parameters by simulation modeling as part of trial evaluations for cost effective and timely acquisition of Weapons / Platforms / Equipment.

### **Simulation Based Trials**

4. **Simulation.** The term 'simulation' for the purpose of the guidelines implies the following :-

(a) Physical/ digital simulation of the environment.

(b) Digital simulation of the equipment / digital twin.

5. **Validation of Simulation Models.** The validation of simulation model may be carried out based on the data obtained from physical trials to establish the efficacy of simulation model prior to its implementation in trials.

6. **Core Parameters.** The validation of core parameters of SQR to be done physically or through a combination of physical evaluation and simulation till simulation modelling procedures fully mature.

7. **Other Parameters.** Compliance to parameters other than core parameters or evaluation of all parameters in areas other than primary area of employment, compliance may be accepted based on simulation based trial evaluation.

8. **Simulation of Environment.** Simulation of the environment for various parameters to be carried out in designated/ accredited labs. These parameters may be evaluated by the trial agencies in simulated conditions or Certificate of Conformance (CoC) be accepted for the purpose of trial evaluation.

9. **Phased Implementation.** The simulation based evaluations be implemented in trials in a phased manner since it is still an evolving concept, and therefore, simulation model be initially implemented in D&D and Make cases. Concurrently, a test case to reinforce advantages accrued would be undertaken. However, SHQ should utilise simulation modelling / digital twin where feasible to consolidate advantages.

10. **Parameters for Simulation.** After a detailed study and analysis, certain identified parameters suitable to be trial evaluated by Simulation for certain type of equipment are attached at **Appendix A**. The same may be refined further based on the findings of the 'Test Case' and accordingly similar identification of parameters of other equipment / weapons need to be done by respective SHQ. However, the decision with respect to trial methodology (Physical evaluation / Simulation / Certification) in a particular case will remain with the SHQ. The scope and depth of Simulation in trials may vary from case to case and as such will be decided by the SHQ.

11. **Accreditation in Simulations.** Existing facilities of DRDO, DPSUs and private sector are presently working for Design & Development of defence systems and have the capability to develop simulation models for trial evaluation. However, there is a need to accredit **simulation companies and engineers or firms** to ensure quality and accuracy of simulation being carried out for trials.

12. For accreditation of private companies and engineers or firms, we may use the CEMILAC approach, in which CEMILAC invites the applications for the accreditation of all such companies / firms and then sends a team of its qualified scientists for verification of their capability, only then it provides them with capability to use the CEMILAC certification. Since currently there is no agency in India to take the role like CEMILAC, RRU / DIAT / IITs / NITs / DRDO (ISSA) may be given a similar role of identification/verification of Government & private Companies / firms to provide Certification / Accreditation, to these agencies.

13. Also a central repository of information of such Companies / Firms with Certification / Accreditation for Simulation capability, to be made available with one of the departments of MoD / SHQ as desired and should be available on a separate portal for reference.

14. **Expenditure on Simulation Modelling during Trials.** Para 41 of Schedule I to Chapter II of DAP-2020 states that the bidder shall bear the cost of all expenses of trials other than the cost of ranges, platform or facilities which buyer may choose to provide free of cost. Accordingly, the cost of simulation for trial purposes **needs to be borne by the Vendor / Bidder.**

15. **Benefits likely to be Accrued.** Simulation in trials is expected to lead to considerable savings in cost & time, both to the vendors and the organisation, during conduct of trials. As such, SHQ must make an endeavour to maximise the scope and depth of simulation in trial evaluation process wherever feasible.

16. **Test Case.** These guidelines need to be implemented in a progressive manner starting with D&D and Make cases or where it is feasible in the current Trial eco system. SHQ may utilise the procurement case of APFSDS Ammunition for Tank T-72 / T-90 under MAKE-II and D&D route (currently under progress) as '**Test Case**' for trial evaluation by Simulation for select parameters to reinforce advantages accrued establish efficacy in trials by simulation. However, concurrently wherever it is feasible to use simulation or combination of physical trials & simulation, SHQ should endeavour to do so if it leads to saving in cost and time.

## **Miscellaneous Issues**

### 17. **Ownership.**

(a) The onus of ensuring that all trial & evaluation agencies carryout trial evaluation within specified time frame needs to be of SHQ, being the primary stakeholder. User / SHQ will validate trial methodology, draft ATP guidelines, ESP, MET, EMI/EMC and DGQA trial parameters as per user requirement.

(b) The list of parameters identified for evaluation by simulation is not exhaustive and would be decided on case to case basis by SHQ, keeping in mind the integrity of the trial process, technical complexity of equipment, facilities existing for providing simulation and the requirement of completing the trials in a time bound manner as enunciated in the DAP 2020.

18. **Capability Building.** The additional capability creation for various simulation activities are attached as **Appendix B**. Moreover based on the outcome of the '**Test Case**', additional capability creation may be undertaken at appropriate level concurrent with the implementation of Simulation in trials/testing. This would be implemented after due deliberations through DPR process on cost benefit analysis.

19. IA, IAF, IN and ICG may suitably interpret these guidelines to suit their equipment/ weapon platforms. The parameters need to be revised periodically by SHQ in sync with the capability building process.

## **Conclusion**

20. The detailed analysis of the trial process has brought out that there exists a large scope of simplification of trials and **reducing timelines and cost** by accepting greater simulation in trial evaluation process. An appreciable positive trend towards this has been witnessed from all stakeholders, the only need is an accelerated & integrated approach towards enhancing acceptance by simulation/certification thus leading to Atma Nirbhar Bharat.

**Appendix A**  
**(Refers to Para 10 of**  
**Policy Guidelines)**

**PARAMETERS FOR EVALUATION BY SIMULATION**

<b><u>Ser</u></b>	<b><u>Parameters</u></b>	<b><u>Equipment</u></b>	<b><u>Recommended Methodology</u></b> <b><u>(to be decided by SHQ on</u></b> <b><u>Equipment basis)</u></b>
1.	<b><u>Climatic Conditions.</u></b> Equipment performance in laid down climatic conditions.	All types of Equipment and Systems.	Physical evaluation in primary area of employment and balance by simulation.
2.	<b><u>Op Temperature.</u></b> From minus xx to plus xx.	All types of Equipment and Systems.	Simulation acceptable in combination to physical evaluation (Should cater for HAAs).
3.	<b><u>Environmental Specification.</u></b> The system to operate effectively under laid down climatic and weather conditions or as per JSS 55555.	All types of Equipment and Systems.	Progressive use of simulation once the facilities are created.
4.	<b><u>Range.</u></b> System should be able to achieve maximum / minimum ranges as laid down in the QRs.	Missile systems, Weapons, Gun systems and similar platforms where applicable.	Combination of physical firing and simulation.
5.	<b><u>Accuracy, Consistency &amp; Hit Probability.</u></b> Laid down standard of accuracy, consistency and hit probability as per QRs.	Missile systems, Weapons , Gun systems and similar platforms where applicable.	Combination of physical firing and simulation.
6.	<b><u>Rate of Fire.</u></b> As laid out in burst, intense and sustained	Missile systems, Weapons,	Combination of initial limited physical firing and thereafter

<u>Ser</u>	<u>Parameters</u>	<u>Equipment</u>	<u>Recommended Methodology</u> <u>(to be decided by SHQ on</u> <u>Equipment basis)</u>
	mode or as per QRs.	Gun systems and similar platforms where applicable.	simulation.
7.	Effective height of target engagement.	AD equipment, missile systems and similar platforms where applicable.	Combination of physical evaluation and simulation.
8.	Target speed that can be engaged.	AD equipment, missile systems and similar platforms where applicable.	Combination of physical evaluation and simulation.
9.	<b>Sensors.</b> Active / Passive sensors.	Gun systems, AD equipment, missile systems and similar platforms where applicable.	Initially physical evaluation, progressive use of simulation once efficacy established.
10.	<b>Barrel Life.</b> Specified equivalent full charge (EFC).	Guns / weapon systems and similar platforms where applicable.	Simulation.
11.	Probability of location and accuracy including computation time, automatic censoring capability and height difference.	Radar systems, electronic equipment and similar platforms where applicable.	Initially physical evaluation. Progressive combination of physical evaluation and simulation based testing.
12.	<b>Fire Control System.</b> Including the sighting systems.	Guns / weapon systems and similar platforms where applicable.	Combination of physical evaluation and simulation. Simulation also to be used to validate in depth performance efficacy.

<u>Ser</u>	<u>Parameters</u>	<u>Equipment</u>	<u>Recommended Methodology</u> <u>(to be decided by SHQ on</u> <u>Equipment basis)</u>
13.	<p><b><u>Platform / Weapon / System Requirements.</u></b></p> <p>(a) All weather system.</p> <p>(b) Desired standards from the equipment.</p> <p>(c) Man / Vehicle Portability.</p> <p>(d) Application of latest technology.</p> <p>(e) Endurance &amp; Ruggedisation of equipment as per specification.</p> <p>(f) Use of in-service ammunition / equipment.</p>	Missiles systems, weapons, explosives, electronic / communication equipment, gun systems and similar platforms where applicable.	Simulation and combination of physical evaluation and simulation.
14.	<b><u>Reliability.</u></b> MTBF must be xxx working hours or more and MTTR of xxx minutes or less	All equipment and systems as applicable.	Software based simulation model.
15.	Electronic Warfare.	Radar system, communication / electronic equipment and similar platforms where applicable.	Combination of simulation and physical evaluation.
16.	Transfer of data in different modes and with varying data rates.	Signal equipment and similar platforms where applicable.	Simulation.
17.	Safety features including variation in power supply / voltage generation.	Signal / electronic equipment and similar platforms where applicable.	Simulation.



**Appendix B  
(Refers to Para 18 of  
Policy Guidelines)**

**CAPABILITY BUILDING**

1. **Capability Building**. The additional capability creation for various simulation activities are as under:-

(a) **Tunnel Firing Ranges**. These are required to be created for QA evaluation of small arms and other flat trajectory weapons for various environmental parameters.

(b) **Radio Propagation Lab**. Such labs are required for the radar systems as well as other radio systems, for emulating own as well as enemy transmissions while evaluating the efficacy of the system. The facility may be ½ to 1 km with simulated path losses & noises equivalent to ranges upto 35 Kms.

(c) **Data Traffic Generator**. A data traffic generator is required for generation of voice/digital communication signals for evaluation of the communication & encryption systems. It will simulate non linear growth of data traffic spurts with various types of electronic attrition/noise to test efficacy of network devices.

(d) **Ballistic Evaluation Labs**. At present there are only two facilities existing in the country i.e TBRL in Chandigarh and National Forensic Science University in Gandhinagar. They too have limitation in terms of the size of equipment and STANAG levels that can be evaluated. Therefore, there is a requirement for creation of additional facilities with capability to carry out simulation based evaluation.

(e) **Facility for Life Assessment of Explosives & Munitions**. Presently ISAT tests are time consuming and often prolong the duration of the trials. Moreover, such facilities are limited in numbers. Therefore there is a need for creation of additional facilities with capability to carry out simulation based evaluation. In the interim, Isothermal Micro Calorimetry (IMC) technique may be validated and used for evaluation of shelf life of explosives & munitions.

(f) **Radiation Emission & Susceptibility**. Additional facilities for evaluation of EUT of size more than one cubic meter are recommended to be created in consultation with the trial agencies close to firing ranges/ trial nodes.

(g) **Active Emission Zones**. Certain earmarked Active Emission Geographical Zones and Facilities may be created both for communication & non communication equipment, to be used in internal evaluation and for FET by the trial agencies and vendors alike.