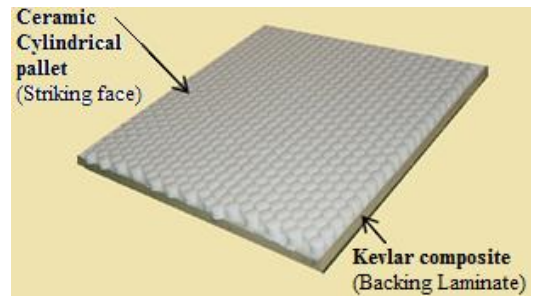


Ceramic Faced Composite Armour Panels for Advanced Light Helicopter (ALH)

Introduction

The Advanced Light Helicopter (ALH) is designed and developed by Hindustan Aeronautical Limited (HAL), India. Ceramic faced composite armour protection panels have been designed and developed by DMSRDE for ALH (Army Variant) to provide protection to aircrews and critical parts of helicopter against 12.7 mm API bullet hits.



Technical Specification of Armour

Dual hardness panel armours consisting of hard ceramic striking face and aramid/epoxy laminates as backing are more efficient than monolithic armors. Ceramic faced composite armour panel is significantly efficient in decreasing the penetrability of a conical striker. Alumina is one of the most readily available and cost-effective material that has a high level of physical properties, which is used as ceramic face in the composites. The ceramic surface being used as impacting surface receives the initial impact of the projectile. Its function is to destroy the head of the projectile progressively as it attempts to penetrate the composite structure. A major part of the impact energy is dissipated during this first stage. The second stage material is a ductile base laminate made of composite material. It's main function is to absorb the residual impact energy caused by the fragmented parts of the projectile till reaches to complete halt. The absorption results in elastic and plastic deformation of the ductile material. The weight of dual hardness panel armor is less than armour made only of steel.

To meet the technical specification requirement, developed armour panels were subjected to Strength, Environmental, Shock, Vibration, Immersion, Flame resistance, Low & high temperature stability, Spall adhesion and Ballistic tests for airworthiness clearance before induction into the helicopter and found fully capable to provide ballistic protection.

Status and Application

Induction of the developed ceramic faced composite armour panels on army version ALH is completed. Carriage and flight trials are conducted & found satisfactory. *Provisional clearance for composite armour panels for ALH* is obtained from RCMA (Helicopter). Subsequently, clearance for bulk production of the *developed ceramic faced composite armour panels* is obtained CEMILAC.

Interested Industries are requested to forward their Expression of Interest (Eoi) to Director DMSRDE, Kanpur (with attachments of supporting documents) with a copy of Director DIITM, DRDO HQ (without attachment) on following address:-

To,
Director
Defence Materials and Stores Research & Development Establishment (DMSRDE)
DRDO, Ministry of Defence, Government of India
PO DMSRDE, GT Road,
Kanpur-208013
Phone : (0512) 2451759-78
Fax : 0512-2450404/ 2404774

E-mail ID : [director\[dot\]dmsrde\[at\]gov\[dot\]in](mailto:director@dmrde.gov.in)

Copy to

Director
Directorate of Industry Interface & technology Management (DIITM)
Room No. 447, DRDO Bhawan, DRDO HQrs, Rajaji Marg, New Delhi-110011
Phone: 011-23013209/23015291
Fax: 011-23793008

Email: [diitm\[dot\]hqr\[at\]gov\[dot\]in](mailto:diitm@hqr.gov.in)

List of Support documents to be attached with Eoi

- a) Memorandum and Articles of Association (Should be incorporated as per Indian Companies Act, as amended time to time)
- b) Certificates of registration as a manufacturing unit, if any.
- c) Audited Balance Sheet for the preceding three years.
- d) Income Tax returns for the preceding three year period
- e) Details of shareholding/ownership pattern especially foreign partners/ shareholders, foreign employees, directors, etc. The company must adhere to the prevailing Govt of India policies and regulations on Foreign Direct Investment (FDI)/DIPP norms as applicable.
- f) Annual budget for R&D during last three years.
- g) Numbers and details of IPR or patents, etc., held by the company.
- h) Number of technically or professionally qualified personnel.
- i) Record of past performance (e.g., Supply orders executed against of Ministry of Defence orders, Public Sectors and Paramilitary Forces, if any).
- j) Availability of adequate infrastructure (List of machines and their production capacities) and technical expertise.
- k) List of Testing and Support equipment's
- l) ISO/ ISI certification or any other certification
- m) Relevant clearances form the authorities/ ministries (if any)

- n) Capacity and capability to undertake developmental work and to accept attendant financial and commercial risks.
- o) Capacity/capability to market the product through the marketing network, sales and service network, reliability to maintain confidentiality.
- p) PESO and DPIIT license for explosive handling if ToT is for high energy Material, explosives, propellants, and component/ system dealing with it etc (if applicable).
- q) Under taking form company seeking ToT that none of its Directors, Independent Directors, non-executive Directors, Key management personnel are involved in any corrupt practices, unfair means and illegal activities.
- r) Details of the industrials license for defence manufacturing be provided by the industry seeking ToTs.