

**QUESTIONNAIRE FOR DEVELOPMENT OF SRGM AMMUNITION (HE AND HEPFF VARIANTS) UNDER MAKE III CATEGORY**

1. **Background.** The Ministry of Defence, Government of India, intends to procure 76/62 SRGM HE (High Explosive) & HEPFF (High Explosive Pre Formed Fragmented) Ammunition through Make-III procedure of DAP-2020.
2. **Description.** 76/62 SRGM HE (High Explosive) & HEPFF (High Explosive Pre Formed Fragmented) Ammunition are the most significant types of the 76/62 SRGM round, fired against aerial targets or for coastal bombardment. These ammunitions are fired from SRGM gun which is the mainstay Medium Range gun onboard most IN ships. At present, 76/62 SRGM ammunition [Target Practice (TP) and Target Practice Tracer (TPT)] is being manufactured by Ordnance Factory Khamaria/ OFK under M/s MIL (with sub-components sourced from other OFs) based on limited ToT obtained from M/s Naschem, South Africa in the early 2000s. Primer fitted in these ammunition variants is being imported by OFK for assembly in the round. Further, SRGM (Anti-Air) AA Flash ammunition (w/o fuze) and SRGM HE (Plgd) ammunition are also under production and supply by Mil, Pune. Bulk production for other SRGM ammunition types viz. HE and HEPFF is still not established by OFs, despite holding ToT for these stores (except primer and fuze). Presently, these variants are imported.
3. **Prototypes.** 500 HE & 500 HEPFF rounds.
4. **Production Quantity.** 11,688 HE and 11,688 HEPFF rounds over a period of 10 years.
5. **Questionnaire.** In order to identify prospective vendors who can undertake said project, the vendors are requested to furnish information as elucidated in succeeding paragraphs including those at **Annuxure I.**

**General**

6. Does the vendor understand the modalities of Make-III route as per DAP 2020?
7. Whether the company is eligible as per provisions of DAP 2020? (Eligibility of Participation: Indian vendors only) with ToT/ Joint Venture (JV) for this proposal.
8. The store requires handling/ filling of explosives. Does the firm possess necessary certification/ license towards this?
9. Does the vendor have domain expertise/ previous experience in the field of production of ammunition?
10. Whether the vendor/ firm is ready to undertake development on "No Cost" basis iaw Make III scheme including conduct of all static and dynamic tests?
11. Will the firm/ vendor be developing the complete product itself? Or, will it be integrating the final round post receipt of components from other vendors?

12. Whether the firm/ vendor envisages the feasibility of achieving future exports?
13. Please provide details of all foreign companies with whom there is a partnership/ Joint Venture/ MoU for carrying out the design and development? Will your company finally hold the IPR of the design so generated during the prototype development phase?
14. What is the modus operandi for Transfer of Technology (ToT) of the imported technology to achieve self-reliance?
15. Estimated tentative time period of completion of R&D or ToT and setting up of production/ assembly facility.
16. Estimated time period for supply of 1000 Nos. prototype quantity (500 rounds of each type of ammunition i.e. HE and HEPFF).
17. Considering the quantum of investment required for setting up dedicated production/ assembly facility, ToT, etc, are the following feasible:-
  - (a) Supply of prototype quantity of 1000 rounds (500 rounds of HE and 500 rounds of HEPFF variant) including conduct of all static and dynamic tests/ firings, under Make III route (industry funded).
  - (b) Supply of 23,376 rounds (11,688 HE and 11,688 HEPFF) over a period of 10 yrs against contract placed under Buy (Indian) route. If quantities are not agreed with, what is the bulk order quantity proposed by the firm (over a 10 yr period)?
18. What will be the rate of supply (per year)? What would be the estimated lot/batch size for supply of the ammunition?
19. What would be the estimated cost of supply of 23,376 rounds over 10 yrs? Or, what would be the estimated cost of supply of proposed quantity over a 10 yr period?
20. What are the areas of uncertainty envisaged by the vendor in the design, development and production of the indigenous development of ammunition upto 60% IC?

### **Technical/ Operational**

21. What are the major components of a round of gun ammunition?
22. What does the firm understand by High Explosive (HE) ammunition and High Explosive Pre-formed Fragmented (HEPFF) ammunition?
23. Any free issue of material which would be required from *IN* as aid to indigenous development?
24. Whether the vendor will be manufacturing the Fuze? Whether it will be assembled in-house or outsourced from an Indian firm? or Whether certain fuze components will be sourced from a foreign firm?

25. Whether the vendor will be manufacturing the Primer? Whether it will be assembled in-house or outsourced from an Indian firm? or Whether certain fuze components will be sourced from a foreign firm?
26. Will the propellant be manufactured in-house? If not, what will be the source for procurement of propellant?
27. Where will the explosive filling of shell be undertaken?
28. Proximity Fuze is used in HEPFF ammunition. However, such functioning is required to be paralysed for using the same Fuze in HE ammunition. What do you understand by this Fuze paralysing action?
29. **Operational Constraints**. Are there any environmental temperature/ humidity Limits for operating the ammunition in Indian atmospheric conditions? Please provide limits and their impact on performance of ammunition.

### **Maintainability**

30. **Shelf Life**.

- (a) What is the projected shelf life of the ammunition when stowed on board the ship as well as ashore?
- (b) What would be the shelf life of the fuze to be fitted in the ammunition?
- (c) What quantum of warranty would you be able to provide for the product considering round storage in stipulated environmental conditions?
- (d) How the vendor envisages to provide product support for complete shelf life cycle of the ammunition?

31. **Quality Assurance**. Please provide details on QA parameters as follows:-

- (a) Whether the firm/ vendor is aware of Quality Assurance Plan, Process flow Chart and Environmental tests for the ammunition stores?
- (b) What are the QA standards that the equipment (including components) will comply to? Provide details of standard of certification like ISO 9000, etc, details of date of certification with validity and agency?
- (c) Whether the firm is aware of various standards viz MIL, IS, BS and JSS to meet the quality requirements of the ammunition stores?
- (d) Environmental test specifications for complete round/ sub-components.
- (e) Vibration requirements for complete round/ sub-components.
- (f) Withstanding salt water spray for complete round/ sub-components.
- (g) Shock test specifications for complete round/ sub-components.

(h) Painting.

32. **Testing.**

(a) How does the vendor envisage testing of the ammunition from shore and afloat ship?

(b) Is the vendor aware of Dynamic/ Proof testing requirements of Gun Ammunition (to be undertaken at a Firing Range)? Is the vendor aware of the cost of conducting such trials? Would the vendor be willing to incur these costs?

(c) Considering each ammunition component is required to be subjected to static and dynamic proof/ firing prior using the same for assembly in the final batch/lot of ammunition, how would the requirement of Proof-in-aid components be met?

***\*Note:** In case the development agency do not accept for the production of fuzes and primers, the same needs to be outsourced. **IN** will not issue/ spare fuzes and primers for proof testing of prototypes. However, proof facility of MoD/ **IN** will be utilized.*

(d) Does the firm has Environmental test facilities/provisions to undertake Qualification and Acceptance tests as per the specification requirements?

33. **Trials.**

(a) Is the vendor ready for Field Evaluation Trials of the prototype at no cost no commitment basis?

(b) Please provide envisaged modalities for trials of prototype viz, location, platform, source of trial ammunition, duration and methodology.

34. Is the vendor willing to carry out necessary enhancement/ up gradations of the ammunition in the future?

35. What are the vendor's recommended list of Special Maintenance Tools (SMTs), Special Test Equipment (STE), Test Jigs (TJs) and fixtures that would be required for maintenance?

36. A Broad Quality Requirements (QRs)/ Technical Specifications are placed **Annexure II** to assist the industry for providing correct feedback to the sought questions.

**VENDOR INFORMATION PROFORMA**

1. **Name of the Vendor / Company / Firm / Unique ID (if any).** (Company profile including share holding pattern, in brief, to be attached)

2. **Type.**

- (a) Original Equipment Manufacturer (OEM) Yes/No
- (b) Authorised vendor of foreign Firm Yes/No (attach details, if yes)
- (c) Others (give specific details).

3. **Contact Details.**

Postal Address:

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City:	State:
Pin Code:	Tele:
Fax:	URL/Web Site:
Email:	

4, **Local Branch / Liaison Office / Agent (if Any)**

- (a) Name and Address.
- (b) Pin Code.
- (c) Tel,
- (d) Fax.
- (e) Email.

5. **Financial Details.**

- (a) Category of Industry (Large/ Medium/ Small Scale).
- (b) MSME/ Startup certificate with validity (if applicable).
- (c) Annual Turnover in INR for last 03 financial years.
- (d) Profit/ Loss Statement of the last 03 financial years.
- (e) Infrastructure and number of employees working in R&D of systems related to the product. Provide details of developmental facilities like laboratories, inspection and quality control, and trials and testing facilities
- (f) Details of earlier contracts with Indian Ministry of Defence/ Government agencies:-

<u>Ser.</u>	<u>Contract Number</u>	<u>Equipment</u>	<u>Quantity</u>	<u>Cost</u>

6. **Certification by Quality Assurance Organisation.**

<u>Name of Agency</u>	<u>Certification</u>	<u>Applicable from (Date &amp; Year)</u>	<u>Valid Till (Date &amp; Year)</u>

7. **Details of Registration.**

<u>Agency</u>	<u>Registration No.</u>	<u>Validity (Dte)</u>	<u>Equipment</u>
<b>GeM</b>			
<b>DGQA/DGAQA/DGNAI</b>			
<b>OFB</b>			
<b>DRDO</b>			
<b>Any other Government Agency</b>			

8. **Membership of FICCI/ASSOCHAM/CII or other industrial Associations.**

Name of Organisation

Membership Number

9. **Equipment/ Product Profile (To be submitted for Each Product Separately.**

- (a) Name of product.
- (b) Description (attach technical literature).
- (c) Whether OEM or Integrator.
- (d) Name and address of foreign collaborator (if any).
- (e) Industrial Licence Number.
- (f) Indigenous component of the product (in Percentage), Give details component wise and as a whole.
- (g) Status (in service/design & development stage).
- (h) Production capacity per annum along with envisaged timelines for local production, maintenance support and lift time support.
- (j) Countries/agencies where equipment supplied earlier (give details of quantity supplied).
- (k) Estimated cost of development in case indigenous R&D is proposed.

- (l) Estimated cost of setting up production/ assembly facility in case of ToT.
- (m) Estimated total development cost (including cost of ToT, setting up of production/ assembly facilities and supply of 1000 rounds with conduct of all static and dynamic firing tests).
- (n) Conformity of Ammunition fit to latest International regulations and standards, wherever applicable.
- (p) Details of manufacturing and testing infrastructure available with the firm.

10. **Indigenous Development Capability.** Elaborate in detail upon the capability to indigenously develop the required equipment along with justification and documentary evidence. The following are to be specified:-

- (a) Details of licences held by your entity/ Company for any systems/ components applicable for this project.
- (b) What are the major components/ Systems/ sub-systems that will be indigenously manufactured by the vendor? What will be the source of acquisition for the remaining components/ Systems/ sub-systems (details of the source firms may be specified indicating whether the source firms are domestic/ ex-Import)?
- (c) Provide details of similar equipment manufactured by the vendor and supplied in India/ abroad.
- (d) Please provide details of any equipment manufactured by the vendor and supplied to Indian Navy.

11. Any other relevant information.

12. **Declaration.** It is certified that the above information is true and any changes will be intimated at the earliest.

**(Authorized Signatory)**

**REQUIREMENT OF MANUFACTURING AND SUPPLY OF  
76/62 SUPER RAPID GUN MOUNT (SRGM) AMMUNITION  
FOR INDIAN NAVY**

1. **Introduction.** 76/62 SRGM is the mainstay Medium Range Gun employed onboard more than 50 warships of the Indian Navy and is used to fire 76 mm ammunition which is of Quick Fire (QF) and fixed type, primarily used against aircraft, sea skimming missiles, ships/ vessels and also for coastal bombardment. The gun and its variants are also in service with several Asian, African, South American, Middle Eastern and NATO countries.

2. **Requirement.** The present requirement pertains to 'Manufacture and Supply of Ammunition for 76/62 SRGM'. The following variants of the ammunition are presently in use with the Indian Navy:-

(a) **High Explosive (HE).** *The shell is filled with a High Explosive for firing against aerial targets, surface vessels and for coastal bombardment.*

(b) **High Explosive Pre-Formed Fragmentation (HEPFF).** *The shell of this round has a unique design to incorporate pre-formed fragment, consisting of heavy metal balls. The shell itself is designed to shatter into thousands of fragments to hit the target with a miss distance between 5-30 meters.*

(c) **Anti-Air (AA) Flash.** The round is used as a practice round against surface and aerial targets. On detonation, a brilliant flash together with smoke is created, leaving a few fragments of the shell onto the target with minor injuries or minimum damage.

(d) **Target Practice (TP).** The round is meant for gun training purpose and does and is filled with inert composition/ High Explosive Substitute.

(e) **Target Practice Tracer (TPT).** This round is the same as TP round, except for an additional tracer attached to the base of the round, giving illumination of the shell trajectory for min 14 sec of flight.

(f) **Clearing Charge.** The clearing charge is filled with approximately 2/3<sup>rd</sup> of the normal service charge/ propellant of the complete round. It is used to eject a projectile jammed inside the gun barrel. The cartridge case containing this charge is shorter than the normal cartridge case, to permit loading in the gun chamber without projectile.

3. **Major Components.** The 76/62 SRGM round comprises mainly of the following components:-

(a) **Projectile/ Shell.** The projectile body is forged steel. The projectile is filled with explosive or any other substitute, and is crimped into a cartridge case. The ammunition may be assembled with following types of shells:-



- (i) HE
- (ii) HEPFF
- (iii) AA Flash
- (iv) TP
- (v) TPT

(b) **Fuze.** Shells HE, HEPFF and AA Flash can be fitted with a Proximity Fuze which can also function on Direct Impact as a backup in case of non-functioning in target proximity. Additionally, the proximity function of the fuze may be paralyzed/ inhibited by inputting designated voltage/ current to the fuze. This would deactivate the proximity mode and would render the fuze functional only in Direct Impact mode. A Universal Proximity and Direct Action (DA) Fuze for SRGM ammunition is presently under development for **IN** by M/s Bharat Electronics Ltd and M/s Precision Power Products.

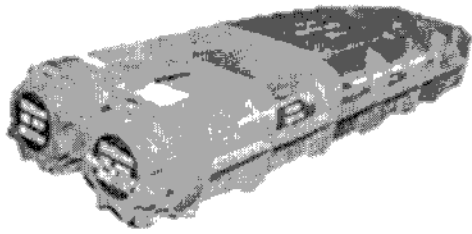
(c) **Cartridge Case.** The cartridge case is a 70/30 brass case drawn or steel, machined and coated to fit the gun chamber and accommodate the propellant and the primer. Coating must be designed to provide excellent corrosion protection, good lubrication and resistance to chemicals. The case is manufactured to strict specifications, controlling dimensions, grain sizes and finish, to ensure that no case will fail to eject after firing. The case is crimped to the shell during assembly of the complete round.

(a) **Propellant.** The propelling charge consists of approximately 2.4 kg of smokeless propellant (single base). A cardboard disc and spacer secures the propellant in position during ramming of the round. The chamber pressure and muzzle velocity is established during manufacturing for each propellant lot to provide an accurate charge for each round manufactured from that lot of propellant

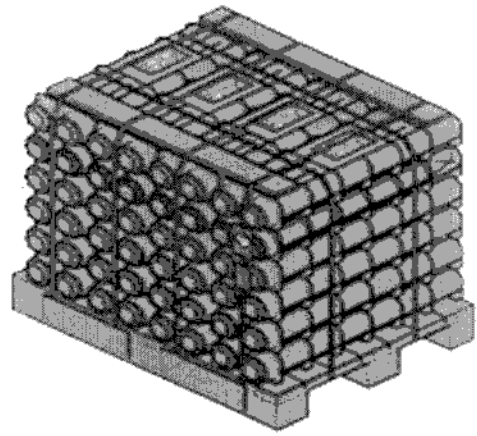
(d) **Primer.** The primer is percussion type, designed to withstand the high ramming force of the gun during round loading into gun chamber without causing premature firing. The percussion cap of the primer is extensively tested lot wise prior to assembly in the primer and after assembly to achieve the high confidence level required to meet the 'non-functioning' and 'all-function' criteria.

4. **Packaging.** SRGM rounds are packed in pairs in Twin (plastic) containers. These are then stacked and palletized, enabling transportation in large quantities by road, rail, ship or aircraft without any detrimental effect to the safety and functional aspects of the ammunition. Following are the broad physical details of the Twin container:-

Dimensions	-	970 X 300 X 150 mm (nominal)
Container Empty weight	-	4.1 Kg (nominal)
Filled weight	-	30 Kgs (after packing 02 rounds)



**Twin Container**  
(accommodates 02 SRGM rounds)



**Unit Load Assembly (for palletizing Twin Containers for transport)**

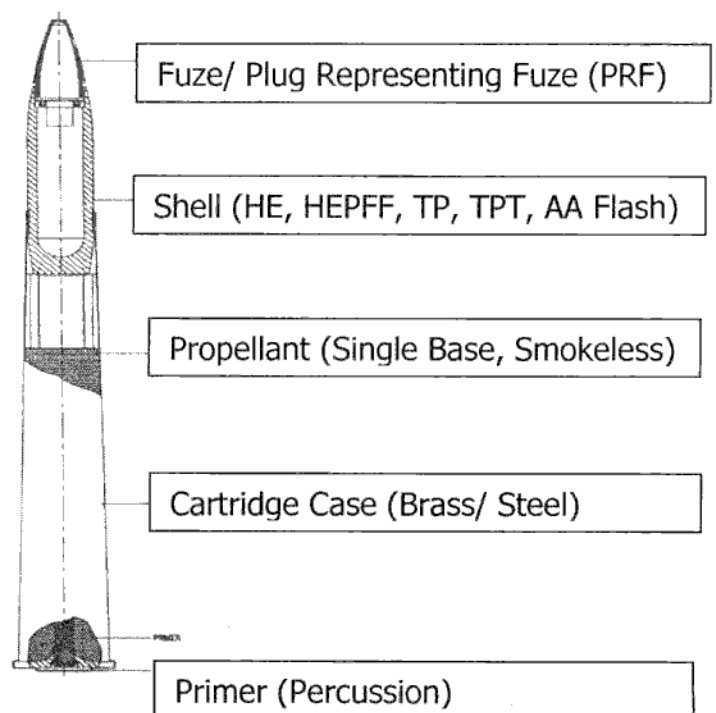
5. **Maintainability.** The ammunition is maintenance free for a minimum of 10 years usable life while contained in the specified packaging in naturally ventilated magazines.

6. **Technical Specifications.** Broad Technical specifications of the ammunition are as follows:-

- |     |                        |   |                                       |
|-----|------------------------|---|---------------------------------------|
| (a) | Mass of Shell          | - | 6.3 Kg (nominal)                      |
| (b) | Mass of Complete Round | - | 12.5 Kg (nominal)                     |
| (c) | Length of Round        | - | 907 mm (nominal)                      |
| (d) | Muzzle Velocity        | - | 905±5 m/s at 21°C                     |
| (e) | Chamber Pressure       | - | 3975 Kg/cm <sup>2</sup> (max) at 60°C |
| (f) | Max Range              | - | 16,000 m                              |
| (g) | Operating Temperature  | - | -20 to +60°C                          |



**Photograph of SRGM Rounds**



**SRGM Round and its Components**

7. **Quantity.** The present requirement entails manufacture and supply of:-
  - (a) Prototypes. 500 HE and 500 HEPFF.
  - (b) 11,688 HE and 11,688 HEPFF rounds over a period of 10 years.
  
8. **Future Requirement.** The following are brought out:-
  - (a) On satisfactory production, testing and delivery of pilot lot, clearance for bulk production would be accorded. This would enable the firm to receive future orders for supply of the ammunition to the Indian Navy.
  
  - (b) Upon successful development of the ammunition, clearance for export to other countries can also be considered.
  
9. **Conclusion.** 76/62 SRGM being the mainstay Medium Range gun fitted onboard existing **IN** platforms and to be fitted on upcoming platforms, the requirement of ammunition for the gun is recurrent. At present this is being met with supply ex-import and partially from (erstwhile) OFB. Successful development of the ammunition by Indian industry would cater to the present and future needs of the **IN** and also give opportunities for exporting the same to other countries.