



भारत सरकार/GOVERNMENT OF INDIA
अंतरिक्ष विभाग/DEPARTMENT OF SPACE
विक्रम साराभाई अंतरिक्ष केंद्र/VIKRAM SARABHAI SPACE CENTRE
तिरुवनंतपुरम/THIRUVANANTHAPURAM – 695 547

विज्ञापन संदर्भ सं. /Advt Ref No: VSSC/MVIT PUR/EOI/02-2024 तिथि /Date : 19/03/2024

विक्रम साराभाई अंतरिक्ष केंद्र [वीएसएससी], भारत सरकार, इसरो के प्रमोचन यान उपयोग हेतु "वीएसएससी में संविदाकार्यान्वयन की गोको विधा में पीएसएलवी और एलवीएम3 चरणों/उप समुच्चयनों के एकीकरण एवं परीक्षण" के लिए देश के अंदर के इच्छुक फर्मों से रुचि की अभिव्यक्ति आमंत्रित करता है।

Vikram Sarabhai Space Centre [VSSC], Govt. of India, invites Expression of Interest from interested firms within the country for "Integration and Testing of PSLV and LVM3 stages/sub assemblies" in GOCO mode of contract execution at VSSC for launch vehicle usage of ISRO.

विस्तृत निबंधन एवं शर्तें और जांचसूची हमारे वेबसाइट www.isro.gov.in तथा www.vssc.gov.in पर उपलब्ध हैं।

Detailed Terms & Conditions and Check list are available in our website www.isro.gov.in and www.vssc.gov.in .

इच्छुक प्रत्याशित निर्माता हमारे संदर्भ सं. 7092 2023 00 6155 01 का उद्धरण करते हुए 18/04/2024 को उपराह्न 3 बजे तक या उससे पहले निम्नलिखित पते पर अपनी अभिरुचि की अभिव्यक्ति प्रस्तुत कर सकते हैं ।

Interested parties can furnish their Expression of Interest quoting our reference No. 7092 2023 00 6155 01 on or before 18/04/2024; Time : 3pm to the following address

वरिष्ठ क्रय एवं भंडार अधिकारी,
Senior Purchase and Stores Officer,
क्रय यूनिटIV, एमवीआइटी, वीएसएससी,
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नियत तिथि और समय के बाद प्राप्त कोटेशनों को विलंबित निविदा मान जाएगा और आगे की प्रक्रिया के लिए विचार नहीं किया जाएगा।

Quotations received after the due date and time will be treated as late tenders and will not be considered for further procedure.

ईमेल/फैक्स द्वारा प्रस्तुत प्रस्ताव स्वीकार नहीं किया जाएगा। कोटेशन केवल डाक के माध्यम से प्रस्तुत किया जाना है। **OFFER SUBMITTED BY EMAIL / FAX WILL NOT BE ACCEPTED. Quotation is to be submitted through Speed Post only.**

हस्ताक्षरित/Sd/-

वरि. क्रय एवं भंडार अधिकारी/Sr. Purchase & Stores Officer

योग्यताप्राप्ति-पूर्वमानदंड/Pre-qualification criteria

1. बोली लगानेवालेको निम्नलिखित सूचनाएं प्रदान करनी चाहिए/The bidder shall provide
 - (a) आपकी फर्म/एन्टिटी की पृष्ठभूमि और संगठन का संक्षिप्त वर्णन।
A brief description of the background and organization of your firm/entity.
 - (b) पिछले तीन वर्षों की लेखापरीक्षित लेखा के आधार पर कंपनी की सालाना बिक्री।
The turnover of the company on the basis of the audited accounts of the previous three years.
 - (c) पिछले तीन वर्षों की आयकर विवरणी की प्रतिलिपि प्रदान की जानी चाहिए।
Copy of the last three years Income Tax returns shall be provided.
 - (d) जीएसटी सं. /GST No.

2. बोली लगानेवाले को निर्माता से वैध प्राधिकरण प्रमाणपत्र प्रदान करना चाहिए कि वे हमारे इलाके में इन सामग्रियों का प्रधिकृत व्यापारी/वितरक/एजेंट हैं।
The bidders shall provide valid authorization certificate from the manufacturer that they are the authorized dealer / distributor /agent for the items in our locality.

3. आपका पूर्वानुभव/Your previous experience:

किसी सरकार/पीएसयूओं द्वारा आपको दिए गए क्रय आदेशों की प्रतिलिपियों को भी संलग्न किया जाना चाहिए।
Copies of Purchase Orders awarded to you by any Government/PSU's shall also be attached.

4. मेक इन इंडिया नीति के अनुसार केवल श्रेणी I और श्रेणी II के स्थानीय आपूर्तिकार ही इस बोली में भाग लेने हेतु पात्र हैं।
Only Class I and Class II Local suppliers as per Make in India Policy are eligible to participate in the bid.

5. विदेशी विक्रेताओं को कोटेशन देने की अनुमति नहीं है।Foreign vendors are not permitted to quote.

6. प्रस्ताव में, ब्रेक-अप और स्थान संबंधी ब्यौरों के साथ, स्थानीय सामग्री के प्रतिशत का विशेष उल्लेखहोना चाहिएजिसके अभाव में प्रस्ताव को सरसरी तौर पर अस्वीकृत किया जाएगा।
The percentage of Local content should be specifically mentioned in the offer, with break-up and location details without which it will be summarily rejected.

7. श्रेणी I के स्थानीय आपूर्तिकारों को वरीयता दी जाएगी और उनके अभाव में, श्रेणी II के स्थानीय आपूर्तिकारों पर विचार किया जाएगा।
Preference will be given to Class I Local Supplier and in their absence, Class II Local Suppliers will be considered.

 8. नामिकायन की वैधता संविदा की प्रभावी तिथि (ईडीसी) से 2 वर्ष है जिसे आपसी करार के आधार पर एक और वर्ष के लिए बढ़ाया जा सकता है।
Validity Period of Empanelment is 2 years from the effective date of contract (EDC) which can be extended for further one more year based on mutual agreement.

 9. जिन विक्रेताओं की ईओआइ टीईसी द्वारा योग्यताप्राप्त हैं, हमारी अपेक्षा के आधार पर, उनके नाम एनआइटी (निविदा आमंत्रण करते हुए सूचना) जारी की जाएगी।
NIT (Notice Inviting Tender) will be issued to vendors whose EOI are qualified by the TEC, based on our requirement.
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Invitation for Expression of Interest

Vikram Sarabhai Space Centre (VSSC) proposes to invite Expression of Interest (EoI) for “Integration and Testing of PSLV and LVM3 stages/ subassemblies in GOCO mode of contract execution at VSSC for launch vehicle usage of ISRO”.

The objective of this EoI is to short list industries [hereafter referred as industry] who are technically suitable for the “Integration and Testing of PSLV and LVM3 stages/ subassemblies in GOCO mode of contract execution at VSSC for launch vehicle usage of ISRO”. The period of contract will be for 3 (three) years from the effective date of contract (EDC), which can be extended for further 2(two) more years based on mutual agreement. The number of missions scheduled for each year are approximately 4 to 6 nos. of PSLV missions and 2 to 3 nos. of LVM3 missions as per the manifest of ISRO.

Industry shall be a reputed agency with adequate experience in the field of integration and testing of aerospace systems involving electrical cable harness , avionic packages, aerospace mechanical structures, assembly operations of aerospace structures and conversant with essential aerospace harness realisation and testing practices of electronics, which are vital in the integration activities. The industry shall be a single entity and consortium of industries is not allowed. The primary/leading vendor shall be an Indian company, registered in India.

For those parties whose EoI is qualified, a pre-bid (for submitting the technical and commercial 2-part tender) meeting will be arranged after final date of EoI. The time and venue will be intimated to the parties well ahead.

EoI document can be downloaded from website www.isro.gov.in and the same shall be submitted after filling all the necessary information within the due date and time. This EoI is issued as a "Pre-bid qualification. Inadequate or incomplete information will result in rejection of the offer. VSSC reserves the right to accept or reject all or any of the EoI. Mere compliance to the EoI terms does not guarantee further consideration for qualification.

Addendum, if any, to this EoI shall be hosted in our website www.isro.gov.in.

The Tender No., due date and time should be explicitly superscribed in the envelope.

For any clarification : **Email:** sps0_mv1t_pur@vssc.gov.in/ps0_mv1t_pur@vssc.gov.in

Due date extension request and last minute clarification will not be entertained.

As there are security restrictions, Courier personnel may not be permitted to enter the Office premises. So it is advised to use the support of India Post.

Integration and Testing of PSLV & LVM3 Sub-assemblies at VSSC Facilities

Call for Expression of Interest



March 2024
VIKRAM SARABHAI SPACE CENTRE
THIRUVANANTHAPURAM

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ABBREVIATIONS

VSSC	: Vikram Sarabhai Space Centre
PSLV	: Generic Polar Satellite Launch Vehicle
PSLV – CA	: Polar Satellite Launch Vehicle – Core Alone
PSLV – XL	: Polar Satellite Launch Vehicle with XL Strap-on Motors
LVM3	: Launch Vehicle Mark 3
L110	: Liquid Booster stage of LVM3 of 110T
MVIT	: Mechanisms, Vehicle Integration & Testing Entity
TERLS	: Thumba Equatorial Rocket Launching station.
PSOM	: PSLV Strap-On Motor
PS1	: First Stage of PSLV
PS2	: Second Stage of PSLV
PS3	: Third Stage of PSLV
PS4	: Fourth Stage of PSLV
EB	: Equipment Bay
IS	: Inter Stage (L: Lower, M: Middle, U: Upper)
CBS	: Core Base Shroud
TF	: Thrust Frame
SAU	: Stub Adapter Upper
FAT	: Flight Acceptance Test
FIM	: Free Issue Material
QC	: Quality Control

1 Introduction

Vikram Sarabhai Space Centre (VSSC) is responsible for realization of Launch Vehicles of ISRO. Realization of flight sub-assemblies which involve integration (mechanical and electrical) and check out of all launch vehicles of ISRO are presently being carried out at VSSC. The activities are carried out using in-house facilities located in Thiruvananthapuram, Kerala.

To meet this demand, it is proposed to outsource the integration & testing of some of the in-house sub-assemblies to industries who can carry out the integration & testing activities at VSSC facilities. The mode of operation will be GOCO-Government Owned Company Operated. All the required facilities will be provided by the department within the campus of VSSC while the identified activities have to be carried out by the industry.

The objective of this EoI is to short list parties having experience in Aerospace / Defence with end to end mechanical & electrical preparation & testing of sub-assemblies [hereafter referred as party] who are technically suitable for the "realization of avionic subassemblies of PSLV and LVM3 for launch vehicle application of ISRO". The period of contract will be for 2 (two) years from the effective date of contract (EDC), which can be extended for further one more year based on mutual agreement. Based on the demand for launch services, the launch frequency of PSLV is expected to be 4 - 8 launches and the launch frequency of LVM3 is expected to be 3-6 launches in a year.

2 Launch Vehicles

PSLV

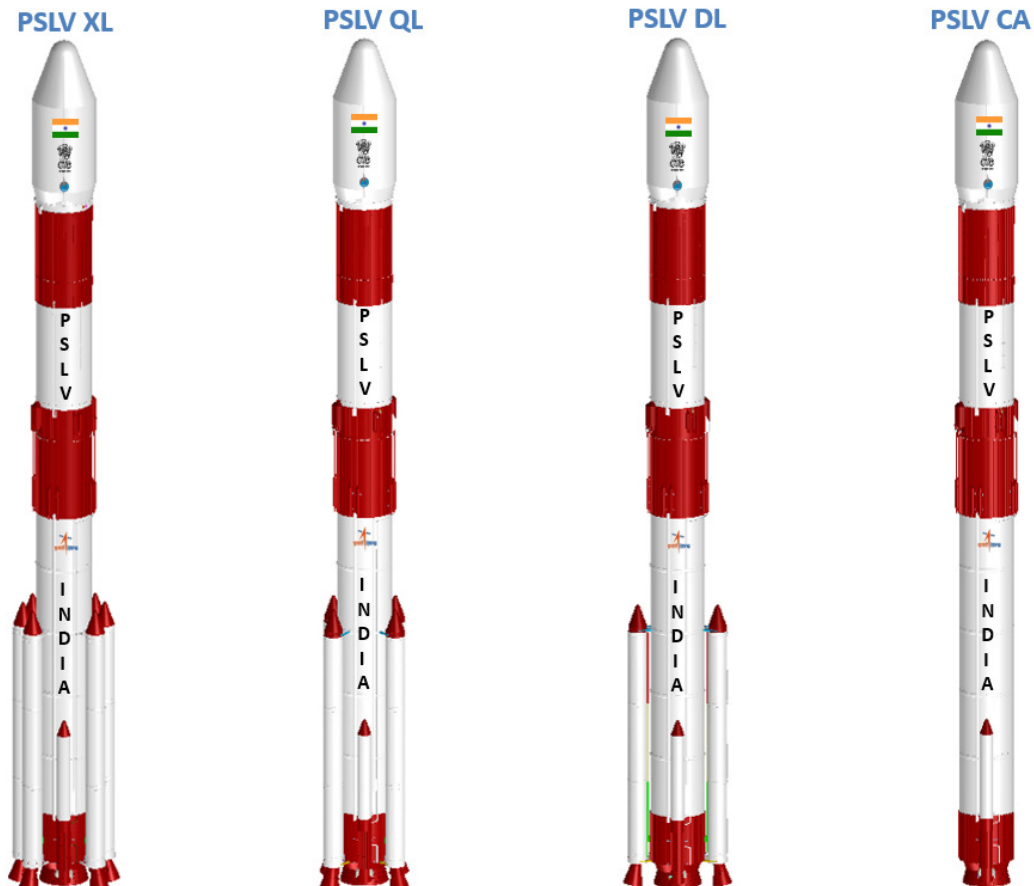
Polar Satellite Launch Vehicle (PSLV) is a launch vehicle developed and operated by the Indian Space Research Organization (ISRO). It was primarily developed to launch Indian Remote Sensing (IRS) satellites into Sun Synchronous Polar Orbits (SSPO). It has proven its worth in launching variety of satellites into SSPO. Further, it has demonstrated its capability for Geo-Transfer missions and used to launch small-medium sized payload satellites into elliptical Geostationary Transfer Orbit (GTO) and circular orbits with varying inclinations. PSLV has the capability to launch 1750 kg in SSPO at 500 km and 1425 kg in sub GTO mission (280 x 20650 km).

With the repeated successful missions over the years PSLV has proven to be versatile and a reliable operational launch vehicle of ISRO. PSLV has a full-fledged end-to-end launch service management and has launched numerous foreign and Indian satellites including several dedicated commercial launches. PSLV today is one of the sought out vehicles to launch a variety of satellites equipped to perform wide

range of applications viz. communication, geographical survey, navigation, inter planetary missions etc. PSLV has successfully launched scientific missions involving Chandrayaan-1, Mangalyaan, Astrosat and the recent Aditya-L1, which demonstrated India’s capability and placed the country among leading space faring nations of the world. PSLV has 4 basic configurations as indicated below, which is determined by the mission definition.

Versions of PSLV		
Designation	Variant	Description
PSLV – CA	Core Alone	Core vehicle without any strap-on boosters
PSLV-DL	DL	Core vehicle with two numbers of S12 strap-on boosters
PSLV-QL	QL	Core vehicle with four numbers of S12 strap-on boosters
PSLV – XL	XL	Core vehicle with six numbers of S12 strap-on boosters

Currently PSLV has four operational variants as described below.

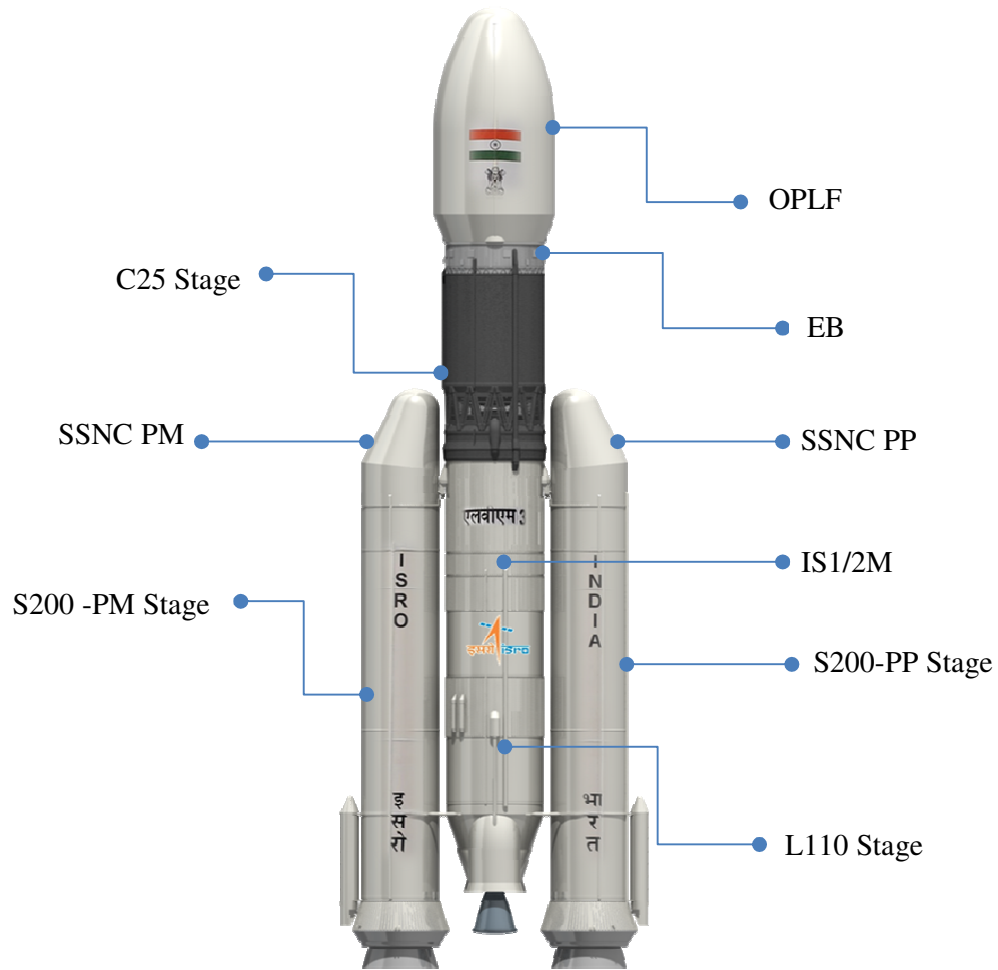


PSLV is a four stage vehicle with alternate solid and liquid propulsion modules. It stands 44 metres tall and weighs approximately 320 tones (XL variant). The first stage employs solid-fuel rocket booster (S 139) and none to six strap-on motors (depending on the variant). The second stage powered by Vikas engine uses Earth storable liquid propellants. The third stage uses solid propellant. The fourth stage has a twin engine configuration with liquid propellants. The Satellite or payload is mounted over a Payload Adaptor and is covered using Payload Fairing which protects the spacecraft and Vehicle Equipment Bay during the vehicle's ascent phase through the atmosphere.

LVM3

With the successful operationalization of PSLV and Geo-Synchronous Launch Vehicle (GSLV), ISRO got established as one of the most reliable, yet cost effective space systems providers to the nation, as well as to the international customers. Together with PSLV and GSLV, the requirements for communication spacecraft up to 2.2 tons in Geosynchronous Transfer Orbit (GTO) can be met with. The development of LVM3 was proposed as a logical next step in enhancing the payload capability to 4 tons and above, towards meeting our national requirements, for launching heavier satellites as well as to offer cost effective launch services to the international customers.

LVM3 is configured as a three stage vehicle with two solid strap-on motors (S200), one liquid core stage (L110) and a high thrust cryogenic upper stage (C25/C32). The S200 solid motor is among the largest solid boosters in the world with 204 tonnes of solid propellant. The liquid L110 stage uses a twin liquid engine configuration with 115 tonnes of liquid propellant, while the C25/C32 Cryogenic upper stage is configured with a fully indigenous high thrust cryogenic engine (CE20) with a propellant loading of 28 tons. The overall length of the vehicle is 43.5 m with a gross lift-off weight of 640 tonnes and a 5m-diameter payload fairing.



LVM3 Vehicle configuration

Vehicle Specifications

<i>Height</i>	: 43.5 m
<i>Vehicle Diameter</i>	: 4.0 m
<i>Payload Fairing Diameter</i>	: 5.0 m
<i>PLF Usable Volume</i>	: 110 m ³
<i>Number of Stages</i>	: 3
<i>Lift Off Mass</i>	: 640 tonnes

2.1.1 Sub-Assemblies of PSLV

The following are some of the major sub-assemblies of PSLV that are currently being realized by VSSC.

Sl.no.	Stage	Subassemblies	Vibration test
1	First stage (PS1)	Core base Shroud (CBS)	YES
2		Strapon Avionic decks and cable interfaces (PSOM)	NO
3		Interstage 1/2L (IS 1/2L)	NO
4		Cable interfaces for Wire Tunnel , RCT, SITVC tankages and torroid (RCT, SITVC, WT)	NO
5	Second stage (PS2)	Thrust Frame (TF)	NO
6		Inter Stage 1/2 Upper (IS 1/2U)	NO
7		Inter Stage 2/3 Lower (IS 2/3L)	YES
8		Inter Stage 2/3 Upper (IS 2/3U)	NO
9		Cable harness for Wire Tunnel , PS2 Engine (ENG)	NO
10	Third stage (PS3)	PS3 Adaptor (PS3A)	YES
11	Fourth Stage (PS4)	PS4 stage + Equipment Bay (EB)	YES
12		Payload launch Adaptor (PLA)	NO

Total number of sub-assemblies: 12 Nos .

Subassemblies for vibration FAT- 4 nos.

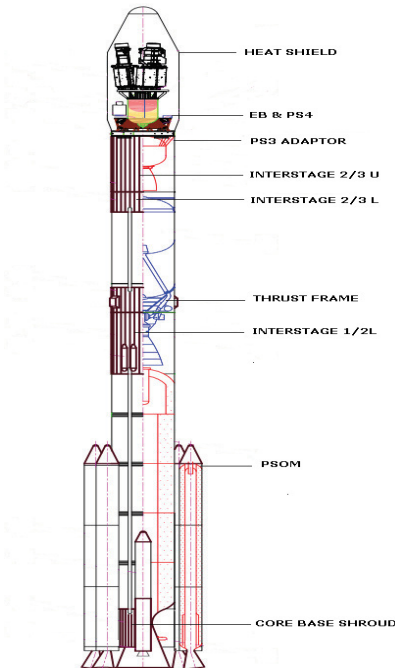


Figure 1: PSLV Generic vehicle configuration with sub-assemblies

Out of the 12 sub-assemblies 4 of them undergo Flight Acceptance Vibration Test (FAT) before transportation from VSSC to other ISRO centres. All other subassemblies are realized at VSSC and these subassemblies undergo electrical tests as standalone subassemblies or along with other subassemblies. The subassemblies identified as stage harnessing cable interfaces like Wire Tunnels, Engines, RCT/SITVC Stages are also to be realized and interconnected with the related stage subassemblies during the electrical tests. The FAT is done at the facility of VSSC and for the tests, the subassemblies will be moved to the facility and Vibration tests (in all 3 axes) is done as per the requirements. Electrical tests will be carried out as part of Vibration FAT tests and the FAT requirements of subassembly hardware are mentioned in the table.

To meet the target of increased launch frequency of PSLV, it is proposed to outsource the responsibility of realizing and testing the above twelve sub-assemblies to Indian industries.

2.1.2 Sub-Assemblies of LVM3

The following sub-assemblies of LVM3 are currently being realized by VSSC.

Sl.no.	Stage	Subassemblies
1	S200 stage (S200 PP)	Strap on Base Shroud (SBS)
2		Strap on Thermal Shroud (STS)
3		Strap on EMA Structure (SES)
4		Nose Cone Adaptor (NCA
5		Nose Cone Avionics Deck (NCD)
6		Slanted S200 Nose Cone Bottom Cone (SSNC-BC)
7		Slanted S200 Nose Cone Top Cone (SSNC-TC)
8		Cable interfaces for Wire Tunnel (WT)
9	S200 stage (S200 PM)	Strap on Base Shroud (SBS)
10		Strap on Thermal Shroud (STS)
11		Strap on EMA Structure (SES)
12		Nose Cone Adaptor (NCA
13		Nose Cone Avionics Deck (NCD)
14		Slanted S200 Nose Cone Bottom Cone (SSNC-BC)
15		Slanted S200 Nose Cone Top Cone (SSNC-TC)
16		Cable interfaces for Wire Tunnel (WT)
17	L110 stage (L110)	Core Base Shroud (CBS)
18		Inter Tank Skirt (ITS)
19		Interstage 1/2L (IS 1/2L)

20		Interstage 1/2M (IS 1/2M)
21		Interstage 1/2U (IS 1/2U)
22		Cable Harness for Engine –YM&YP, Wire Tunnel (WT)
23	Cryo stage (C25)	Cable harness for Engine , LOX Tank, LH2 tank, Stage External, Wire Tunnel
24	Equipment Bay	Equipment Bay (EB)
25		Payload launch Adaptor (PLA)

Out of the 25 sub-assemblies, 8 of them undergo Flight Acceptance Vibration Test (FAT) before transportation from VSSC to other ISRO centres.

1. Slanted Strap-on Nose Cone (SSNC) Pitch Plus (PP) sub-assembly of S200
2. Slanted Strap-on Nose Cone (SSNC) Pitch Minus (PM) sub-assembly of S200
3. Strap-on Core Base Shroud (SBS) Pitch Plus (PP) sub-assembly of S200
4. Strap-on Core Base Shroud (SBS) Pitch Minus (PM) sub-assembly of S200
5. SES Pitch Plus (PP) sub-assembly of S200
6. SES Pitch Minus (PM) sub-assembly of S200
7. Inter Stage (IS) 1/2 M sub-assembly of L110
8. Equipment Bay sub assembly

2.2 Sub-assembly activities

The industry shall carry out all the activities involved in the preparation of a sub-assembly for flight at facilities inside VSSC, Trivandrum campus. The flight hardware, electrical & mechanical components, packages, fasteners, isolators, consumables, fixtures & support stands, tools, workstations, checkout stations, operation documents and interface drawings will be provided by VSSC. VSSC also will provide the facilities & support for carrying out the Flight acceptances vibration testing of the hardware as applicable. All internal movements of the sub-assembly shall be carried out by the party. Trailers, containers and forklifts support will be provided by VSSC.

The industry is expected to realise flight-ready sub-assembly after performing all the required activities on the hardware. All activities required for the integration and testing of sub-assemblies are to be carried out by the industry at VSSC facilities. All the facilities will be owned by the department and will be operated by the industry. Required hierarchy of technical team with necessary skill set (Manager-supervisor-operation in charge-technicians-helpers) must be maintained by the industry at VSSC facilities.

The activities are briefly described below.

A sub-assembly consists of the identified structure with mechanical elements such as brackets, isolators and decks/housings on which avionics and sensors with their

harness are integrated. Each sub-assembly undergoes a series of activities for preparation of flight. They are classified into Mechanical, Electrical integration & testing activities and Acceptance Testing (Vibration testing) related activities.

2.2.1 Mechanical Integration Activities

All the activities will be carried out on flight hardware with configuration controlled drawings and documents.

- Preparation and readiness of Proto / Mockup hardware for harnessing
- Pre-integration activities on flight hardware.
- Assembly of mechanical elements.
- Assembly of avionics packages and other electrical interface elements.
 - Package connector assembly
 - Assembly of connectors in termination brackets/clamp
- Assembly and Mating of Electrical Umbilicals
- Alignment Operations like Navigation Package Assembly, CG Measurement etc
- Thermal Protection System application wherever recommended
- Store/Inventory management of the FIMs.

2.2.2 Electrical Integration Activities

Preliminary operations are carried out on a mock-up hardware. Further, the activities are performed on flight hardware.

- Electrical cable harnessing on proto and transfer to flight hardware.
- Assembly of electrical elements like harness, packages, sensors.
- Continuity and isolation checks for electrical harness.
- Electrical checks on flight sub-assembly with Avionic systems through operations from checkout systems
- Pre and post vibrations checks, checkout during vibration

2.2.3 Checkout System Activities

The checkout systems does the electrical testing of the subassemblies from command consoles interconnected to the stage subassemblies through command and monitoring racks and interface cables with connectors. The following activities are performed on the flight stage / subassemblies

- Configuration of checkout system for the stage interfaces
- Test and evaluation of the checkout system and interfaces
- Testing of subassemblies during stage electrical tests and vibration acceptance

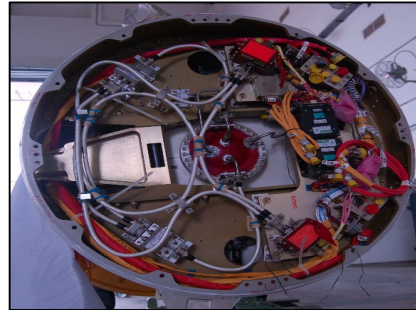
2.2.4 Acceptance Testing Activities

After the final preparation and Phase-1 electrical checks, the flight sub-assembly undergoes flight acceptance test, where it is tested to vibration environment expected to be experienced during the flight.

Views of a few sub-assemblies are shown below.



*Figure 2.1: CBS (PSLV)
2800 mm dia, 3000 mm height*



*Figure 2.2: PSOM (PSLV)
1000 mm dia, 500 mm height*



Figure 2.4: IS 2/3L (PSLV)



Figure 2.5: SES subassembly (LVM3)



*Figure 2.6: IS1/2M subassembly
harness (LVM3)*



Figure 2.7: Equipment bay subassembly harness (LVM3)



Figure 2.8: IS1/2M sub-assembly (LVM3)



Figure 2.9: SSNC subassembly (LVM3)

3 Scope of Work

- Integration, Testing and Delivery of sub-assemblies to meet the requirement of 4-8 PSLV launches and 3-6 LVM3 launches per year.
- Mobilization of skilled technical team & facility management.
- Planning & execution of activities and management of workforce.

A typical flow of activities involved in realising a sub-assembly is described in the chart below. Operation documents, hardware, Free issue material (FIM) such as decks, housings, fasteners, avionic packages, wires, connectors, harnessing accessories etc will be supplied by VSSC.

The preparation of flight hardware and electrical harnessing mock-up on hardware will be carried out in parallel. The full flight harnessing is to be done on the mock-up hardware with respective flight's cleared layout drawing for avionic packages, sensor & connector terminations and other components.

This will be followed by electrical harness transfer to flight hardware. Validation of electrical harness by continuity, isolation and insulation checks using automated

harness tester is to be done . Later , the assembly of packages is to be done which completes all the preparation activities for flight.

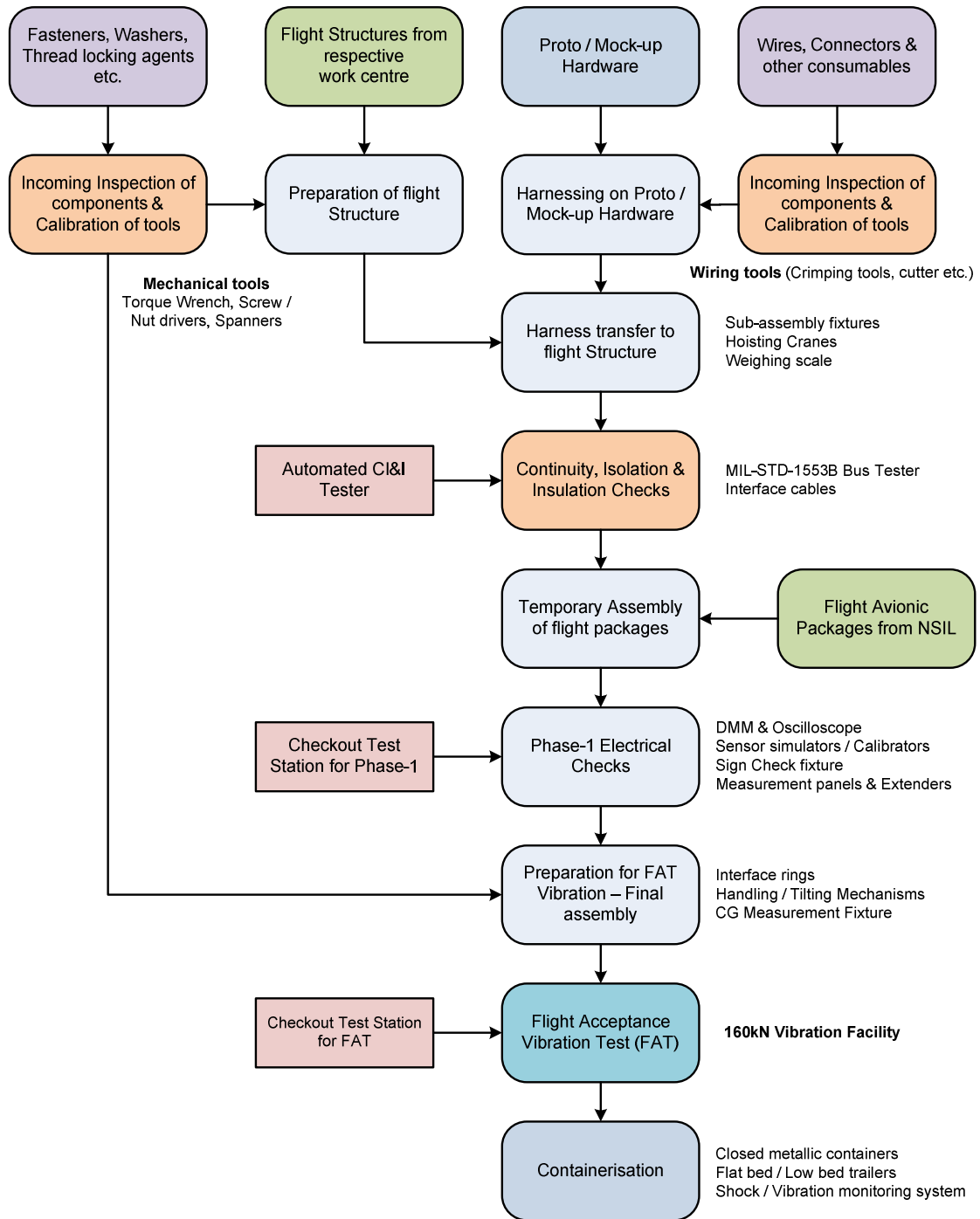
The sub-assembly is further subjected to Phase 1 electrical checks including tests using computer-based checkout system identified for respective subassemblies, followed by vibration test.

After the successful completion of tests, the sub-assembly will be delivered / despatched to other centres.

3.1 Overall activities

Overall activities involved in preparation of a sub-assembly are mentioned below.

- Receipt of hardware.
- Mechanical interface verification/generation& bracket/cowling assembly
- Harness mock-up preparation, labelling, inspection and mechanical integration activities.
- Inspection & verification of harnessing components.
- Electrical Harnessing on mock-up structure.
- Filling of documents/operation logs
- Preparation of flight structure, match mate checks/trial assembly & transfer of harness.
- Continuity and isolation checks (manual & using automated system)
- Package inspection and assembly.
- Check out system readiness and T & E
- Electrical checks.
- Assembly for vibration test.
- Review of sub-assembly readiness/test results at appropriate intervals.
- Online QC surveillance & report generation for the above activities.
- Despatch of hardware to other work centres.
- Loading and unloading activities for sub-assembly receipt & despatch and all internal movements



Flowchart for Sub Assembly realization

3.2 Mechanical Integration Activities

Activities on sub-assemblies related to mechanical area are described in this section. All the activities will be carried out under the supervision of a mechanical engineer and surveillance of a quality control engineer.

3.2.1 Preparation of Mock-up

The flight harness is done on a Harness Mock up hardware, which is a replica of the flight structure. The mock-up hardware consisting of Support Structure, Mockup decks and Avionics Package Simulators (L-Plates) will be handed over in the assembled condition by VSSC and any changes required in the subsequent flights viz L-Plate fabrication, Layout Modification, assembly etc has to be carried out by the party as per the inputs from VSSC for the mission related changes. Inspection and verification of layout w.r.t the flight approved drawing supplied by VSSC.

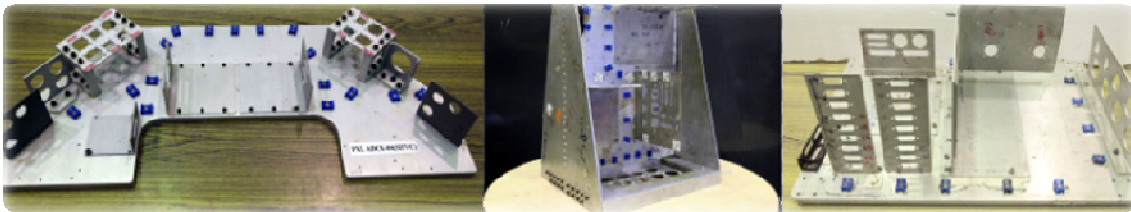


Fig. 3.2: PSOM Deck

Fig. 3.2: CBS Housing deck

Fig. 3.2: CBS Deck

3.2.2 Pre – integration activities

Once the Flight hardware is received from the work centre & is identified for a mission it will be ready for start of sub-assembly operations. Various mechanical interfaces are to be generated on the flight hardware by carrying out metal – cutting operations. All the operations shall be carried out as per the documents and drawings supplied by VSSC. These interfaces will be used to assemble various mechanical components such as brackets/clamps, decks, isolators, avionic packages and harness supports such as cable tie mounts, etc. Specific changes and requirements if any for a given mission will be provided during the course of the activity.

3.2.3 Assembly activities

After the completion of pre-integration activities, assembly of flight brackets/clamps, decks/housings and avionic packages shall be carried out. The electrical harness prepared and checked on mock-up hardware will be transferred to flight hardware after the completion of all metal cutting operations on flight hardware, isolation & continuity checks on mock-up / flight hardware. The components, packages and electrical connectors should be temporarily assembled using appropriate fasteners and torqued as per the operation documents for further checks. All alignment

operations/ CG measurements & sign-checks operations also has to be carried out by the party.

3.2.4 Final Assembly

After the successful completion of electrical checks, all the packages and connectors shall be assembled with the final torque values as defined in operation documents.

3.2.5 Handling activities

The receipt of flight hardware , unloading from the transportation container, positioning on the test / support stand, movement within the facility for the various types of tests, handling , tilting , loading and movement of subassembly for the vibration test at vibration facility, loading and movement of subassembly from the vibration facility to the integration facility, loading on container and clearance of transportation of subassembly / stage also has to be carried out by the party as per the operational documents/ checklists.

3.3 Electrical Integration Activities

Activities on sub-assemblies related to electrical area are described in this section. All the activities will be carried out under the supervision of an Electrical/Electronics engineer and surveillance of a quality control engineer.

3.3.1 Preparation of electrical harness on mock-up

The electrical harnessing shall be carried out on the mock-up hardware. The harness shall be prepared using connectors, wires sleeves, ties for cable anchoring, sheaths, lacing threads etc. All the avionic packages supplied by VSSC have to be integrated and subjected to electrical testing and be cleared.

The Electrical harnessing activities of the sub-assembly that is to be carried out by the industry involve the following

- QC inspection of the collected FIM material
- Wire/Cable preparations (cutting/stripping etc.)
- Crimping tool verification/setting/sample pull test
- Crimping different types of connectors
- QC inspection of the crimped joint (100% inspection)
- Inserting in the shell and verification
- Cable bunching/routing/lacing/labelling
- Shield soldering
- Isolation and continuity checks
- QC inspection of harnessing process and on the finished sub-assemblies.
- Hook soldering if any as per the document
- Testing of continuity of the connections, isolation checks and functional checks as per the checklist supplied.

3.3.2 Activities on flight hardware

After completion of harnessing on mock-up structure and its testing, the same is transferred to the flight structure. The avionic package connector plates are assembled to flight structure during harness transfer. The harness transfer on EB



Fig. 3.5.2: Harness transfer to flight hardware

structure is shown below.

The mechanical team will carry out the assembly of packages and connectors on flight hardware along with electrical integration team.

3.3.3 Electrical Testing

After the completion of harness transfer, it is tested for continuity and isolation. An automatic Cable Harness Tester is used for the purpose which will be supplied by VSSC. Subsequent to continuity and isolation checks, Phase – 1 check are to be carried out. This involves powering up of sub-assembly and performing various electrical checks as per check-list using checkout system delivered by VSSC. After the completion of all checks, final assembly of packages and connectors shall be carried out. The test and evaluation of Checkout systems in Designer level and with participation of QA agency also has to be carried out by the party.



Fig. 3.9.1: Continuity and Isolation

3.4 Vibration Test

After the completion of all final assembly activities, the sub-assembly has to undergo acceptance level vibration testing to be cleared for flight. The sub assembly is moved to Vibration facility and assembled to the vibration table using identified interface fasteners. Tests are carried out as per the Flight acceptance test (FAT) as per the document along the axes (maximum of 3 axes) of the hardware. It involves subjecting the sub-assembly to vibration environment experienced during flight. The electrical testing of the hardware is done before, during and after the vibration test using suitable checkout test stations. Post vibration torque verification of packages and connectors will be done before preparation for containerisation.

After the successful completion of FAT the sub assembly is moved to preparation bay for containerization and transportation to launch complex. Adequate care and protection to the sub-assembly to be incorporated. The requirements for handling is as in the operation document.

3.5 Operation Documents

Configuration Controlled Documents will be supplied by VSSC for each sub-assembly preparation which contains the details of all the mechanical & electrical activities. The documents are provided for carrying out the electrical harnessing of the structure. Operational checklists/logs are also provided for carrying out harnessing, where all details of personnel like operators, QC inspectors, supervisors, engineers etc. are entered. All operations carried out are to be recorded in real time, and it provides the details of components used for the activity, any observations/re-works. This documentation provides easy traceability of the flight preparation activities.

4 Responsibilities

Responsibilities of the Department and industry in preparation of sub-assembly for flight are described in this section.

4.1 Responsibilities of Department

- Facility for carrying out the integration & testing operations are owned by Department.
- Transportation and delivery of flight hardware to Integration facility.
- Identifying and Positioning of Flight/related structures of PSLV & LVM3.
- Issue of Integration components (Mechanical & electrical) and avionic packages.
- Issue of fasteners, isolators, flight consumables.
- Supply of Work benches, support fixtures, platforms, tools & measuring equipments.

- Delivery of Checkout systems, harness tester and flight components.
- Issue of documents for harnessing, assembly and testing for each sub-assembly
- On-line random surveillance for quality assurance.
- Participation of experts during critical phase of electrical testing and review at site
- Vibration testing of sub-assembly

The Department reserves the right at any time to modify the qualitative requirements, specifications or drawings related to the work.

4.2 Responsibilities of Industry

The industry is expected to carry out the following

- Operation & Periodic maintenance of the facility.
- L-plate (Simulating package connector interfaces) preparation & harness model preparation for sub-assembly harnessing.
- Integration, testing and delivery of flight sub-assemblies of PSLV & LVM3 starting on the identified flight hardware using the facilities at the premises of VSSC. A joint review board , with members from VSSC as well as from industry, will monitor the progress of the activities
- Non-conformances are to be communicated to VSSC immediately
- Assembly activities for vibration testing.
- Loading & unloading activities for sub-assembly receipt & despatch including logistic support for internal/external transportation.
- Maintaining & management of skilled technical team with different qualification levels (Engineers, Technical Assistants, Technicians, and Helpers) for carrying out the integration & testing activities.
- Acquire the skills in terms of the functional requirements of Assembly, Integration, Testing and documentation.
- Scheduling & day to day planning of the activities for sub-assembly integration & testing as per the VSSC requirements & schedule. In case of exigencies of work, the persons deployed shall be ready to work beyond office hours and on holidays as per the VSSC requirement.
- The industry shall maintain proper records for all the issued manufactured parts and bought out items along with the usage details. The records will be periodically verified by VSSC.

- Day to Day management of the facility, housekeeping & maintenance.
- Tool crib & stores operation, all the tools, components, consumables, etc must be stored and issued as per standard stores operational procedures with proper logging of distribution & consumption data. Separate stores must be in operation for mechanical & electrical items.
- Support for Calibration & maintenance of tools, fixtures, tackles, support structures, equipments, etc.
- Preparation of QC reports, test results & reports, non-conformances, snags, salvage action plans, filling of operation logs, etc.
- The industry shall recruit/position trained team for carrying out the sub-assembly integration. All technicians and QC supervisors must undergo a familiarisation session on the activities and work protocols to be followed. This session would be conducted by the department after the deployment of full process team by the party.
- In case of changes in flight activities as per mission requirement, industry has to work out the **scope of work** for implementing the change. This will be reviewed by VSSC, and will be accepted based on mutual discussion with the industry.

The industry shall not sub contract the works related to Integration & testing except for alignment/ laser Tracker measurements.

5 Insurance & Safety

Industry is responsible for the safety of the facility including the sub-assemblies/equipments, safety of the manpower in the facility. The party shall ensure proper insurance coverage for the working team personnel in line with the statutory requirements.

6 Payment Terms

- Payments will be made against each sub-assembly realised. For each sub-assembly, levels of payment stages will be given in the RFP.
- Industry should submit the necessary clearance papers and stage clearances to confirm that all required activities are completed without any deviations/non-conformances.
- Invoices submitted by the Industry, after completing the activities in the stages identified for payment, shall be cleared by a Joint Review Board constituted by Department.

7 Requirements from Industry for Expression of Interest

The interested supplier shall be required to prepare and submit an offer to VSSC with the following documentation details.

- Profile of the company and the details of registration under company act.
- Staff strength with relevant skill set, and hierarchy of organisation
- Engineering skills
- Relevant Past experience (in aerospace & defence with end to end mechanical & electrical preparation & testing of sub-assemblies)
- Financial statement for the last three years.
- Details of Purchase Orders executed for similar nature of work in the last five years.
- ISO certification details if applicable
- Planned structure of workforce deployment, and its management

The industry should arrange a presentation of the above details and their plan for executing the sub-assembly integration & testing, if called by the department.

8. Submission and evaluation of EoI

- Mode of submission of EoI: Vendor shall furnish their interest in participating in this bid in their own letterhead with details of Contact person(s). **No mention of price shall be given in the EoI.** Vendor shall furnish the EoI in the following format
- **Part A:** A covering note, expressing the interest to participate in the bid. This is to be prepared on company's letter head and signed by the authorized signatory.
- **Part B:** Declaration on the understanding by the vendor about the work as per the details given including, plan of activities, plan of manpower identification and deployment, mechanical assembly ,electrical testing , vibration testing and handling of assemblies.
- **Part C:** Documentary evidences towards fulfilling the eligibility criteria as given in above sections
- **Part D:** Filling up the check-list given as Annexure-1

9. Basis of Short listing

Short listing of parties, responding to EOI, will be done on the basis of several factors which include

- Experience in similar activities in defence and aerospace areas where End to End implementation of sub-assembly preparation & testing including mechanical, electrical & vibration testing activities
- Staff strength with necessary skill set & experience. Permanent Staff strength with relevant skill set of at least 100 nos. with technical qualification background is required.
- Profile of the company- companies registered under Indian company Act1956only will be considered. The company should have been in existence for a minimum period of five years prior to the date of quotation.
- Financial standing with an annual turnover of Rs 50 crores minimum and having net profit for the last three years.
- Purchase Orders executed for a minimum cumulative value of Rs 2 crores for similar nature of work in the last five years.
- If required, an audit of the industry will be carried out by VSSC team prior to finalisation.

10. Secrecy and Confidentiality Clauses

- The vendor and all their personnel shall abide by INDIAN OFFICIAL SECRETS ACT 1923inogue and shall provide information of awareness of the above in writing.
- The vendor shall ensure appropriate protection of Intellectual Property Rights involved in the work, consistent with VSSC policy.
- Details of any document, whatsoever, submitted to vendor by VSSC shall not be disclosed to any third party.
- All information and documents exchanged pursuant to the contract should be kept confidential by the vendor. The vendor shall not use the information for purposes other than that specified.
- All confidential information provided by VSSC shall remain as exclusive property of VSSC. The vendor shall agree this contract and the disclosure of the confidential information do not grant or imply any license, interest or right to the vendor in respect to any intellectual property.
- The vendor shall not sub-license, assign or sub-assign partly or fully the activities, rights, obligations, permissions, etc. received from VSSC in the contract to third parties, under any circumstances

11. Mode of Tendering & Final selection

- Invitation of Expression of Interest from industry.

- Industries, responding to EOI, will be shortlisted based on the above factors (Described in Section 8)
 - A Request for proposal (RFP) in two parts – technical & commercial will be prepared by VSSC and will be issued to shortlisted parties. RFP will give more details regarding the integration & testing of sub-assemblies and other terms & conditions.
 - RFP document is made in two parts- Technical & Commercial. Technical part gives the details of all sub-assembly related activities which helps the interested parties to get proper understanding about the work content expected of them. Commercial part addresses the general commercial terms, schedule, format for quote, payment terms etc.
 - All parties to whom the tender form is issued are invited for a pre-tender discussion & clarification at VSSC within 4 weeks of tender floating. Interested parties are requested to make use of this opportunity by sending their technical and commercial experts to understand the system and get clarifications.
 - Quotation of Parties who had attended the pre-tender (contradicts with interested) discussions only will be considered. All other quotes will be rejected.
 - Industry has to make quotation in two parts –Techno-commercial and Price bid. The Technical & Commercial Bids from the industries will be evaluated by the Technical Committee constituted by VSSC and will be short listed based on the merits of the proposal and the capability of the Industries for realizing the sub-assemblies as per VSSC requirement.
 - Final selection will be based on the evaluation of the price bid. Technically competent and qualified Industry fulfilling all the requirements and quoting the overall lowest cost will be selected. The final decision will be the prerogative of VSSC based on its own experience, wisdom and judgment and such decision shall be final and binding on all.
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12. Disclaimer

This call for EoI shall not be treated as a firm commitment or contract from VSSC/ISRO with any of the participating vendors.

Annexure – 1

Checklist for the supporting documents(Filled checklist to be submitted by the Vendor along with the Expression of Interest)

#	Document / Proof	Attached / Not with EoI	Remarks
1.	Company registration details		
2.	Proof for experience of the vendor in the area of aerospace harness fabrication, testing, mechanical assembly .etc.		
3.	Certified copies from Chartered accountant for balance sheet showing profit/loss for the last 3 years		
4.	Income tax statements for the last 3years		
5.	Company profile, financial standing and line of business		
6.	Certified copies of the annual reports for the last 3 years		
7.	Details of major customers of the Company		
8.	Willingness to abide by the terms and conditions in the EoI document and to comply with the vendor's requirement given in the EoI document.		
9.	Company brochure		
10.	Copies of similar purchase/work Orders executed by the Company		
11.	Vendor should have valid registration of GST. Vendor should submit GST registration details		
12.	Vendor should submit PAN card - Details		
13.	Vendor should submit bankers - Details		
14.	Copies of PO released by ISRO to the party for		

#	Document / Proof	Attached / Not with EoI	Remarks
	last 3 years in the related work (at least 3)		
15.	Documents to support the facilities listed in 4.6 of EoI		
16.	Skilled man power availability for harnessing, fabrication, electrical testing, quality surveillances, mechanical assembly of avionic subassemblies / systems / stages .		