

## **Manufacturing of Carbon-Silicon Carbide composite (C-SiC) Jet Vanes through Liquid Silicon Infiltration Method**

### **Introduction**

Jet vane are used in Thrust Vector Control (TVC) system. At initial stage of launch, when the velocity is very less, jet vanes are used to control yaw, pitch and roll by using high speed motor exhaust. Exhaust is having very high temperature, high heating rate, high mass flow rate with solid particle impingement where high mass flux of the exhaust gases exert very high shear stresses in addition to the chemical/oxidative attack which results into a severe thermo-oxidative recession of the Jet vane. This innovation was created to indigenize this critical system for typical applications. C-SiC (Carbon Fiber Reinforced Silicon Carbide) Composite is a thermo-structural material which has high thermal shock resistance, oxidation resistance and melting point. It can retain its mechanical strength at high temperature and can be used up to 2500<sup>0</sup>C for short duration.

### **Essential infrastructure required for ToT**

Those who are willing to take up the ToT should have a plant having pitch infiltrator, Carbonization furnace, Graphitization furnace, Hot Iso static Pressurization (HIP) System, Heat Treatment/ Siliconisation furnace. Approximately 20Cr investment is required (except HIP).

**Areas of application:** C-SiC jet vanes are used in thrust vector control system.

Interested companies/ industries are requested to apply against this EoI to following address:-

**Director,  
Advanced Systems Laboratory (ASL)**  
Kanchanbagh P O,  
Hyderabad - 500058  
Ph.No: 040- 24188400  
Fax: 040-24343779  
Email: director[dot]asl[at]gov[dot]in

A copy of interest may be sent to the following address (without any attachment):-

**Director  
Directorate Industry Interface and Technology Management (DIITM)**  
Room No 447, DRDO Bhawan, DRDO HQrs, Rajaji Marg, New Delhi – 110011  
Phone No: 01123013209/23015291  
Fax No: 011-23793008  
Email ID: diitm[dot]hqr[at]gov[dot]in

All industries interested in seeking ToT are requested to fill in the form given below and provide reference of page no. of supporting document (wherever applicable) in the relevant field. The list of documents to be attached is provided in Annexure - I.

**PART-1**

**General Information**

1.	<b>Name of the Technology requested for Technology Transfer (Technology name and concerned Lab, Category)</b>	
2.	<b>Name of the industry/ organization</b>	
3.	<b>Complete Address and other details</b>	
	<b>Registered Office</b>  State Phone No Fax Email Website	
	<b>Factory</b>  State Phone No Fax Email Website	
4.	<b>Point of Contact</b> Name Designation Address Mobile No Ph No Email ID	
5.	<b>NAME OF CMD/ MD /PARTNERS/ PROPRIETOR/ etc</b> Name Designation Address Mobile No	

	Ph No Email ID	
6.	<b>Date of Incorporation of company</b>	
7.	<b>Foreign Direct Investment in company (if any in %)</b>	
8.	<b>Shareholding pattern</b>	
9.	<b>Turn over as per Audited Balance Sheet for the preceding three years.</b> Year _____ Year _____ Year _____	
10.	<b>Annual budget for R&amp;D during last three years (if any)</b> Year _____ Year _____ Year _____	
11.	<b>Income Tax returns for the preceding three years period</b> Year _____ Year _____ Year _____	
12.	<b>Nature of company</b> DPSU, Private Limited, Public Limited, Partnership, Proprietary, Ex- Serviceman Unit	
13.	<b>Category of industry</b> Large Scale, Medium Scale, Small Scale, Micro, Startup	
14.	<b>MSME Registration No</b>	
15.	<b>Certificates of registration as a manufacturing unit, if any.</b>	
16.	<b>If Startup, DPIIT Registration No</b>	
17.	<b>UDYOG AADHAR No</b>	
18.	<b>PAN Number</b>	
19.	<b>Details of Industrial license for defence manufacturing issued by DPIIT (if any)</b>	
20.	<b>Details of PESO license (if any)</b>	
21.	<b>GST Number</b>	
22.	<b>Nature of business</b>	

	Manufacturing/ Sole Selling or Authorized Agent/ Assembler/ Traders/ Dealer/ Processor/ Repacker/ Others	
23.	<b>Details of current products and services</b> Products and services Supplied (please specify Govt/ Domestic market/ Export)	
24.	<b>Record of past performance</b> (e.g., Supply orders executed against of Ministry of Defence orders, Public Sectors and Paramilitary Forces, if any).	
25.	<b>Details of registration with</b> NSIC / SSI, DGS&D, other Defence Department, other Govt. Dept, membership of FICCI/ASSOCHAM/CII or other Industrial Association <b>(Attach relevant copies of registration letters)</b>	
26.	<b>Have you already taken any technology from DRDO</b> (If yes, give details attaching separate sheet) Name of the Technology, Lab, Year, License number & Status	
27.	<b>ISO/ ISI certification or any other certification</b> (If yes, give details)	
28.	<b>Relevant clearances form the authorities/ ministries</b> (if any)	
29.	<b>Capacity and capability to undertake developmental work and to accept attendant financial and commercial risks.</b>	
30.	<b>Capacity/capability to market the product through the marketing network, sales and service network, reliability to maintain confidentiality.</b>	

## PART-2

### Infrastructure and other Information

(a)	<b>Total area of factory</b> Covered (m <sup>2</sup> ), Uncovered (m <sup>2</sup> ), Bonded space available (m <sup>2</sup> )	
(b)	<b>Ownership of factory</b> Self-owned, partnership, rental	
(c)	<b>Electric power</b> Sanctioned Installed Standby (if any)	
(d)	<b>Availability of adequate infrastructure</b> (List of machines and their production capacities) and technical expertise	
(e)	<b>Name of bank &amp; A/c No</b> Name of bank A/c type A/c no	

	Address of the bank Phone: Email:	
--	--------------------------------------	--

**(a) Details of current products:**

Sl.no.	Type	Description	Licensed/installed capacity	Annual production for preceding 3 years

**(b) Details of foreign collaboration, if any**

Sl.no.	Product	Name & address of collaborator	Year	Remarks

**(c) Details of products developed for services**

Sl.no.	Nomenclature of stores	Order no and date	Remarks

**(d) Please give details of important facilities & infrastructure as per following format for:**

- a. Production
- b. Unconventional, special m/c
- c. Testing & quality control facilities

Sl.no.	Description of m/c	Make & model	Qty	date of purchase	Remarks

**(e) Furnish the following details with relevant certificates and documents**

- a. R&D facilities available :
- b. Inspection quality control of raw material components :
- c. Assistance from central agency for testing / calibration etc. :
- d. laboratory and drawing office facility :

**(f) Principal customers:**

Sl.no.	Name & address	S.O No. & date	Date of last supply	Products supplied	Value

**(g) Future plan (if any) in respect of expansion programme installation of additional machines/ test facilities etc.**

(h) **Name of the technology requested for transfer** (give self-assessment of your capability to absorb the technology)

(i) **Details of employee as on date on firm's pay roll**

PERMANENT				
Category	Post Held	Number	Qualification	Total Service
Technical	Prod. Manager Q.C. Manager Supervisor Testing Staff (Qc) Skilled workers Unskilled workers, etc.			
Administrative	Purchase Manager Accounts Officer Office Superintendent Clerical Others etc			

TEMPORARY				
Category	Post Held	Number	Qualification	Total Service
Technical	Prod. Manager Q.C. Manager Supervisor Testing Staff (Qc) Skilled workers Unskilled workers, etc			
Administrative	Purchase Manager Accounts Officer Office Superintendent Clerical Others, etc			

**DECLARATION :**

I / we confirm that the information furnished in Part 1 & 2 above is correct. In the event of any information given by me / us is found incorrect / false at any time, I / we understand our EoI for ToT will be cancelled/ rejected without notice, beside any other appropriate action against me / us.

Industry seal

Authorized signatory

Name(s) in capital  
designation and seal of authorized  
signatory

dated:

Place:

**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.
- (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.