

भारत सरकार / GOVERNMENT OF INDIA  
अंतरिक्ष विभाग / DEPARTMENT OF SPACE  
विक्रम साराभाई अंतरिक्ष केंद्र / VIKRAM SARABHAI SPACE CENTRE  
तिरुवनंतपुरम / THIRUVANANTHAPURAM – 695 022

**विज्ञा. सं. वीएसएससी/पी/विज्ञा./297/2019 दि. DT. 19.02.2020**

**ADVT. NO. VSSC/P/ADVT/297/2019 DT. 19.02.2020**

भारत के राष्ट्रपति के लिए तथा उनकी ओर से वरिष्ठ प्रधान, क्रय एवं भंडार, विक्रम साराभाई अंतरिक्ष केंद्र (वीएसएससी), तिरुवनंतपुरम, निम्नलिखित के लिए ई-प्रापण के ज़रिए निविदाएं (क्रम सं. 1 से 4 तक) तथा (क्रम सं. 5 और 6 के लिए) अभिरुचि की अभिव्यक्ति आमंत्रित करता है।

For & on behalf of the President of India, the Sr. Head Purchase & Stores, Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram invites Tenders **through e-procurement (for Sl. No. 1 to 4) & Expression of Interest (Sl. No. 5 & 6)** for the following :-

क्रम सं. Sl. No	निविदा सं. Tender No.	वर्णन / Description	मात्रा Qty.	निविदा शुल्क Tender Fee
01.	VSSC/PRSOPURCH/ 2019E1846101 [दो भाग / TWO PART]	लेजर बीम वेल्डन यूनिट Laser Beam Welding Unit	1 सं./No.	
02.	VSSC/MMEPUR/2020E 1963101 [दो भाग / TWO PART]	त्रिअक्षीय सीएनसी ऊर्ध्वाधर मशीनन की आपूर्ति, संस्थापन व कमीशनिंग Supply, Installation and Commissioning of 3 Axis CNC Vertical Machining Centre	1 सं./No.	लागू नहीं / NA
03.	VSSC/MMEPUR/2020E 1970701 [दो भाग / TWO PART]	3 अक्षीय सीएनसी मिल्लन मशीन की आपूर्ति, संस्थापन व कमीशनिंग Supply, Installation and Commissioning of 3-axis CNC Milling machine	2 सं./No.	
04.	VSSC/CMSEPUR/2019E 1849701 [दो भाग / TWO PART]	कैमरा संरचना के लिए सीएफआरपी लैमिनेट व रिंग का संविरचन एवं आपूर्ति Fabrication and Supply of CFRP laminates & rings for Camera structures	1 Lot	
<b>अभिरुचि की अभिव्यक्ति (ईओआई) / <u>EXPRESSION OF INTEREST (EOI)</u></b>				
05.	VSSC/CMSE/EOI/ CCDD/2019	फिल्म क्वथन रासायनिक वाष्प इनफिल्टरेशन (एफबी-सीवीआई) प्रणाली की अभिकल्पना, निर्माण, परीक्षण, आपूर्ति, संस्थापन, कमीशनिंग तथा प्रशिक्षण Expression of Interest for Design, Manufacturing, Testing, Supply, Installation, Commissioning & Training of Film Boiling Chemical Vapour Infiltration (FB-CVI) System.		

06.	VSSC/CMSE/CPSG/ HPS3/EOI/2020	सम्मिश्र मोटर आवरणों के निर्माण हेतु अभिरुचि की अभिव्यक्ति Expression of Interest for Manufacturing of Composite Motor Cases
<p>इच्छुक प्रत्याशी विक्रेता, हमारी संदर्भ संख्या का उद्धरण देते हुए, दिनांक 20.03.2020 को या उससे पहले [16:00 बजे] अपनी अभिरुचि की अभिव्यक्ति ई.ओ.आइ. में उल्लिखित पते पर प्रस्तुत कर सकते हैं। / Interested prospective Vendors can furnish their Expression of Interest quoting our reference No. <b>on or before 20.03.2020 [16:00 Hrs.]</b> to the address mentioned in the EOI.</p> <p>ब्यौरेवार तकनीकी विनिर्देशन तथा निबंधन एवं शर्तें हमारे वेबसाइट <a href="http://www.isro.gov.in">www.isro.gov.in</a> और <a href="http://www.vssc.gov.in">www.vssc.gov.in</a> पर उपलब्ध हैं।</p> <p>Detailed Technical Specifications and Terms &amp; Conditions are available in our website <a href="http://www.isro.gov.in">www.isro.gov.in</a> and <a href="http://www.vssc.gov.in">www.vssc.gov.in</a></p>		

Sl. No.	निविदा प्रारूपों को डाउनलोड करने की समय-सीमा / Time limit for download of Tender Forms	बोली प्रस्तुत करने की समय-सीमा / Time limit for submission of Bid	बोली खोलने की तिथि Bid Opening date
01.	Upto 10.03.2020 [14:00 Hrs.]	Upto 10.03.2020 [14:00 Hrs.]	16.03.2020 [10:01 Hrs.]
02.	Upto 31.03.2020 [14:00 Hrs.]	Upto 31.03.2020 [14:00 Hrs.]	08.04.2020 [14:00 Hrs.]
03.	Upto 23.03.2020 [14:00 Hrs.]	Upto 23.03.2020 [14:00 Hrs.]	26.03.2020 [11:01 Hrs.]
04.	Upto 25.03.2020 [17:00 Hrs.]	Upto 25.03.2020 [17:00 Hrs.]	31.03.2020 [10:00 Hrs.]

विवरण ई-प्रापण पोर्टल <http://eprocure.isro.gov.in> पर उपलब्ध है।

Details are available on ISRO e-procurement portal <http://eprocure.isro.gov.in>.

शुद्धिपत्र, यदि कोई हो तो, हमारे वेबसाइट [www.vssc.gov.in](http://www.vssc.gov.in) / [www.isro.gov.in](http://www.isro.gov.in) में मात्र प्रकाशित किया जाएगा।

Corrigendum, if any will be published in our websites : [www.vssc.gov.in](http://www.vssc.gov.in) / [www.isro.gov.in](http://www.isro.gov.in) only.

हस्ताक्षरित/Sd/-

वरि. प्रधान, क्रय एवं भंडार / Sr. Head, Purchase & Stores

1. E-Tenders are invited for **Laser Beam Welding Unit** listed below. The Bids are to be prepared and submitted in specified Templates online, by logging into the portal <https://eprocure.isro.gov.in>. Submission of Bids involves two stages to be performed by Vendors - Submission of Bids and Open Authorization. The Bids remain encrypted with the bidders's public key, until the Open Authorization stage. All those Bids where Open Authorization is not given, are automatically disqualified. Such Bids will not be openable and will not be considered for further processing. The Vendors are advised to submit the Bids much before the Closing Time to avoid last minute problems.

E-Procurement No. VSSC/PRSOPURCH/2019E1846101 Dt. 07.02.2020 and Print Media Advertisement ref. No. VSSC/P/ADVT/297/2019 Dt. 19.02.2020. E-Tenders are invited for **Laser Beam Welding Unit** through our E-procurement site <https://eprocure.isro.gov.in>. Tender documents can be downloaded **upto 10.03.2020 [14:00 Hrs.]**, **Tender Opening date : 16.03.2020 [10:01 Hrs.]**.

Only online tenders will be accepted. No manual / Postal / e-mail / fax offers will be entertained. No manual tender document will be issued. Parties interested to participate in this e-Tender are required to register themselves as vendors, if not already registered, in our e-procurement portal <https://eprocure.isro.gov.in> by downloading plugins and help demos listed on the home page of the e-procurement link mentioned above to complete the vendor registration process. They can seek help from help desk 080 6780 7786 also as provided in the home page of e-procurement portal in case of any problem for registration and subsequent process. Vendors may please note that without registering in our e-procurement portal, they will not be able to quote for this e-tender.

Important Notice : Tender shall be opened on the first day of the schedule [ie. **16.03.2020 [10:01 Hrs.]**]. If the tender could not be opened on the first day due to any technical snag, it will be opened on the subsequent day as per the schedule. Bidders who are desirous of attending the tender opening may make arrangements for attending the tender opening at their cost.

This is a two part tender, Technical & Commercial part (Part I) and Price Part (Part II) shall be submitted separately. The tenderers should not attach any documents containing Price information along with Technical & Commercial Bid (Part I). We do not open PART II (Price Bid), if PART-I (Technical & Commercial offer) does not meet with our technical specification requirements. Cost split up, other price details etc. shall be uploaded as a separate document under COMMERCIAL DOCUMENTS FROM VENDOR tab.

**THE TECHNICAL DOCUMENTS NEED TO BE ATTACHED ONLINE AS A SINGLE PDF FILE WITHOUT ANY PRICE INFORMATION, TECHNICAL BID CONTAINING PRICE DETAILS WILL BE TREATED AS REJECTED.**

2. E-Tenders are invited for **Supply, Installation and Commissioning of 3 Axis CNC Vertical Machining Centre** listed below. The Bids are to be prepared and submitted in specified Templates online, by logging into the portal <https://eprocure.isro.gov.in>. Submission of Bids involves two stages to be performed by Vendors - Submission of Bids and Open Authorization. The Bids remain encrypted with the bidders's public key, until the Open Authorization stage. All those Bids where Open Authorization is not given, are automatically disqualified. Such Bids will not be openable and will not be considered for further processing. The Vendors are advised to submit the Bids much before the Closing Time to avoid last minute problems.

E-Procurement No. VSSC/MMEPUR/2020E1963101 Dt. 18.02.2020 and Print Media Advertisement ref. No. VSSC/P/ADVT/297/2019 Dt. 19.02.2020. E-Tenders are invited for **Supply, Installation and Commissioning of 3 Axis CNC Vertical Machining Centre** through our E-procurement site <https://eprocure.isro.gov.in>. Tender documents can be downloaded **upto 31.03.2020 [14:00 Hrs.], Tender Opening date : 08.04.2020 [14:00 Hrs.]**.

Only online tenders will be accepted. No manual / Postal / e-mail / fax offers will be entertained. No manual tender document will be issued. Parties interested to participate in this e-Tender are required to register themselves as vendors, if not already registered, in our e-procurement portal <https://eprocure.isro.gov.in> by downloading plugins and help demos listed on the home page of the e-procurement link mentioned above to complete the vendor registration process. They can seek help from help desk 080 6780 7786 also as provided in the home page of e-procurement portal in case of any problem for registration and subsequent process. Vendors may please note that without registering in our e-procurement portal, they will not be able to quote for this e-tender.

Important Notice : Tender shall be opened on the first day of the schedule [ie. **08.04.2020 [14:00 Hrs.]**]. If the tender could not be opened on the first day due to any technical snag, it will be opened on the subsequent day as per the schedule. Bidders who are desirous of attending the tender opening may make arrangements for attending the tender opening at their cost.

This is a two part tender, Technical & Commercial part (Part I) and Price Part (Part II) shall be submitted separately. The tenderers should not attach any documents containing Price information along with Technical & Commercial Bid (Part I). We do not open PART II (Price Bid), if PART-I (Technical & Commercial offer) does not meet with our technical specification requirements. Cost split up, other price details etc. shall be uploaded as a separate document under COMMERCIAL DOCUMENTS FROM VENDOR tab.

**THE TECHNICAL DOCUMENTS NEED TO BE ATTACHED ONLINE AS A SINGLE PDF FILE WITHOUT ANY PRICE INFORMATION, TECHNICAL BID CONTAINING PRICE DETAILS WILL BE TREATED AS REJECTED.**

3. E-Tenders are invited for **Supply, Installation and Commissioning of 3-axis CNC Milling machine** listed below. The Bids are to be prepared and submitted in specified Templates online, by logging into the portal <https://eprocure.isro.gov.in>. Submission of Bids involves two stages to be performed by Vendors - Submission of Bids and Open Authorization. The Bids remain encrypted with the bidders's public key, until the Open Authorization stage. All those Bids where Open Authorization is not given, are automatically disqualified. Such Bids will not be openable and will not be considered for further processing. The Vendors are advised to submit the Bids much before the Closing Time to avoid last minute problems.

E-Procurement No. VSSC/MMEPUR/2020E1970701 Dt. 17.02.2020 and Print Media Advertisement ref. No. VSSC/P/ADVT/297/2019 Dt. 19.02.2020. E-Tenders are invited for **Supply, Installation and Commissioning of 3-axis CNC Milling machine** through our E-procurement site <https://eprocure.isro.gov.in>. Tender documents can be downloaded **upto 23.03.2020 [14:00 Hrs.], Tender Opening date : 26.03.2020 [11:01 Hrs.]**.

Only online tenders will be accepted. No manual / Postal / e-mail / fax offers will be entertained. No manual tender document will be issued. Parties interested to participate in this e-Tender are required to register themselves as vendors, if not already registered, in our e-procurement portal <https://eprocure.isro.gov.in> by downloading plugins and help demos listed on the home page of the e-procurement link mentioned above to complete the vendor registration process. They can seek help from help desk 080 6780 7786 also as provided in the home page of e-procurement portal in case of any problem for registration and subsequent process. Vendors may please note that without registering in our e-procurement portal, they will not be able to quote for this e-tender.

Important Notice : Tender shall be opened on the first day of the schedule [ie. **26.03.2020 [11:01 Hrs.]**]. If the tender could not be opened on the first day due to any technical snag, it will be opened on the subsequent day as per the schedule. Bidders who are desirous of attending the tender opening may make arrangements for attending the tender opening at their cost.

This is a two part tender, Technical & Commercial part (Part I) and Price Part (Part II) shall be submitted separately. The tenderers should not attach any documents containing Price information along with Technical & Commercial Bid (Part I). We do not open PART II (Price Bid), if PART-I (Technical & Commercial offer) does not meet with our technical specification requirements. Cost split up, other price details etc. shall be uploaded as a separate document under COMMERCIAL DOCUMENTS FROM VENDOR tab.

**THE TECHNICAL DOCUMENTS NEED TO BE ATTACHED ONLINE AS A SINGLE PDF FILE WITHOUT ANY PRICE INFORMATION, TECHNICAL BID CONTAINING PRICE DETAILS WILL BE TREATED AS REJECTED.**

4. E-Tenders are invited for **Fabrication and Supply of CFRP laminates & rings for Camera** structures listed below. The Bids are to be prepared and submitted in specified Templates online, by logging into the portal <https://eprocure.isro.gov.in>. Submission of Bids involves two stages to be performed by Vendors - Submission of Bids and Open Authorization. The Bids remain encrypted with the bidders's public key, until the Open Authorization stage. All those Bids where Open Authorization is not given, are automatically disqualified. Such Bids will not be openable and will not be considered for further processing. The Vendors are advised to submit the Bids much before the Closing Time to avoid last minute problems.

E-Procurement No. VSSC/CMSEPUR/2019E1849701 Dt. 30.01.2020 and Print Media Advertisement ref. No. VSSC/P/ADVT/297/2019 Dt. 19.02.2020. E-Tenders are invited for **Fabrication and Supply of CFRP laminates & rings for Camera** through our E-procurement site <https://eprocure.isro.gov.in>. Tender documents can be downloaded **upto 25.03.2020 [17:00 Hrs.]**, **Tender Opening date : 31.03.2020 [10:00 Hrs.]**.

Only online tenders will be accepted. No manual / Postal / e-mail / fax offers will be entertained. No manual tender document will be issued. Parties interested to participate in this e-Tender are required to register themselves as vendors, if not already registered, in our e-procurement portal <https://eprocure.isro.gov.in> by downloading plugins and help demos listed on the home page of the e-procurement link mentioned above to complete the vendor registration process. They can seek help from help desk 080 6780 7786 also as provided in the home page of e-procurement portal in case of any problem for registration and subsequent process. Vendors may please note that without registering in our e-procurement portal, they will not be able to quote for this e-tender.

Important Notice : Tender shall be opened on the first day of the schedule [ie. **31.03.2020 [10:00 Hrs.]**]. If the tender could not be opened on the first day due to any technical snag, it will be opened on the subsequent day as per the schedule. Bidders who are desirous of attending the tender opening may make arrangements for attending the tender opening at their cost.

This is a two part tender, Technical & Commercial part (Part I) and Price Part (Part II) shall be submitted separately. The tenderers should not attach any documents containing Price information along with Technical & Commercial Bid (Part I). We do not open PART II (Price Bid), if PART-I (Technical & Commercial offer) does not meet with our technical specification requirements. Cost split up, other price details etc. shall be uploaded as a separate document under COMMERCIAL DOCUMENTS FROM VENDOR tab.

**THE TECHNICAL DOCUMENTS NEED TO BE ATTACHED ONLINE AS A SINGLE PDF FILE WITHOUT ANY PRICE INFORMATION, TECHNICAL BID CONTAINING PRICE DETAILS WILL BE TREATED AS REJECTED.**

**GOVERNMENT OF INDIA  
DEPARTMENT OF SPACE  
VIKRAM SARABHAI SPACE CENTRE  
INDIAN SPACE RESEARCH ORGANISATION  
THIRUVANANTHAPURAM-695022**

Ref No: VSSC/CMSE/EOI/CCDD/2019

Date: 19.02.2020

**INVITATION FOR “EXPRESSION OF INTEREST”**

“Expression of interest for Design, Manufacturing, Testing, Supply,  
Installation, Commissioning & Training of Film Boiling Chemical Vapour  
Infiltration (FB-CVI) System”

Vikram Sarabhai Space Centre, Thiruvananthapuram invites Expression of Interest for Design, Manufacturing, Testing, Supply, Installation, Commissioning & Training of FB-CVI system for processing of Carbon –Carbon Composites for ISRO’s missions.

Interested vendors can furnish their Expression of Interest quoting our reference No. VSSC/CMSE/EOI/CCDD/2019 **on or before 20/03/2020 [04:00 PM]** to the following address:

**Purchase & Stores Officer  
CMSE Purchase,  
Vattiyoorkavu PO,  
Thiruvananthapuram - 695013.  
Ph: 0471-256 9290**

Sd/-  
Sr. Head, Purchase & Stores

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## **1. EOI OBJECTIVE**

VSSC is planning to involve technically suitable and competitive vendors for Design, Manufacturing, Testing, Supply, Installation, and Commissioning & Training of Film Boiling Chemical Vapour Infiltration system.

The purpose of this Expression of Interest (EoI) is to invite proposals from the potential Vendors for Design, Manufacturing, Testing, Supply, Installation, and Commissioning & Training of Film Boiling Chemical Vapour Infiltration system on turn-key basis at VSSC Thiruvananthapuram. On successful completion of EoI, an RFP will be released and on completion of RFP stage, depending on the response of vendors and their capability, the most competitive vendor shall be selected to take up the activity. The project shall be completed within a tentative period of 12 months from the release of purchase order.

## **2. MODE OF OPERATION OF EOI**

The intending vendors are advised to read the EoI documents, terms and conditions and other details carefully relating to the work contemplated in the required Design, Manufacturing, Testing, Supply, Installation, Commissioning & Training activities and fully acquaint themselves to all conditions and matters which may in anyway affect the work or cost thereof. The Vendor shall be deemed to have known the nature, scope and magnitude of the work. Vendor should express their interest only if they consider themselves eligible and if they are in possession of all documents required as per the EoI. The Vendors are required to study EoI document and express interest after carefully examining all instructions, eligibility criteria, forms, terms, standards and specification as per the EoI document with full understanding of its implications.

EoI proposals which are not in compliance with our EoI conditions shall be rejected, without assigning any reasons thereof. Failure to furnish all requisite information and/or documents shall result in repudiation of the EoI. Notwithstanding the

foregoing conditions, Vikram Sarabhai Space Centre [VSSC], Thiruvananthapuram reserves the right to assess the capability of the Vendor to perform the contract keeping in view the overall interest of VSSC. In the event, the Vendor capability and capacity are found to be unsatisfactory; VSSC reserves the right to reject the EoI document.

Any neglect or omission or failure on the part of the Vendor in obtaining necessary information as stated above or in any other matter affecting the Vendor shall not relieve them from any risks or liabilities or the entire responsibility for completion of activity in accordance with the EoI Documents.

The requirements stated herein below are a minimum and VSSC reserves the right to request for any additional information and reserves the right to reject the EoI document of any Vendor, if in the opinion of VSSC, the qualification or data is incomplete or if the Vendor is found not qualified to satisfactorily perform the Contract. The Vendor shall bear all costs and expenses associated with preparation and submission of EoI document including post EoI clarifications, discussions, technical and other presentations and VSSC shall not be responsible or liable for such costs, regardless of the outcome of the EoI process. The Vendor shall also not be entitled to claim any costs, charges and expenses incidental to or incurred by them through or in connection with the submission of the EoI or its consideration by VSSC, even though VSSC may prefer to modify or withdraw the Invitation to EoI or not to accept the EoI.

At any time prior to the deadline for submission of EoI, VSSC may for any reason on its own initiative modify the EoI document by amendment. The amendment shall be notified by uploading the same online in VSSC's website. VSSC shall bear no responsibility or liability arising out of non-receipt of the same in time or otherwise. Notwithstanding the above, VSSC may at its discretion extend the deadline for

submission of EoI in order to allow reasonable time to Vendor to take into account the amendment in preparing the EoI.

All the EoI must be submitted before the time and date fixed for the receipt of EoI asset forth in the EoI document. VSSC shall not be responsible for non- receipt of EoI due to any postal delays/loss of EoI documents in transit and delay due to customs/courier, etc. and it shall be the sole responsibility of the Vendor to ensure delivery of the EoI within the time fixed. VSSC reserves the right to accept or reject any of the EoI in full or part. EoI received after stipulated time and date shall be rejected.

EoI documents shall be uploaded on the VSSC website i.e. [www.isro.gov.in](http://www.isro.gov.in). Interested Vendor may download the EoI document from website and submit their response.

If the EoI opening date happens to be on an unidentified Holiday due to any reason, including Force Majeure, EoI's shall be opened on the next working day.

Vendor shall submit EoI document only in sealed envelopes, super scribing the EoI advertisement number and the due date and due time of opening the EoI. The EoI shall be complete in respect of all technical requirements, as per the EoI document. Failure to furnish all information as per the requirements of the EoI document and submission of EoI not substantially responsive to the EoI document shall render the EoI/Vendor liable for rejection. Any/all submission of EoI byway of fax/e-mail shall not be accepted.

The Vendor shall provide along with his EoI document the Name of their Bankers, if required by Vikram Sarabhai Space Centre [VSSC], Thiruvananthapuram.

*The vendors have to get enrolled in the e-procurement portal to access tender and submit their offer online during RFP stage. Vendor shall comply with the procedures for enrollment/registration as mentioned in the e-procurement portal of ISRO.*

### **3. INTRODUCTION**

Vikram Sarabhai Space Centre (VSSC) is involved in development and realization of Carbon-Carbon (C-C) composite products for various ISRO's missions.

To realize Carbon-Carbon products for various applications, VSSC has developed process technology of Film-Boiling Chemical vapour Infiltration (FB-CVI). The process of FB-CVI enables realization of Carbon-Carbon Composite products through a faster process methodology and is adaptable for manufacturing of Carbon-Carbon Composite products for diverse applications.

The objective of this EoI is to identify suitable industry to take up the manufacturing and supply of FB-CVI system as per the technical & conceptual design specifications provided by VSSC.

#### **3.1 SCOPE**

This section provides the structure of this EoI and general instructions for the vendors.

#### **3.2 STRUCTURE OF THE EOI**

Instructions to Vendors	Section – 4
System Description	Section – 5
Statement of Work	Section – 6

### **4. INSTRUCTIONS TO VENDORS**

The following instructions shall be followed by the vendors for submitting proposals in response to this EoI.

#### **4.1 STRUCTURE OF THE RESPONSE**

- 4.1.a These guidelines have been prepared to assist vendors in generating the proposals in response to the VSSC Expression of Interest (EoI). VSSC reserves the right to revise the requirements as may evolve based on interaction with vendor during evaluation of EoI.
- 4.1.b The cost of preparing proposals in response to this EoI shall be borne solely by the Vendor and the release of this EoI does not bind any financial or other obligation on the part of VSSC.
- 4.1.c VSSC reserves the right to consider the vendor in the RFP Process for the whole or any part of the work defined in the EoI. VSSC also reserves the right not to float the RFP or float in partial/modified version.

Participation of Vendors for Pre-EoI Meeting: Approximately 10 days before due date, a Pre-EoI meeting will be arranged at Vikram Sarabhai Space Centre, Thiruvananthapuram in order to have better understanding of the EoI document with regard to technical and commercial aspects, clarify doubts if any, and other allied techno-commercial details.

**Participation in the pre-EoI meeting is compulsory for the prospective vendors. The Vendors who do not participate in the Pre-EoI Meeting, such Expression of Interest will not be considered and it will be disqualified. Vendors who have participated in Pre-EoI meeting are only eligible to bid their response for this EoI.**

- 4.1.d RFP if issued will be given only to the Vendors who will participate in EoI.

#### **4.2 CLARIFICATIONS CONCERNING THE EOI**

- 4.2.a Clarifications concerning the EoI may be submitted by e-mail to the VSSC contact point indicated below.

Sr. Purchase and Stores officer,  
Purchase unit No VI  
Vikram Sarabhai Space Centre, Thumba

CMSE, Vattiyookavu  
Thiruvananthapuram – 695013, India

4.2.b Vendors shall not contact VSSC for information on the progress or possible outcome of the evaluation.

#### **4.3 SUBMISSION OF PROPOSALS**

4.3.a Complete proposals must be received by the VSSC at the address given below, not later than the date and time specified in the EoI cover letter.

Sr.Purchase and Stores officer,  
Purchase unit No VI  
Vikram Sarabhai Space Centre, Thumba  
CMSE, Vattiyookavu  
Thiruvananthapuram – 695013, India

4.3.b Proposal of the vendor must also include the name of the point of contact, together with the designation, appropriate contact number and e-mail address.

#### **4.4 PROPOSED CALENDAR OF EVENTS**

Sl. No.	Event	Time line
1	EoI release	T0
2.	Pre-EoI meeting	T0 + 2 weeks
3.	Last date for submission of Interest	T0 + 4 weeks

#### **4.5 PRESENTATION OF PROPOSALS**

4.5.a Proposals in response to this EoI shall be submitted in electronic form along with two set of hard copies.

4.5.b Vendors are also requested to provide a transmittal letter, signed by an authorized company official, with respect to the technical commitments made in the proposal.

4.5.c All parts of the proposal and communications relating thereto shall be in English.

#### 4.6 EVALUATION CRITERIA

The evaluation criteria used by VSSC to determine the acceptability of proposals at any stage and eventual technical discussion with one or more selected vendors will include the following.

4.6.a Vendor Assessment Criteria-A: Compliance of all points in Criteria-A is mandatory. Vendor shall submit relevant documents against each compliance statement.

4.6.b Vendor Assessment Criteria-B: Vendor shall secure minimum qualifying mark in each category and 60% in aggregate.

**Table 1 – Vendor Assessment Criteria - A**

Sl. No.	Criteria	Compliance (Yes/No)
1.	An Indian Company would be deemed to be owned by Indian Citizen and by an Indian Company if more than 51 percent of equity interest in the company is beneficially owned by Resident Indian Citizens and Indian Companies that are, in turn, ultimately owned and controlled by Resident Indian Citizens.	
2.	Vendor supplying High Temperature composite processing equipment shall be OEM. Auxiliary systems of furnace if required, shall be sub-contracted to Vendors registered in VSSC procurement list or can be sub contracted to other vendors after obtaining clearance from VSSC.	
3	Vendor shall provide details of probable manufacturing facilities which will be utilized for realization of Film Boiling Chemical Vapour Infiltration system. If deemed necessary VSSC expert team shall visit Vendor premises.	
3.	Vendor shall supply process facilities based on the current state of the art technologies. Vendor shall provide relevant documents to support the claim	

**Table 2 – Vendor Assessment Criteria - B**

Sl. No.	Criteria	Mark (min. for Qualifying)	% Weight	
1.	Average Annual Turnover (in crores) during last three financial years (2017-2019)	6	25%	
				Score
	1.1 Minimum turnover of rupees three crores. Out of that, <ul style="list-style-type: none"> <li>• one or more orders are of value rupees two Crores and above</li> </ul> AND <ul style="list-style-type: none"> <li>• orders of value at least rupees 50 Lakhs and above, totaling to at least rupees two crore.</li> </ul>			10
	1.2 Minimum turnover of rupees three crores. Out of that, <ul style="list-style-type: none"> <li>• two or more orders are of value rupees one Crore and above</li> </ul> AND <ul style="list-style-type: none"> <li>• Orders of value at least rupees 50 Lakhs and above, totaling to at least rupees one crore.</li> </ul>			9
	1.3 Minimum turnover of rupees three crores. Out of that, <ul style="list-style-type: none"> <li>• one or more orders are of value rupees one Crore and above</li> </ul> AND <ul style="list-style-type: none"> <li>• Orders of value at least rupees 50 Lakhs and above, totaling to at least rupees two crores.</li> </ul>			8
1.4 Minimum turnover of rupees three crores. Out of that, six or more orders are of value rupees 50 lakhs and above.	6			



	Vendor shall submit Last 3-years work order copies and financial statement with audited copy, <b>failing which EoI will not be considered.</b>										
2.	<p>Past experience in the area of Design, Manufacturing, Testing, Supply, Installation, Commissioning &amp; Training of High Temperature composite processing equipments.</p> <table border="1"> <thead> <tr> <th></th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>Experience of fifteen years or more</td> <td>10</td> </tr> <tr> <td>Experience of ten years</td> <td>9</td> </tr> <tr> <td>Experience of five years</td> <td>6</td> </tr> </tbody> </table>		Score	Experience of fifteen years or more	10	Experience of ten years	9	Experience of five years	6	6	25%
	Score										
Experience of fifteen years or more	10										
Experience of ten years	9										
Experience of five years	6										
3.	<p>Past experience in executing projects in the field of such Integrated mechanical &amp; chemical systems (Ref-2) for ISRO/R&amp;D Institutions/ Government Organizations/ PSU (Public Sector Government Undertaking) in India during last five financial years (2015-2019).</p> <table border="1"> <thead> <tr> <th></th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>Three projects or more executed</td> <td>10</td> </tr> <tr> <td>Two projects executed</td> <td>9</td> </tr> <tr> <td>One project executed</td> <td>6</td> </tr> </tbody> </table> <p>Vendor shall submit relevant Work Order /Completion Certificates to support the claim</p>		Score	Three projects or more executed	10	Two projects executed	9	One project executed	6	6	25%
	Score										
Three projects or more executed	10										
Two projects executed	9										
One project executed	6										
4.	<p>Infrastructure for carrying out establishment of process facilities based on new technologies</p> <table border="1"> <thead> <tr> <th></th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>Fabrication and testing carried out at Vendor's premises</td> <td>10</td> </tr> <tr> <td>Testing carried out at Vendor's premises</td> <td>6</td> </tr> </tbody> </table> <p>Vendor shall provide relevant documents to support the claim</p>		Score	Fabrication and testing carried out at Vendor's premises	10	Testing carried out at Vendor's premises	6	6	25%		
	Score										
Fabrication and testing carried out at Vendor's premises	10										
Testing carried out at Vendor's premises	6										

#### 4.7 EVALUATION OF VENDOR

##### 4.7.a Method of Conversion of Marks into Percentile for Criteria-B:

- Vendors securing minimum qualifying mark against each requirement (SL no 1 to 4) are only considered for Percentile calculation.
- Mark scored in each requirement (Sl. No. 1 to 4) are multiplied by 2.5 and all are added to get the Percentile of the Vendor.

4.7.b Vendor meeting all the requirements in Criteria-A and securing 60% or above in Criteria-B will be considered to take part in RFP. However, based on the Vendor responses VSSC holds the final decision on the evaluation process.

#### 4.8 COMPLIANCE MATRIX TO BE FILLED BY VENDOR

##### **COMPLIANCE STATEMENT**

(to be provided by the bidder with EoI on their letter head)

Sl. No.	Particulars	Yes/No	Remarks
1.	Whether a copy of the Establishment Registration Certificate is enclosed		
2.	Whether a copy of PAN Card is enclosed		
3.	Whether a copy of the AADHAR Card/ Udyog AADHAR Card in enclosed		
4.	Whether a copy of last 3 years financial statement return filled by the establishment (Form-16) is enclosed		
5.	Whether a copy of the valid Goods and Service Tax Registration Certificate is enclosed		
6.	Whether a copy of the valid Registration /License obtained with the Labour Department is enclosed.		
7.	Whether copy of Financial Statements like profits & Loss Account, Balance sheet etc., in support of financial turnover of the establishment is enclosed		
8.	Whether copy of statement of Bank A/C for the last financial year in the name of the Establishment is enclosed.		

9.	Whether the Annexure-1 (Details of the Bidders Establishment) is duly filled in and signed		
10.	Whether the Offer is valid for 180 days from the date of opening of the Tender		

\*\*Compliance to all the above points is required and mandatory, failing which the EoI will not be considered.

Date:..... (Signature of Authorized Signatory with seal)

Place:..... Name in full:

**The Government of India has enacted the Micro, Small and Medium Enterprises Development (MSMED) Act, 2006 and the preferences that are extendable to the MSME Units including Women and SC/ST Entrepreneur's as issued by the Government of India from time to time and wherever feasible, will be applicable for this Expression of Interest (EoI). In order to avail the benefits extended by the Government of India to Micro and Small Enterprises, Vendors are requested to submit Entrepreneur Memorandum Part-II duly signed by the General Manager, District Industries Centre or NISIC Registration/Udhyog Aadhar details. However MSMED act can be extended to the vendors who are complying with Vendor Assessment Criteria A& B, Compliance statement and Technical specifications.**

#### **4.9 VALIDITY PERIOD OF PROPOSALS**

4.9.a The proposals shall remain valid for a period of 6 months from the due date for submission of proposals.

#### **4.10 RETENTION OF PROPOSALS / PROPRIETARY INFORMATION /**

##### **CONFIDENTIALITY**

4.10.a All documents submitted in response to the EoI shall become the property of VSSC. Any information in such documents, which is proprietary to the vendor,

should be specifically identified as such. Proprietary information shall not be deemed to include information that is obtainable from another source or available in the public domain. Notwithstanding the foregoing, VSSC may disclose proposals, including proprietary information, to appropriate personnel selected by VSSC for evaluation purposes.

4.10.b All information contained in this EoI is proprietary information of VSSC and is protected under Indian law.

4.10.c All the information contained in this EoI is confidential and cannot be disseminated to third parties or used by any recipient of this EoI for any purpose other than answering to this EoI. No public statement or press release shall be issued by the recipient regarding this EoI, the information contained within, or the EoI process without the prior written authorization of VSSC.

## **5. SYSTEM DESCRIPTION**

The FB-CVI system envisaged towards development of Carbon-Carbon composite products is having Inner diameter of 1.2 m X 1.7 m height. The FB-CVI system is designed for processing using hydrocarbon liquid precursor, capable to produce carbon matrix for densification of carbon preform to desired density. The FB-CVI system comprises of the following sub systems, however, based on the design requirement the supplier may add/omit sub-systems if required

- Furnace & Supporting structures
- Power system
- Process Control system (PLC & SCADA)
- Liquid storage tank, Receiver tank & Collector tank
- Precursor (Liquid Hydrocarbon) transfer system
- Inert gas (N<sub>2</sub>) distribution system
- Cooling system (Chiller, Cooling tower & Water distribution system)
- Heat exchanger (Condenser)

- Vacuum system
- Chimney
- Safety systems (Gas sensors)

The process flow diagram is enclosed as annexure - 2

5.1 VSSC seeks to realize FB-CVI system which will be used for development and realization of Carbon-Carbon products for ISRO's missions. VSSC's decision to select the party will be based on capability of supplier to manufacture similar equipment.

5.2 Furnace and supporting structures: The furnace of FB-CVI system refers to the process chamber where the carbon preform along with the heater is positioned between two power feedthroughs and undergoes densification. The furnace is having inner diameter of 1.2 m X 1.7 m height. To separate the vapours from the entrained liquid, a liquid vapour separator is provided on top of the reaction chamber. Supporting structures are provided to keep the furnace process chamber in position.

5.3 A hydraulic lift shall be provided for lifting and positioning of job inside the reactor.

5.4 A trolley arrangement to enable positioning and movement of individual power feedthroughs.

5.5 Power system: Power system shall be provided to carry out the process under controlled current mode.

5.6 Process control system: The control of Film Boiling Chemical Vapour Infiltration process shall be executed through PLC based Control system. The proposed control system shall include provision for the following process activities.

- Initial Vacuum creation
- Filling of liquid hydrocarbon from liquid storage tank to reactor
- Controlled Nitrogen supply

- Heating Process Control
- Vapour Exit
- Coolant flow control
- Liquid Level Management throughout process
- Controlled Drainage of liquid after process
- Temperature Controlling and Monitoring of the process
- Valves control to optimally carry out the process.
- Incorporation and maintenance of safety Interlocks
- Power Source Controlling and Monitoring of all the power parameters
- Multifunction Meter communication to display the parameters in SCADA for operators
- Water Flow control with necessary interlocks.
- Pressure Monitoring in reactor and Condenser
- Liquid hydrocarbon Pump control and Mass flow controller feedback
- Data Logging, Trend Display and Report Generation for the process parameters
- Overall Controlling of the whole process as per the logic and design

5.7 Supplier shall provide storage tank, reactor tank & collector tank for storage of liquid hydrocarbon. Supplier shall obtain necessary statutory clearance for Liquid hydrocarbon storage and usage as per VSSC requirements.

5.8 Precursor transfer system: Supplier shall provide Liquid hydrocarbon transfer system including pumps, valves and associated instrumentation.

5.9 Inert gas (N<sub>2</sub>) distribution system: Supplier shall provide N<sub>2</sub> gas manifold system which houses N<sub>2</sub> gas cylinders and gas cabinet for distribution to various sub systems of the equipment.

5.10 Cooling system: Supplier shall provide Chiller, Cooling tower & dedicated manifold for distribution for chiller water/ normal water to various sub systems.

5.11 Heat exchanger (Condenser): Supplier shall provide suitable heat exchanger for condensation of hydrocarbon vapors generated during the process.

5.12 Vacuum pump: Supplier shall provide a Vacuum pump for evacuation of process chamber.

5.13 Gas sensors: Supplier shall provide Gas sensors for detection of hydrocarbon vapors in the atmosphere.

5.14 Supplier is expected to provide lead times for the supply of the equipment.

5.16 Supplier shall indicate mechanisms, procedures and arrangements for annual maintenance of the equipment.

#### Technical Specifications of FB-CVI Systems

S.No	Equipment	Specifications	Qty
1	Furnace chamber	The furnace is three segment chambers having inner diameter of 1.2 m X 1.7 m height. Liquid vapour separator is mounted on the reactor chamber. The material of construction shall be SS304L/316.	1
2	Power system	A DC programmable power supply shall be provided for heating the heater.	1
3	Precursor transfer systems.	Pumps, valves and associated instrumentation system for recirculation of liquid Hydrocarbon precursor.	1
4	Nitrogen distribution system	N <sub>2</sub> gas manifold & gas cabinet for distribution of inert gas to various sub systems shall be provided.	1
5	Vacuum pump	Vacuum pump shall be provided for evacuation of chamber	1

6	Hydraulic lift	Hydraulic lift for lifting of process job to the reactor chamber	1
7	Trolley	Trolley for positioning and movement of individual power feedthrough.	1
10	Chiller	Chiller for cooling of various sub systems of the FB-CVI furnace	1
11	Cooling tower	Cooling tower to provide normal water to various sub systems of the FB-CVI furnace	1
12	Water distribution system	For distribution of cooling water to various sub systems	2
13	Gas sensors	Hydrocarbon Gas detectors shall be provided for detecting the concentration of Hydro carbon vapors in atmosphere.	3

## 6. STATEMENT OF WORK

This section provides nature of work and the responsibilities of the vendor involved in “Design, Manufacturing, Testing, Supply, Installation, Commissioning & Training of Film Boiling Chemical Vapour Infiltration system”.

The major activities are as listed below:

- 6.1 Design , Manufacturing, Testing & Supply of Systems as per VSSC specifications
- 6.2 Assembly and testing at component level & system level
- 6.3 Transportation, Installation, Commissioning and Training of system at VSSC.



### ANNEXURE-1 (BIDDER'S PROFILE)

Sl. No.	Details Requested	Bidder's Response
1.	Name of the Company /Firm and Address :	
2.	Year of Establishment:	
3.	Status of the firm: (Whether Pvt. Ltd. Company / Public Ltd. Company / Partnership Firm/etc.):	
4.	Name of the Chairman / Managing Director /CEO (as the case may be):	
5.	Whether registered with the Registrar of Companies / Registrar of Firms in India? If so, mention number and date and enclose Registration Certificate copy:	
6.	Name and address of Bankers: A) B)	
7.	Financial Turnover of the Company/ Firm in 2016-17, 2017-18 and 2018-19: (Please attach a copy of audited Profit & Loss Account for the above three years): 2016-17: 2017-18: 2018-19:	
8.	Goods and Service Tax Registration Certificate:	
9.	Permanent Account Number ( Furnish Copies of Income tax clearance certificates):	
10.	Under which Act/ Rule the service Provider/Bidder / Tendering Company / Firm / Agency is registered	

Note: - 1. If any of the above columns are kept unfilled and not supported by documentary proof, such EoIs will be summarily rejected by the Service Receiver.

DECLARATION

I/We hereby declare that the information furnished above are true and correct to the best of my / our knowledge and belief

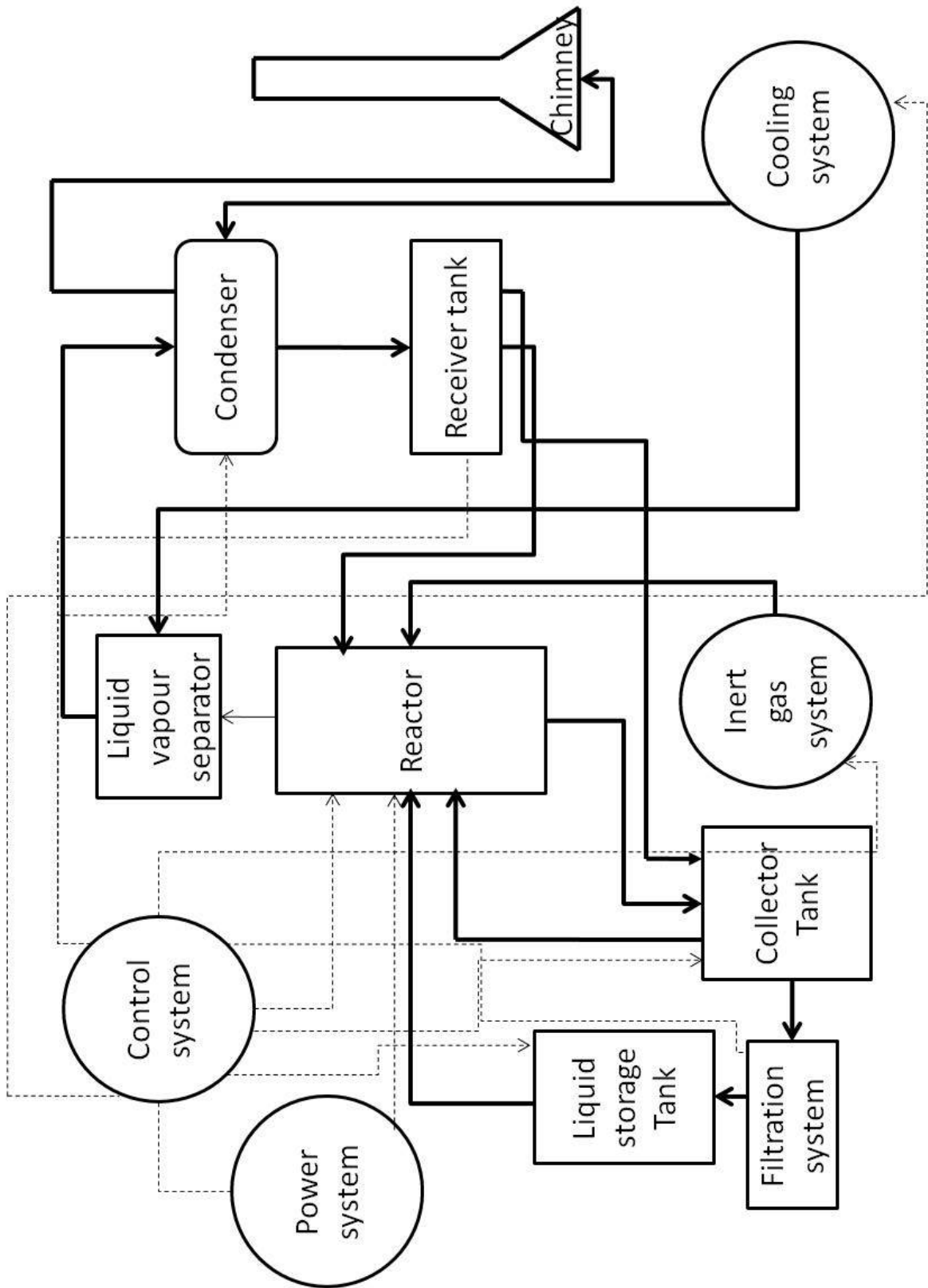
Date:.....

(Signature of Authorized Signatory with seal)

Place:.....

Name in full:

ANNEXURE - 2



**GOVERNMENT OF INDIA  
DEPARTMENT OF SPACE  
VIKRAM SARABHAI SPACE CENTRE  
INDIAN SPACE RESEARCH ORGANISATION  
THIRUVANANTHAPURAM-695022**

Ref No: VSSC/CMSE/CPSG/HPS3/EOI/2020

Date: 19.02.2020

**INVITATION FOR “EXPRESSION OF INTEREST”**

Vikram Sarabhai Space Centre, Thiruvananthapuram invites Expression of Interest **for Manufacturing of Composite motor cases of ISRO’s launch vehicles.**

Interested vendors can furnish their Expression of Interest quoting our reference No. VSSC/CMSE/CPSG/HPS3/EOI/2020 **on or before 20/03/2020 [04:00 PM]** to the following address:

**Purchase & Stores Officer  
CMSE Purchase,  
Vattiyoorkavu PO,  
Thiruvananthapuram - 695013.  
Ph: 0471-256 9290**

Sd/-  
Sr. Head, Purchase & Stores

Invitation for Expression of Interest (EoI)  
for  
Manufacturing of Composite motor cases  
of  
ISRO's launch vehicles

January 2020

VIKRAM SARABHAI SPACE CENTRE (VSSC)  
Indian Space Research Organization (ISRO)  
Department of Space, Government of India



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## Composite Motor Case – Outsourcing

### 1. OBJECTIVE OF EoI

ISRO's launch vehicles employ Composite motor cases, in its operational launch vehicle PSLV and its upcoming vehicle, SSLV. The production of these cases are currently in-house with established and qualified process.

VSSC plans to outsource the manufacturing of these cases to meet the increased launch demand of ten PSLV missions per year, and SSLV missions, which is likely to further increase in the coming years.

The objective of this EoI is to identify competent aerospace manufacturing industry to take up the manufacturing of Composite motor cases as per the process document provided by VSSC, by setting up the necessary manufacturing facility in India.

The following are the products identified for manufacturing by industry:

1. 2m class composite motor case for 3<sup>rd</sup> stage of PSLV (10 cases/year)
2. 2m class composite motor case for 2<sup>nd</sup> stage of SSLV (10 cases/year)
3. 1.6 m class composite motor case for 3<sup>rd</sup> stage of SSLV (10 cases/year)

The indicated numbers are based on current demand, which is likely to increase in coming years.

Interested Vendors with already established infrastructure or with sound financial background & commitment to establish the required infrastructure and desirous of long-term partnership with ISRO are invited to participate in the Expression-Of-Interest.

### 2. SCOPE OF WORK

2.1. Scope of work of prospective vendor:

- 2.1.1. Establishment of facilities for production, non-destructive testing, metrology, chemical testing and mechanical testing
- 2.1.2. Recruiting required manpower and getting them trained at VSSC
- 2.1.3. Procurement of raw materials identified by VSSC from the approved vendors and its acceptance testing
- 2.1.4. Realization of metallic end fittings, process tooling, fixtures, transportation containers, etc based on the guidelines provided by VSSC
- 2.1.5. Realization of first-off products at party's facility as per the process document provided by VSSC, which will be qualified through testing at Party's site with VSSC guidance
- 2.1.6. Regular production as per the process document provided by VSSC



2.2. Scope of VSSC:

- 2.2.1. Providing process document of each product and all the necessary technical know-how for the manufacturing
- 2.2.2. Providing details of necessary manufacturing and testing equipment
- 2.2.3. Providing specification and source of raw materials to be procured by party and approved vendors for metallic fittings fabrication
- 2.2.4. Providing hands-on training to manpower recruited by party at VSSC

3. MAJOR FACILITIES REQUIRED

3.1. Facility Requirement

Towards the realization, an exclusive processing facility shall be established:

Major Processing activities include winding mandrel fabrication/ assembly, machining of metallic end bosses, grit blasting, rubber lining, filament wet winding/layup, curing and skirt assembly. Support activities include raw material mechanical testing, chemical testing, NDT and Dimensional inspection, pressure testing and structural testing. Indicative machinery for these activities is listed in Sec 3.2

3.2. Major machinery and support equipment required

Activity	Facility	Machinery/Equipment
Processing related		
1.	Grit blasting Facility	Grit Blasting machine kept in enclosed space Shall handle products of size 1m X 1m X 0.5 m Automated operation preferred
2.	Specimen realization facility	i. Surface plates ii. Composite cutting tools (such as band saw, rotary cutter etc.)
3.	Sand Mandrel preparation facility	Shall have i. Sand-PVA mixer for preparation of moulding mix (60 kg mix capability) ii. Local heating hood (with capability to impart 160 deg C on sand surface ) iii. Lathe for Sand sweeping with profile template – 2m swing and length 3 m – 6 rpm nominal iv. Dust collection system

Activity	Facility	Machinery/Equipment
4.	Filament Winding Facility with spool heating chamber	Two nos. of winding machines for parallel operation: i. 2m dia. class CNC Winding Machine with 4-axis (minimum) simultaneous interpolation capability, with center-to-center distance of 3.5 m (minimum) having wet winding capability and equipped with fiber tensioning systems. Spool creel chamber shall have heating facility to heat the spools upto 100 deg C. ii. 2m dia. Class winding machine with 2-axis minimum, for making carbon prepreg for skirt layup, mandrel balancing, etc. iii. Standard Mobile Industrial dust collection system iv. Granite work tables (1.2 m X 2.4 m) v. CCTV surveillance and archival of process
5.	Resin preparation facility	i. Shall have a weighing balance with accuracy of 0.5g and capability of 3 kg. ii. Shall have plate heater of 1.5 kW capacity with a fume hood
6.	Curing Oven and Dehumidification Ovens	i. Curing oven Shall handle 3 X 3 X 4m length (product + mandrel) Temperature upto 180 deg C) Temperature uniformity: +/- 3 deg C Heating rate: controllable upto 30 deg C/ hour Data recording capability (Thermocouple : 8 channels min)  ii. Dehumidification oven for Doily For dehumidification of aramid fabric (doily) Shall be of size 1.5 L X 1 W X 1 H (in m) minimum Temperature upto 150 deg C with vacuum provision  iii. Dehumidification oven for Rovings For dehumidification of aramid rovings Shall be of size 1 L X 1 W X 1 H (in m) minimum Temperature upto 150 deg C with vacuum provision  CCTV surveillance and archival provision to be made
7.	Cold Storage facility	Shall be capable of working at -20 deg C continuously -for storage of towpregs/prepreg and intermediate process raw material: Size 3m X 2 m X 2 m
8.	Rubber processing facility	Autoclave to handle products of size 1m X 1m X 0.2 m Pressure capability: 4 bar atm. Rubber chopper and stirrer to prepare rubber solution Rubber lining tools and fixtures
Testing Related		
9.	DI facility	CMM / Laser Tracker system for dimensional inspection of the 2m class case. Any other system proposed by vendor shall be approved by VSSC before implementation Other standard dimensional measurement instruments (such as vernier, micrometer etc.)

Activity	Facility	Machinery/Equipment
10.	NDT facility	<ul style="list-style-type: none"> <li>i. Ultrasonic equipment with Dry-coupled Through-transmission capability. (Make: SONATEST or equivalent, with 10 dia. roller probes of 1.25 MHz nominal frequency). Shall employ accessories to inspect 2m dia cylindrical region (shear-ply location).</li> <li>ii. Radiography machine (LINAC) :4Mev (minimum) with handling provision for 2m class case</li> <li>iii. Film Digitizer <ul style="list-style-type: none"> <li>- 11 line pairs per mm with geometric accuracy better than 1% or two pixels)</li> <li>- Film size of 30 cm X 40 cm nominal</li> <li>- Bit depth of 8 or finer</li> </ul> </li> <li>iv. Infra-Red thermography Machine – to handle 1 m X 1m X 0.2 m rubber-lined metallic products, with following spec: FLIR-E60 Infrared camera or equivalent with the following features <ul style="list-style-type: none"> <li>- Spectral range : 7.5 - 13µm</li> <li>- Detector Type : Uncooled microbolometer</li> <li>- Field of view : 25° x 19°</li> <li>- Thermal sensitivity : 0.05°C @ 30°C</li> </ul> </li> </ul>
11.	Pressure test & Structural Test facility	<p>For hydraulic testing a volume of 6000 lit. vessel till 100 bar</p> <ul style="list-style-type: none"> <li>- Storage capacity shall be planned accordingly</li> <li>- Overhead tank capacity: 1000 lit. minimum</li> <li>- Rate of pressurization : 0.75 to 1 bar/s</li> <li>- Pressure capability: 125 bar minimum</li> </ul> <p>For structural testing, to apply tensile and compressive loads (1000 kN capability), using hydraulic power pack</p> <p>Accuracy of loading: &lt; 0.5 % of test loads</p> <p>AMLS (Automatic Loading system) for closed-loop uniform loading (tensile and compressive)</p> <p>Instrumentation (strain gauge and LVDT) and Real-time Data display, recording and data archival capability  No of channels: 50 strain channels, 20 LVDT channels  No. of channels shall be extendable for Qualification or similar tests to atleast 80 strain channels &amp; 30 LVDT channels.  CCTV surveillance and archival system during the test (minimum 10 nos)</p>
12.	Mechanical Testing Facility	<p>UTM for Raw material and Specimen Testing (10 Ton)</p> <ul style="list-style-type: none"> <li>- Standard test fixtures for carrying out NOL ring tensile test and laminate characterization tests.</li> <li>- Capability shall exist to track and record force-strain curves to establish mechanical properties of raw</li> </ul>

Activity	Facility	Machinery/Equipment
		material
13.	Chemical Testing Facility	Chemical Testing Facility to handle resin characterization The facility shall have essentially: i. Viscometer - Evaluation of viscosity to 5000 cPs with temperature range upto 100 deg C, ii. Weighing balance – Evaluation of specific gravity, Capacity; 200 g, Accuracy: 0.1 mg iii. Oven– Gel time evaluation , Size: 300 mm X 300 mm X 300 mm, Temperature: RT to 200 deg C iv. Resin evaluation for epoxy content v. Hardener evaluation for amine content, moisture content, flash point and insoluble content
Handling Related		
14.	Product and Tool handling	Crane – 5 ton Total nos. to be planned based on plant layout Fork Lift – 3 ton (battery operated)
Metallic components related		
15.	Forging, Machining, Surface coating etc	For realization of End bosses and Skirt ring. i. CNC Lathe of 1m class and Vertical Turning Machine of 2m class. ii. Surface coating facility (Anodization) for anodizing end bosses and skirt ring. iii. Heat treatment facility (Annealing) of the metallic systems iv. The realization shall be by the vendor or through sub-contracting v. Drilling machine vi. Dye-Penetrant facility
16.	Calibration facility	For equipments, instruments etc.
17.	Generator	To ensure uninterrupted Winding & Testing

**Important Note:**

- a. Typical area envisaged for facility build-up accommodating storage and processing is expected to be 2500 m<sup>2</sup> including AC bay of 700 m<sup>2</sup>. Facility shall have 8m height crane hook for vertical handing of product and related accessories. Vendor shall independently assess and establish the same. BARC clearance will be mandatory for X-ray facilities as per norms. Safe distance shall be provided between facilities like Processing, X-ray, Pressure test facility etc. as per industrial safety norms
- b. Adequate provisions should be planned for handling and storage of raw materials, in-process products and final products.
- c. The vendor shall mandatorily have/plan-to-establish following facilities In-House
  - i. Specimen preparation
  - ii. Filament winding facility

- iii. Sand Mandrel facility
- iv. Grit blasting facility
- v. Curing and De-humidification Ovens
- vi. Cold storage
- vii. CMM / Laser Tracker system /Equivalent dimensional inspection system
- viii. Pressure test and structural load test facility
- ix. Drilling facility

Sub- contracting of above activities is not acceptable.

d. Activities that can be sub-contracted

- i. Mechanical testing
  - ii. Chemical testing
  - iii. NDT – IR Themography, UT & Radiography
  - iv. Instrumentation for testing and Data acquisition
  - v. Metallic fitting realization
  - vi. DP (Dye-Penetrant) test facility
  - vii. Metallic fitting anodization facility
  - viii. Calibration activities
- e. It is preferred to have the sub-contracted facilities in the vicinity of manufacturing facilities. In case the party plans to outsource these activities, it should be with the concurrence of VSSC. However, the responsibility of meeting the quality requirement and delivery schedule lies with the party.
- f. Any equivalent system proposed by vendor, as an alternate, shall be implemented only with approval of VSSC
- g. No financial support shall be provided by VSSC for facility build-up or equipment realization at Vendors site. Payment shall be purely based on accepted products supplied.

#### 4. BRIEF DESCRIPTION OF PRODUCTS TO BE MANUFACTURED

The product is a prestigious component of proven PSLVs. It is used in 3<sup>rd</sup> stage of the vehicle to hold the solid propellant and act as a pressure vessel.

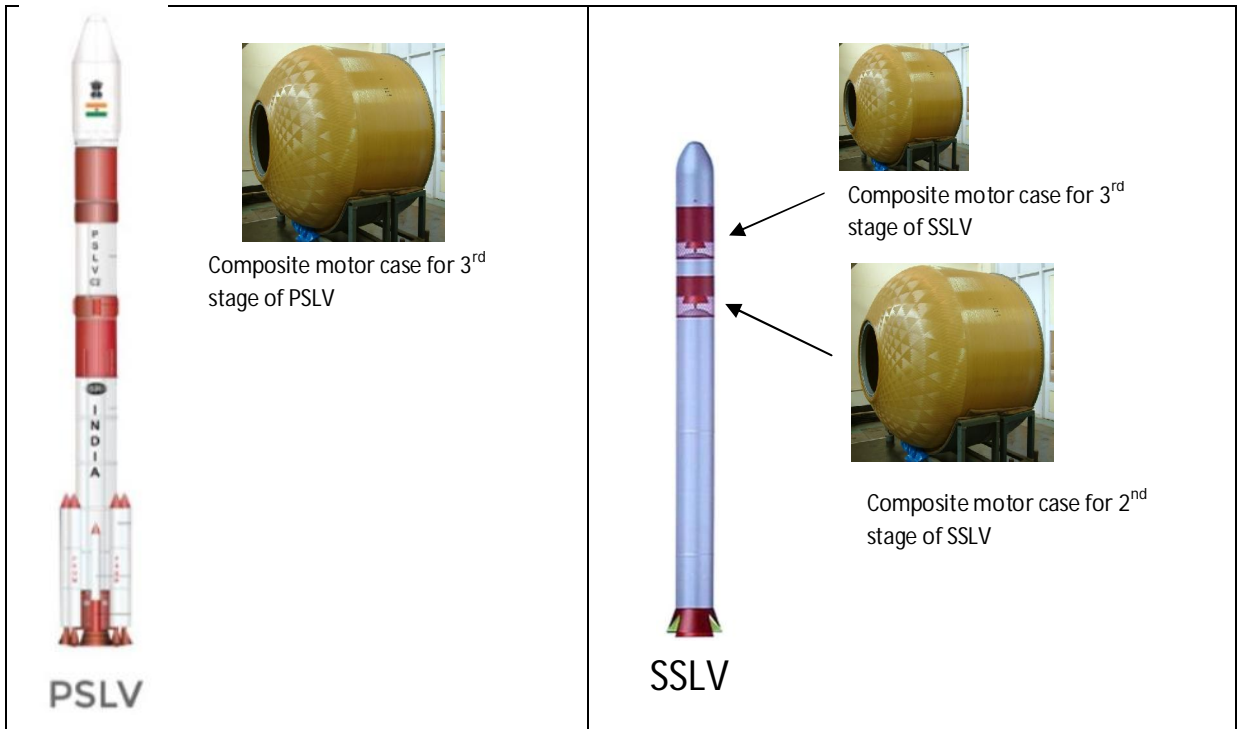


Figure 1: 2m Class Filament Wound Composite Motor cases for ISRO's Launch Vehicles

Typical view of the product with major features are listed in figure below.

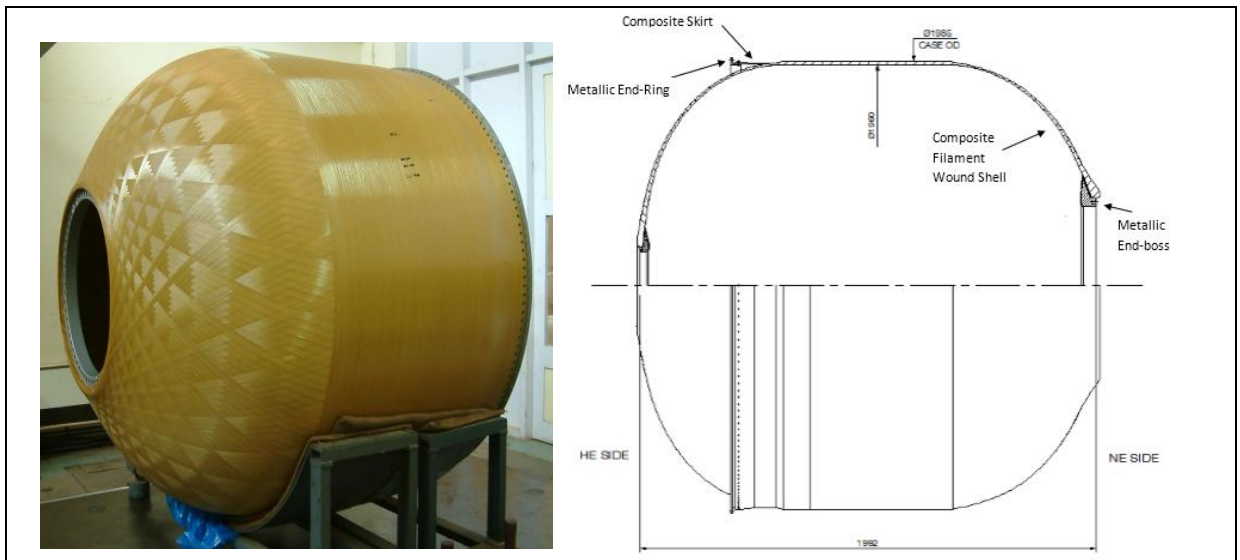


Figure 2: Typical configuration of Composite Motor case

The configuration is a Cylinder with Dome ends, realized by wet filament winding of high strength aramid rovings impregnated with epoxy resin, over a collapsible mandrel. The case has openings at either ends supported by metallic end bosses, namely, Nozzle End Boss

(NEB) and Head End Boss (HEB). The opening sizes are typically 700 mm and 300 mm respectively.

The build of the case is made of two major components: the Shell and the Skirt.

- a. Shell - is the pressure vessel part that is built by combination of Helical and Hoop layers, with Doily layers manually laid in the dome regions between each helical layers.
- b. Skirt – is the extension provided on the cylindrical portion of the shell, to act as interface with vehicle. It is built-of carbon-epoxy layer which are manually laid at pre-defined angles, and consolidated at regular intervals with hoop winding. The end of the skirt is provided with a metallic ring that is fastened to the skirt by radial screws.

## 5. BRIEF DESCRIPTION OF PROCESS

The filament wound case is realized by a sequence of controlled processes, with interludes of quality checks namely ‘stage clearances’ that ensure the compliance of process with quality checks, before advancing to subsequent stage. The typical process flow is listed:

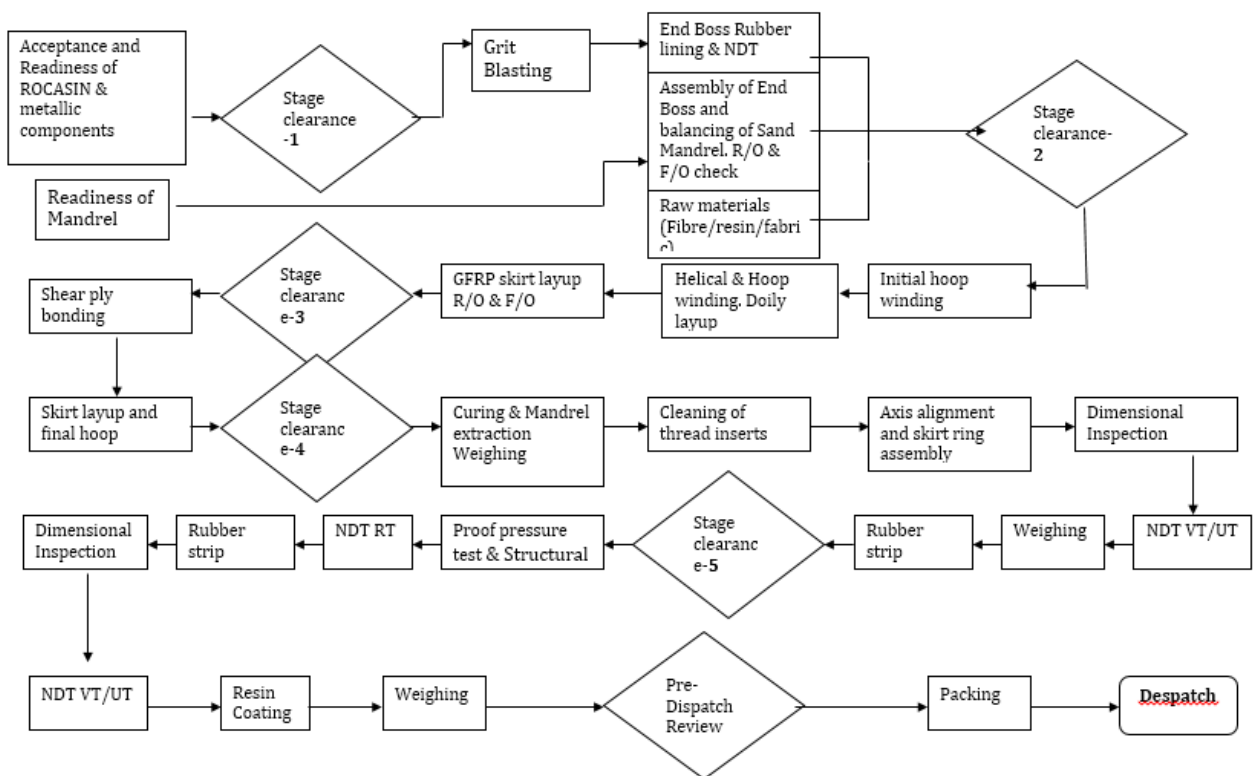


Figure 3: Typical Process flowchart

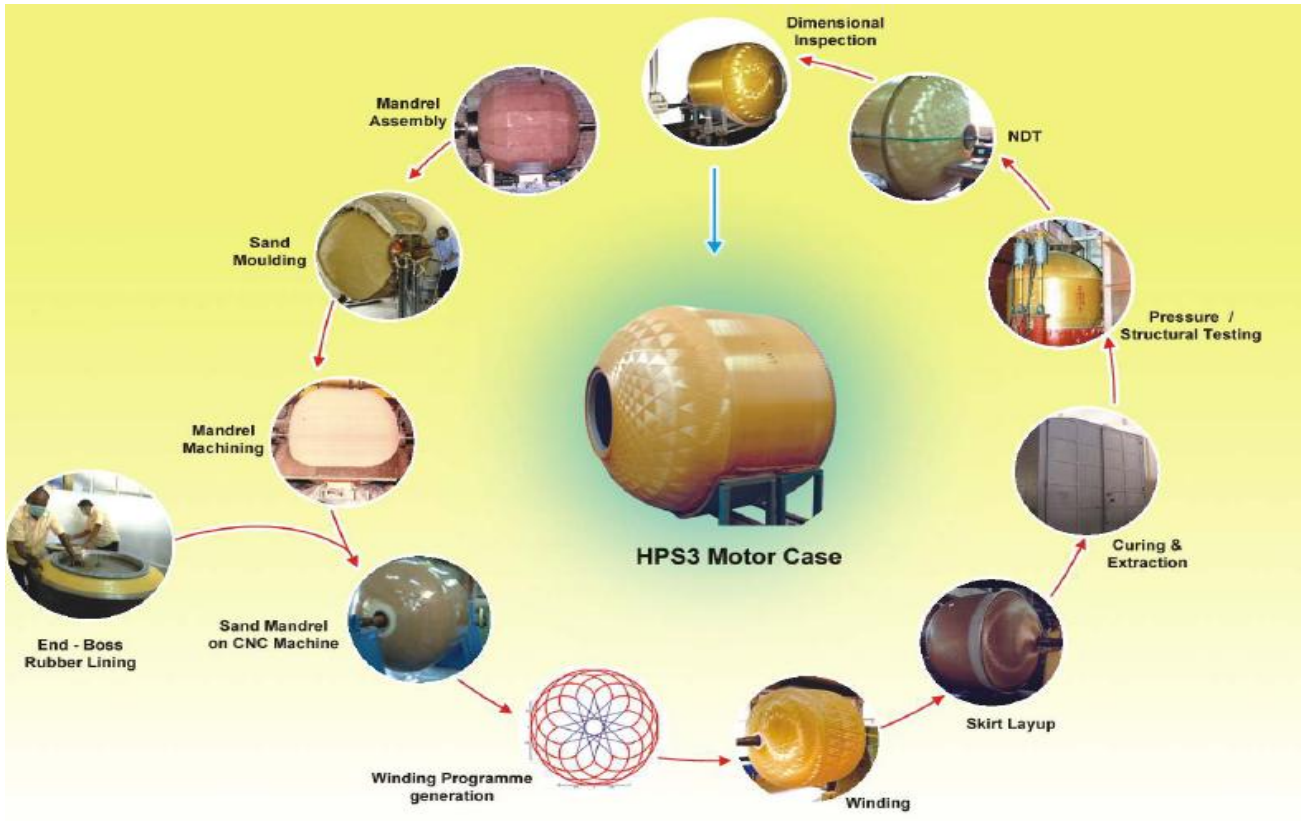


Figure 4: Typical Process Flow

### 5.1. Sand Mandrel Realization:

The winding mandrel is typically made with Collapsible Sand mandrel. A central shaft with rings in head end and nozzle end side acts as the support for building a metallic petal assembly. The sand is casted in sectors over this, and cured by local heating with a Heating hood. PVA is used as the binder for sand. After the entire surface is casted, the required profile is machined using a sweeping template, and rotating the mandrel in a lathe.

### 5.2. End boss rubber lining:

End boss lining is carried out by sequential placement of raw rubber to required thickness, supported in metallic moulds. It is finally cured in an autoclave. The integrity of bond is verified by IR thermography

### 5.3. Winding & skirt layup:

After locating the rubber-lined end boss on the sand mandrel and setting geometrical conditions (run-out, face-out, length etc.), the winding is carried out by combination of Helical, Hoop and Doily layup



till required thickness is built. Skirt mandrel is employed to locally build the skirt extension with carbon-epoxy hand layup.

#### 5.4. Curing and Extraction:

Curing is carried out in an oven with product temperatures monitored by thermocouples. The collapsible sand mandrel is subsequently removed to extract the case.

#### 5.5. Ring setting & Skirt ring assembly:

The skirt ring is aligned to the cured motor case and fixed to the skirt by combination of wet bonding and using fasteners. Skirt ring and composite skirt is match drilled and skirt ring is threaded to accommodate the fasteners.

#### 5.6. Dimensional Inspection and NDT:

The case is inspected in a CMM and Non-destructive techniques are employed to assess the case health using UT at shear-ply region, NDT-RT along the case tangents and Visual inspection. The same operations are repeated after the structural acceptance tests, to assess the integrity of the case.

#### 5.7. Structural Acceptance Tests :

The case is subjected to Proof pressure test and structural load tests in tension and compression, as part of case acceptance. The real-time health is monitored using strain gages and LVDTs.

After all above operations, the case will be cleared for dispatch based on successful compliance with acceptance criteria in each stage of processing.

## 6. MAJOR PROCESS TOOLINGS AND SUPPORT FIXTURES INVOLVED

The process toolings are an integral part of case realization and define the quality of the final product. The typical tooling involved in processing activity is listed in the following table:

Activity	Tools/Fixtures
Processing Related	
1.	Winding Mandrel (petal assembly, sweeping template, inspection template)
2.	Skirt Mandrel
3.	Rubber lining Moulds for End-bosses

4.	Extension adaptors for end-bosses
5.	Kevlar/Aramid cutting tools, Air compressor, Industrial vacuum cleaner, Weighing balances of various capacity
6.	Extraction fixture
Handling related	
7.	Lifting frame for handling with crane
8.	Transportation Trolley for movement of product within facilities
9.	Transportation container for movement between centres
10.	Fixtures for horizontal and vertical handling such as Saddles, vertical support trolleys etc
11.	U-stands
Testing Related	
12.	Raw material test fixtures like NOL mandrels, Laminate making fixtures etc.
13.	Pressure test closure plates at both NE and HE ends
14.	Rubber bladder
15.	Base Platform
16.	Loading Adapter
17.	Interface adapter
18.	Loading Column

**Note:**

- i. Each motor case requires a specific winding mandrel for filament winding. The vendor shall realize each of the mandrels in adequate numbers as per the mandrel drawing/design provided by VSSC.
- ii. Fixtures are required at various phases of realization, for rubber moulding, handling, testing, etc. The vendor shall realize each of these fixtures as per the fixture drawing/design provided by VSSC.
- iii. The vendor shall also realize transportation containers for safe handling of finished products to the place specified by VSSC, in adequate numbers.
- iv. It may be specifically noted that process toolings of composite motor case for 2<sup>nd</sup> stage of SSLV is interchangeable with composite motor case for 3<sup>rd</sup> stage of PSLV to maximum extent. However, the process toolings of 3<sup>rd</sup> stage of SSLV are different.

## 7. QUALITY REQUIREMENT

7.1. Maintaining necessary quality control during manufacturing is the responsibility of the vendor

- 7.2. The manufacturing shall be strictly as per the process document provided by VSSC
- 7.3. Considering process intensive nature of composites in general and the nature of filament wound products in particular, strict online quality monitoring is mandatory. VSSC may depute resident engineers for online quality surveillance.
- 7.4. VSSC will conduct periodic quality audit for verifying adherence to the quality protocols.

## 8. DELIVERY SCHEDULES

The vendor should be able to meet the delivery schedule as follows:

- 8.1. The procurement of raw materials and commissioning of the facilities should be completed within a period of 18 months from the date of order placement
- 8.2. First-off products should be delivered within 24 months from the date of order placement
- 8.3. Subsequent to clearance for regular production, products shall be delivered at regular intervals as follows:
  1. 2m class composite motor case for 3<sup>rd</sup> stage of PSLV: 1 case every 35 days
  2. 2m class composite motor case for 2<sup>nd</sup> stage of SSLV: 1 case every 35 days
  3. 2m class composite motor case for 3<sup>rd</sup> stage of SSLV: 1 case every 35 days

## 9. VENDOR EVALUATION CRITERIA

The following are the essential criteria to be fulfilled by the vendor:

- 9.1. Should be an aerospace manufacturing industry having at least three orders worth 1 crore or more in the past three years
- 9.2. Should have experience and facilities for general composite manufacturing
- 9.3. Should have healthy financial conditions with minimum turnover of 10 crores consistently for past 3 years."
- 9.4. Should have the ability to invest large capital (more than 50 crores) over long term (more than 3 yrs)
- 9.5. Should have end-to-end capability for
  - i. Planning/identifying and procurement of manufacturing equipment
  - ii. Design and realization of tooling
  - iii. production planning and process control
  - iv. independent quality control system
  - v. qualified and calibrated inspection/testing facilities

- 9.6. Should have adequate and competent manpower to take up aerospace manufacturing of similar complexity
- 9.7. Should setup the essential manufacturing facilities in India under one-roof listed in Section 3, as well as identify VSSC approved vendors for sub-contracting

Vendors who express interest will have to mandatorily visit VSSC on a mutually convenient date and present their interest and capabilities to meet above requirements. A compliance chart will be provided subsequently for the party to provide the requisite proofs and demonstrating compliance to the mentioned evaluation criteria.

VSSC also reserves the right to visit the party and verify the proofs for the claims made by the party for meeting the vendor evaluation criteria.

## 10. OTHER REQUIREMENTS

- **Safety**

The Vendor shall follow all safety stipulations as per approved industrial practice.

- **Secrecy**

The contractor/supplier shall take all reasonable steps necessary to ensure that all persons employed in connection with the Purchase Order/Contract have full knowledge of the Official Secrets Act and the regulations framed there under.

- **Patents & Patent Rights Indemnification**

- All specifications, drawings, patents and such other relevant information furnished by the Centre/Unit to the contractor/supplier shall be the property of the Centre/Unit. If, during the process of execution of the Purchase Order/Contract, any improvements, refinements, technical changes, modifications, etc., are effected by the contractor/supplier, such changes shall not affect the title of the Centre/Unit to that property.
- The Centre/Unit shall have the absolute right to assign, transfer, sublet, use and transmit all such modified drawings, specifications, patents, proto-types, etc., to any third party and the contractor/supplier shall not have any claim or right whatsoever in respect of such modified drawings, specifications, patents, proto-types, etc.

- **Grievance Redressal and Arbitration**

The arbitration proceedings would be subject to the provisions of the Arbitration & Reconciliation Act, 1996, and the Rules framed there under.

- **Jurisdiction**

Subject to the Arbitration clause, the Courts in whose territorial jurisdiction the Centre/Unit is located shall be competent to deal with any matter arising out of the

Purchase Order/Contract.

## 11. SUBMISSION OF EoI

Interested vendors who understand the technical requirements as mentioned in this document and confirm their eligibility to the evaluation criteria given in section 9 are requested to express their interest to take up this manufacturing activity.

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