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CHANGE HISTORY

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ABBREVIATIONS USED

IATF-ST	Integrated Assembly & Test Facilities for Spacecraft Thrusters
AOCS	Attitude & Orbit Control System thrusters
ESEG	EARTH STORABLE ENGINES GROUP
EBW	Electron Beam Welding
FIM	Free Issue of Materials
LSRV	Latchable Series Redundant Valve
TTT	Technical Task Team
JRT	Joint Review Team
GN ₂	Gaseous Nitrogen
GHe	Gaseous Helium
CMM	Co-ordinate Measuring Machine
PPC	Product Planning & Control
SRQA	System Reliability & Quality Assurance
FCD	Functionally Critical Dimensions
NCR	Non Conformance Report
TIG	Tungsten Inert Gas
MSHLD	Mass Spectrometer Helium Leak Detector
SRC	Standing Review Committee

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1. **INTRODUCTION**

The purpose of the proposed “Integrated Assembly & Test facilities for Spacecraft Thrusters” (IATF-ST) at Valiamala is to meet the increased demand of thrusters for satellite programmes. This integrated facility is equipped with full complement of clean room and assembly & test facilities including silicide coating & hot test facilities in order to realise the satellite thrusters. The entire Integrated Assembly & Test facilities for Spacecraft Thrusters (IATF-ST) is proposed to be operated by the Service provider for assembly, testing and delivery of 10N/22N Thrusters under the supervision of LPSC (V) Engineers on GOCO model.

The Contract period is 2 years and extendable by another 2 years based on satisfactory completion and mutual consent at the end of 2nd & 3rd year after review and Department approval.

The machines and equipment which are available at the above facility are listed in **Section.4**. TPTG/LPSC shall select a Vendor hereinafter referred to, as the ‘SERVICE PROVIDER’ and enter into a Contract/agreement to assemble, test and deliver AOCS thrusters 10 N & 22 N as listed in **Section 2.2**.

Following are the broad spectrum of activities that are to be performed in the above stated Assembly & Test facility (IATF-ST), in order to realize AOCS thrusters:

- Receipt and storage of machined parts, standard parts and consumables at bonded stores.
- Pre-assembly operation: Precision de-burring of machined parts under microscope, visual inspection of standard parts, Ultrasonic cleaning and high pressure jet cleaning.
- Sub-assembly conversion: Electron beam (EB) welding of Injector parts.
- Injector calibration: Assembly of injector with ground valves and water calibration.
- Injector Characterisation: Injector hot test in the sea level test facility using liquid propellants MMH & N₂O₄ and post-test activities.
- Silicide coating of chamber: Green coating, diffusion in vacuum furnace, inspection of dimension & coating thickness.

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- Sub-assembly conversion: Electron beam (EB) welding of injector & thrust chamber.
- Environmental testing viz., Vibration tests of Valves with thrust chamber assemblies & post vibration flushing, contamination check etc.,
- Flight Assembly: Assembly of thruster inside clean room followed by pressure test, leak test and water calibration & vacuum drying, thruster level vibration test & Posttest activities.
- Acceptance Tests: Injector characterisation test in ambient condition & Hot firing in Vacuum simulated condition using liquid propellants such as Nitrogen Tetroxide & Mono methyl Hydrazine.
- Post-test activities: Decontamination, water calibration, pressure port plugging followed by functional checks & alignment checks etc.,
- Verification of Interface Critical Dimensions (ICD)
- On-line quality surveillance at all stages of assembly & testing operations.
- Documentation, packing & delivery.

2 **SCOPE OF WORK**

2.1 ***Terminologies of AOCS Thrusters***

AOCS Thruster:

- A component/equipment used in the satellite propulsion systems in order to produce a thrust/force using hypergolic propellants for control of satellite.

LSRV

- Latchable Series Redundant Valve is a solenoid/ latch valve in order to control the propellant flow through it.

2.2 ***Deliverables***

Approximate quantity of AOCS thrusters that are to be assembled, tested & delivered under using the IATF-ST facilities in each year are listed below. The quantities are subjected to change:

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Sl.No	Category	Annual quantity (Indicative) (Nos.)
1	AOCS 10 N Thruster	100
2	AOCS 22 N Thruster	100
	TOTAL DELIVERABLES PER YEAR	200

2.3 Responsibilities

2.3.1 *LPSC Responsibility*

- 2.3.1.1** LPSC shall identify a Department focal point for the interaction with the Service Provider.
- 2.3.1.2** LPSC shall form a Technical Task Team (TTT) to familiarize and give adequate specific training with respect to Assembly & Testing procedures to the Service Provider's personnel at its facilities during the initial three months.
- 2.3.1.3** LPSC shall form a Joint Review Team (JRT) to review the progress, status etc., and to finalize the deliverables requirement, man-hour deployment, payments etc.
- 2.3.1.4** LPSC shall provide all the accepted & cleared machined parts (both metallic & non-metallic) and bought out items, log books to be used in Assembly & Testing of AOCS thrusters.
- 2.3.1.5** LPSC shall issue the entire test fluids (DM water, LN2, GN₂& GHe), consumables (Isopropyl alcohol, snoop solution etc.) for all the machines and equipments in the facility and propellants such as N₂O₄, MMH for carrying out the tests to the SERVICE PROVIDER, who shall maintain proper records of the issued items along with the details of the usage. The records shall be periodically verified by LPSC.
- 2.3.1.6** LPSC shall provide clean room garments for the personnel to be engaged inside the cleanroom.
- 2.3.1.7** Electricity, water & compressed GN₂/GHe supply for the facility shall be provided by LPSC.
- 2.3.1.8** LPSC shall provide adequate personal computers, printers & associated consumables for data generation.

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2.3.1.9 LPSC shall provide necessary formats for raising Non Conformances, request formats etc.,

2.3.1.10 All the necessary technical inputs, processes, relevant technical documentation required to carry out Assembly & testing shall be provided by LPSC.

2.3.1.11 LPSC shall verify and approve the detailed Assembly and test procedure delta documents submitted by the SERVICE PROVIDER.

2.3.1.12 LPSC shall be responsible for taking decision on Non Conformance Reports(NCR) raised by the SERVICE PROVIDER.

2.3.1.13 LPSC shall carryout mandatory/ random quality surveillances during assembly and testing, quality auditing, quality assurance and certification of the deliverables.

2.3.1.14 LPSC shall ensure that all the machines/equipments are in proper working condition.

2.3.1.15 LPSC shall be responsible for the maintenance of the facilities including calibration of all the equipments/instruments as per standard.

2.3.1.16 LPSC shall permit the workforce of SERVICE PROVIDER for using its Canteen facility as per the prevailing rates fixed by LPSC applicable to such category of personnel.

SERVICE PROVIDER's Responsibility

2.3.1.17 The Service Provider shall identify a focal point (engineer) who shall be the single point of contact for the Department for day to day execution of the contract. This focal point shall be the Product Planning & control (PPC) Engineer.

2.3.1.18 Acquire the adequate specific skills in terms of the functional requirements of Assembly, Integration, Testing and documentation.

2.3.1.19 The SERVICE PROVIDER should provide atleast the minimum work force (indicated in this RFP in terms of man-hours) for Assembly & Testing and deliver the AOCS thrusters as per drawings and processes, within the given schedule.

2.3.1.20 The SERVICE PROVIDER should position workforce with experience and capable in handling precision equipments such as EBW, Vibration shaker,

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CMM etc., pneumatic systems, assembly inside clean room etc., In case of exigencies of work, the Service Provider shall ensure that personnel are deployed to work beyond normal working hours and on holidays as per the requirement of LPSC.

2.3.1.21 The personnel shall be stationed only in areas identified for their work and shall not trespass into other areas without proper permission.

2.3.1.22 All equipment and utilities entrusted to the SERVICE PROVIDER should be handled with due care and caution and any liability whatsoever in nature due to intentional mishandling or repeated negligence by the Service Provider's personnel would be borne by the SERVICE PROVIDER. It is also agreed by and between the parties that in any case, any liability arises, neither LPSC/ Department or representative of LPSC/Department shall be responsible for the same. In case it is found that the damages have been caused as detailed above, the SERVICE PROVIDER shall be liable to pay the entire damages to LPSC/Department.

2.3.1.23 In case of any accidents inside LPSC (during operation on the machines, facilities, material handling etc., or otherwise) first aid shall be provided by LPSC during the normal working hours of LPSC. For further medical treatment and for any other emergency beyond the normal working hours of the laboratory, the SERVICE PROVIDER shall make their own arrangement.

2.3.1.24 Salary: Appropriate market based salaries matching to experience and skill shall be given to prevent attrition. Attrition shall be strictly prevented since this precision job involves familiarizing the critical assembly & testing procedures to the Service Provider's personnel from LPSC side and also due to security reasons. Salaries shall be directly credited by the SERVICE PROVIDER to the respective bank a/c of SERVICE PROVIDER employees, before 7th of every month. In case, there is an eventual need for replacement for the trained manpower, re-training to the replaced manpower shall be arranged by the SERVICE PROVIDER only. Also, such replacements shall be done with prior approval of the DEPARTMENT in writing.

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2.3.1.25 Transport: Transport to & from LPSC is in the SERVICE PROVIDER's scope.

2.3.1.26 Statutory Rules and Regulations:

A. The service provider shall strictly adhere to all statutory rules/labour laws and regulation including provisions of applicable social security measures. If any violations of these applicable statutory provisions are observed, the same shall be sufficient reasons for the termination of this Purchase order.

B. Keeping in view of liability under Employees Compensation Act, 1923, in case of the occurrence of any Accident during the course of execution of this Purchase Order involving any of the persons engaged by the Service provider occupied within the premises of the work site specified by LPSC and during the discharge of duties, resulting in:

(i). Death or permanent disability from loss of both limbs (or)

(ii). In the event of other permanent disability,

The victim/dependent shall be eligible for a compensation of Rs. 10 lakhs and Rs. 7 lakhs for (i) & (ii) respectively. This compensation is applicable irrespective of whether or not there has been any wrongful act, neglect or default and notwithstanding anything contained in any other law. The liability for this shall rest with the Service provider concerned. Whenever such incident occurs, as per the guidelines of the Department, Department shall make arrangements for disbursing this amount and shall recover the same from the Service provider concerned.

For this purpose, without limiting any of the other obligations or liabilities, the Service provider shall at his own expense take a comprehensive insurance for his workforce and for all the work during the execution period from any of the Insurance companies as approved by the Insurance Regulatory & Development Authority of India (IRDA). The Service provider shall have to furnish originals along with premium receipts and other papers related thereto the Officer concerned at LPSC within 15 days from the date of placement of the Purchase order and work shall commence only thereafter.

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- 2.3.1.27 Uniform & safety protective equipment:** All the employees of the SERVICE PROVIDER shall be provided with neat uniform and appropriate footwear etc. All the employees of the SERVICE PROVIDER shall compulsorily wear the uniform on all working days. Soiled & torn uniform shall not be worn by the personnel.
- 2.3.1.28** Identification cards (ID cards) shall be provided by the SERVICE PROVIDER for all the employees positioned by it. LPSC shall provide only the entry pass for a specific period.
- 2.3.1.29** All manpower deployed shall be the employees of the SERVICE PROVIDER.
- 2.3.1.30** The Service Provider shall carry out all other associated activities required to assemble, test and deliver QA cleared components and modules.
- 2.3.1.31** The SERVICE PROVIDER shall follow all the LPSC security instructions applicable for people & processes prevailing at present and those issued from time to time.
- 2.3.1.32** The SERVICE PROVIDER shall ensure that all the personnel deployed are all Indian citizens only, character & antecedents of whom are duly verified by the Police and security clearance obtained from the local police station. The police verification certificate should be submitted to LPSC.
- 2.3.1.33 SAFETY:** Testing activities involves high pressure operations and handling of hazardous propellants and the facilities are provided with sufficient safety features and equipments. All personnel engaged in these activities are given appropriate briefing/instructions on maintaining personnel safety and the same will be extended to the Service Provider's personnel. They shall strictly adhere to the instructions and the responsibility to ensure this compliance rests entirely with the Service Provider. SERVICE PROVIDER shall ensure that other general safety precautions as laid down periodically by Department shall also be strictly adhered to. Due to the non-compliance of safety guidelines, any loss/damage/injury occurring to the personnel engaged/facilities shall be the responsibility of Service Provider for compensation, if any.

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2.3.1.34 WASTE DISPOSAL: The SERVICE PROVIDER shall transfer the waste products/materials generated during the process to a location identified by LPSC. LPSC shall organize further safe disposal of waste products.

In addition to the above mentioned responsibilities of the Service Provider, following responsibilities shall be taken by the Service Provider in respective categories:

Major responsibility of Graduate engineers from SERVICE PROVIDER

- 2.3.1.35** Getting familiarized with the procedures involved in assembly & testing of AOCS thrusters from Technical Task Team (TTT)/ LPSC focal point.
- 2.3.1.36** Preparation of detailed assembly & test delta document based on the assembly & test procedure document supplied by LPSC and the Assembly & Testing procedures familiarized through TTT, within first 3 months.
- 2.3.1.37** The Service Provider's focal point shall be entrusted with the overall responsibility of execution of Product Planning & Control (PPC).
- 2.3.1.38** Arrangement of components/test fluids rests with LPSC focal point.
- 2.3.1.39** Generation of NC's observed during assembly & testing and convening discussion with LPSC focal point.
- 2.3.1.40** To maintain attendance details of SERVICE PROVIDER employees.
- 2.3.1.41** Overall management of assembly and testing activities and its employees.
- 2.3.1.42** To Convene Joint Review Team (JRT) meeting and prepare minutes of meeting. Obtain approval through LPSC focal point.
- 2.3.1.43** To participate in real time assembly & testing.
- 2.3.1.44** To identify the technical and administrative bottlenecks in hardware realization and communicating to LPSC focal point for clearance.
- 2.3.1.45** Prior intimation to LPSC focal point about SERVICE PROVIDER employee's absence/leave.
- 2.3.1.46** All related activities required to ensure smooth operations of Assembly, Integration & Testing under the Purchase order.
- 2.3.1.47** Overall project management of the Purchase order.

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Major responsibility of Diploma engineer from SERVICE PROVIDER

“Diploma engineer of SERVICE PROVIDER shall work under the directive of Graduate engineer of SERVICE PROVIDER”

- 2.3.1.48** Preparation of bill of materials for assembly & testing.
- 2.3.1.49** To generate stores issue request and submission to LPSC focal point for approval.
- 2.3.1.50** Collection of fabricated & standard parts from IATF-ST bonded stores.
- 2.3.1.51** Before initiating pre-assembly activities, obtain approval from LPSC- SRQA, for final parts list, through LPSC focal point.
- 2.3.1.52** Collection of consumables from IATF-ST stores, through LPSC focal point.
- 2.3.1.53** Request generation for FCD & bought out inspection, TIG & EB welding, Passivation & contamination checks, assembly machining, NDT evaluation; submission of parts to respective LPSC Section, after obtaining approval from LPSC focal point and oversee these activities.
- 2.3.1.54** Verification of parts availability and clearance and logging.
- 2.3.1.55** To ensure that proper pre-assembly operations are carried out and maintaining logbook/Route card for the same.
- 2.3.1.56** Supervision and recording of observation during water calibration, proof pressure test, functional assembly & testing, flight acceptance test activities.
- 2.3.1.57** Preparation of assembly & test results delta documents.
- 2.3.1.58** Maintenance of log books, for the issue of parts, consumables, test fluids, etc.

Major responsibility of ITI Technicians from SERVICE PROVIDER

“ITI Technicians of SERVICE PROVIDER shall work under the directive of Graduate engineer/ Diploma engineer of SERVICE PROVIDER”

- 2.3.1.59** To perform all Pre-assembly, Assembly & Testing activities defined in Section.3

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Major responsibility of Data Entry Operator from SERVICE PROVIDER

“Data Entry Operator shall work under the directive of Graduate engineer/ Diploma engineer of SERVICE PROVIDER”

- 2.3.1.60** Preparation of assembly & test documents, delta documents, test results reports, presentations etc.
- 2.3.1.61** All related activities in order to ensure proper documentation of all assembly and testing activities.

Major responsibility of Helper from SERVICE PROVIDER

“Helper shall work under the directive of Engineer/ Supervisor from the Service Provider”

- 2.3.1.62** Carry out all support activities such as request submission to various facilities and its follow up, submission/collection of parts to/ from machining lab, inspection lab, test facilities etc., as per the directive of Engineer/ Supervisor.
- 2.3.1.63** Any other task assigned to ensure smooth flow of assembly and testing activities.

3 ASSEMBLY, TESTING & PERFORMANCE EVALUATION

- 3.1** The assembly & testing of AOCS Thrusters is complex and involves critical operations, which shall be properly understood and absorbed by the SERVICE PROVIDER’s personnel.
- 3.2** Acceptance criteria for each component realization during each activity shall be specified in the respective assembly & testing procedure document of AOCS thrusters that are to be realized using IATF-ST facilities. Entire assembly & test activities required for AOCS thrusters’ realization shall be categorized in general as follows:

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- Pre-assembly operation: Precision de-burring of machined parts under microscope, visual inspection of standard parts, Ultrasonic cleaning and high pressure jet cleaning.
- Sub-assembly conversion: Electron Beam (EB) welding of Injector parts, Injector Inner body to Outer Body & Injector to Chamber.
- Injector calibration: Assembly of injector with ground valves and water calibration
- Injector Characterisation: Injector hot test in the sea level test facility using liquid propellants MMH & N₂O₄ and post-test activities like flushing and gas purging.
- Silicide coating of chamber: Green coating, diffusion in vacuum furnace, inspection of dimension & coating thickness measurement.
- Sub-assembly conversion: Electron beam (EB) welding of injector & thrust chamber.
- Environmental testing viz., Vibration tests of Valves with thrust chamber assemblies & post vibration flushing, contamination check etc.,
- Flight Assembly: Assembly of thruster inside clean room under Class 100 Laminar flow table, followed by pressure test, leak test using MSHLD and water calibration & vacuum drying, thruster level vibration test & Post-test activities.
- Acceptance Tests: Hot firing in vacuum simulated condition using liquid propellants such as Nitrogen Tetroxide & Mono methyl Hydrazine as per test matrix.
- Post-test activities: Decontamination, water calibration, pressure port plugging followed by functional checks & alignment checks etc.,
- Assembly & Test results document preparation and obtaining approval.
- Convening Joint Review Team meeting for hardware clearance.

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Delivery conditions:

After completion of flight acceptance testing activities, following activities are also needs to be completed after getting SRC (Standing Review committee) clearances:

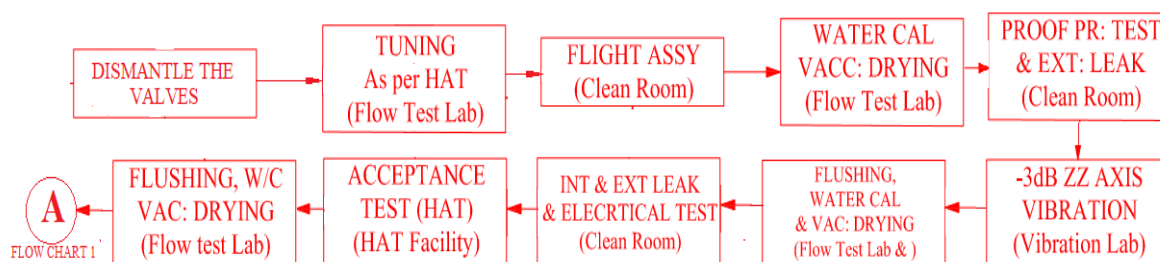
- Cleanliness/Contamination check
- Alignment check
- Endoscopy check
- Pre delivery electrical test
- Weighing of thrusters
- Hardware shall be delivered with entire associated A&T delta documents with QA clearance.

3.3 Flow Chart No.1 describes typical activities carried out for realisation of a 22 N AOCS thruster and is shown below. From experience approximately 10-15% of thrusters will be undergoing retuning activities if found Not OK in performance as indicated by A & B together in the Flow chart 1. Such thrusters shall undergo all operations as per Flow Chart No.2 & for Injector retuning the operations listed in the Flow Chart No.3.

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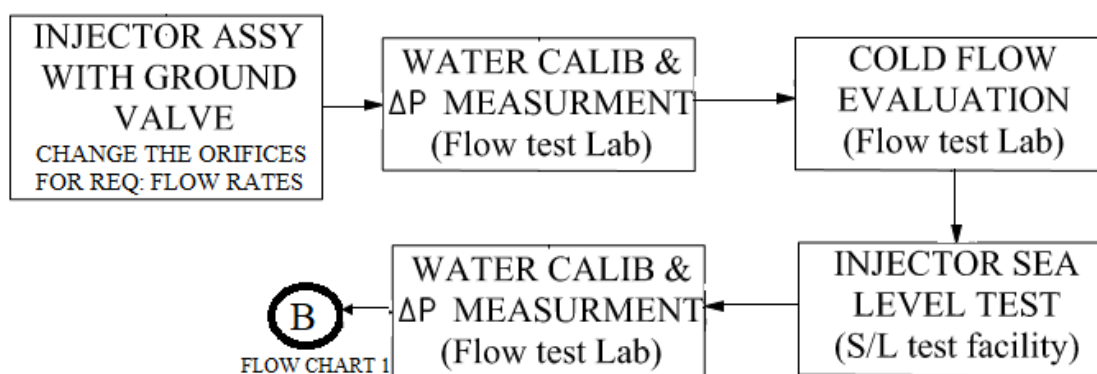
Flow Chart No.2

AOCS THRUSTER RETUNING ACTIVITIES FLOW CHART



FLOW CHART 2

AOCS INJECTOR RETUNING FLOW CHART



FLOW CHART 3

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4 FACILITIES AVAILABLE AT IATF-ST:

- Pre assembly lab.
- Clean room (Class 100,000)
- Flow test lab
- Vibration lab
- Electron Beam Welding facility
- Silicide coating & chemical lab
- Hot testing facility
- Instrumentation & Data acquisition lab

Following equipments/ machines are available for Assembly, test & delivery of AOCS Thrusters:

- Stereo microscopes
- Video measuring system
- Ultrasonic cleaning machine
- Air borne particle counter
- Liquid borne particle counter
- Mass Spectrometer Helium leak detector
- Solvent Filtration system
- Vacuum drying oven
- Pneumatic pressure testing console
- Vibration shaker
- Electron Beam Welding machine
- Vacuum Furnace
- Slurry stirring machine
- Dermitron (Coating Thickness Measuring Instrument)
- CMM

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- Hot test facility with Vacuum Chamber & pumps
- Storage & Distribution system for propellants, gas, water etc.,
- Data Acquisition system & Instrumentation panels
- Assembly & testing tools

5. TECHNICAL TASK TEAM

- 5.1** A core technical support team from LPSC shall be associated with the SERVICE PROVIDER during the initial three months of the Purchase order as the Technical Task Team (TTT), composed of Graduate engineers, Diploma engineers, ITI technicians, etc.
- 5.2** The complete technical details of assembly, testing and delivery of the AOCS Thrusters shall be demonstrated by the TTT to the SERVICE PROVIDER, with all relevant documents, in the first three months.
- 5.3** During the first set realization of each item, the TTT shall be closely associated with the SERVICE PROVIDER for transferring the necessary skills including all major and minor technical details. Subsequently the SERVICE PROVIDER should be able to assemble, test and deliver independently without TTT. The TTT will not be available after the first three months. However, a focal point from LPSC shall be available for any technical clarifications, clearance for submission of parts to EBW, assembly related machining, assembly related inspection, Vibration, Silicide coating & hot testing etc.,
- 5.4** All the necessary & relevant technical documents (including the standards as applicable for various procedures) shall be provided by the TTT.
- 5.5** Any non-conformances, technical snags shall be addressed by the LPSC focal point for which the requests shall be raised by SERVICE PROVIDER.

6. PRODUCT PLANNING & CONTROL(PPC)

- 6.1.** The SERVICE PROVIDER's focal point shall be the PPC engineer. He should maintain the documentation, job cards, and traceability for all the items realized in LPSC facility. The PPC engineer shall be entrusted with the overall responsibility of safe custody of configuration controlled drawings &

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documents issued by LPSC. He shall also be entrusted with the responsibility with respect to schedules, convening meetings for clearance of Non-conformance & deliverables of items, etc.

7. JOINT REVIEW TEAM (JRT)

A Joint Review Team (JRT) shall be formed by LPSC (with representatives from LPSC & SERVICE PROVIDER) to finalize the targeted deliverables for the forthcoming month, review the progress & give recommendation for the milestone payments etc.,

8. ACCEPTANCE AND REJECTION CRITERIA

- 8.1. The final acceptance of any of the AOCS thrusters shall be based on the conformity of items with all acceptance standards and successful assembly & testing.
- 8.2. If deviations are noticed during assembly/ testing, the same shall be rectified by the SERVICE PROVIDER only after obtaining clearance from the LPSC focal point.
- 8.3. The SERVICE PROVIDER shall deliver the items only after obtaining clearance from the LPSC focal point.
- 8.4. The acceptance or rejection of hardwares at various stages of realization rests with the LPSC.

9. REPLACEMENT CRITERIA

- 9.1. Fabricated parts/Standard parts required, for replacement of any during Assembly & Testing of AOCS thrusters getting rejected during the course of assembly and testing **due to any inherent defect in the material or due to technical reasons beyond the SERVICE PROVIDER purview**, shall be supplied by LPSC. Additional man-hours invested towards disassembly, reassembly & testing shall be presented by SERVICE PROVIDER to JRT (details of JRT are mentioned in Section7) for review& clearance for payment.
- 9.2. Fabricated parts/Standard parts required, for replacement of any during Assembly & Testing of AOCS thrusters getting rejected during the course of

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assembly and testing **due to intentional negligence and improper handling** shall be supplied by LPSC, for which the payment towards replacement shall be made by SERVICE PROVIDER to LPSC. In this connection, payment for additional man-hours invested towards disassembly, reassembly & testing shall not be considered. The details of the same to be presented to the JRT to review the reasons for rejection and recommendation for settlement of payment.

10. CHANGES AND MODIFICATIONS

10.1. The Department reserves the right at any time to modify the qualitative and quantitative requirements, specifications, patterns or drawings related to the work that shall be covered by the Purchase order.

11. DOCUMENTATION

11.1. The SERVICE PROVIDER shall maintain proper records for all the issued manufactured parts and bought out items along with the usage details. The records shall be periodically verified by LPSC.

11.2. The SERVICE PROVIDER should maintain job cards, Route cards, Documentation and traceability for all the items realized in the facility.

11.3. The SERVICE PROVIDER should maintain the log books for all the consumables, test fluids, machines, equipments, being issued by LPSC, etc.

11.4. The assembly & test documents have to be maintained for future reference. LPSC shall issue all the stationery for the above activities.

11.5. SERVICE PROVIDER shall generate detailed assembly & testing checklist (delta document) for Thrusters, immediately after delivering the 1st set of thrusters consisting of 3 hardwares, based on technology acquisition. Also, this detailed document shall be reviewed and approved by TTT, before initiating the next set of thrusters' realization in each category. Regular updating should be effected, if any modifications are introduced.

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12. PACKAGING, STORAGE & RECORDS

12.1. The SERVICE PROVIDER should properly pack all the assembled components and store them appropriately as per LPSC Instruction. All packing boxes and material shall be made available by LPSC.

12.2. All the Thrusters' test reports, data sheets and all relevant records generated should be submitted to LPSC.

13. DELIVERABLES AND MAN-HOURS

13.1. The SERVICE PROVIDER shall provide all the required workforce (indicated in this RFP) for the scope of work detailed.

13.2. Following is the minimum Annual Man-hours requirement to be positioned by the SERVICE PROVIDER for A&T of Thrusters. Any additional requirement to carry out the scope of work within the specified delivery periods shall be provided by the Service provider without any additional cost to LPSC.

Sl. No	Category	Annual Qty (nos)	Minimum Annual Man-hour Requirement (in hrs)									Data Entry Operator	Helper
			ITI Technician			Diploma Engineer		Graduate Engineer					
			Fitter	Chem	Elec /Inst	Mech	Elec/ Inst	Mec	Elec/ Inst	Che	7480	9980	
1	10 N Thruster	100	19100	1270	5090	8910	6360	5090	5090	1270			
2	22 N Thruster	100	18340	1230	4890	8560	6110	4890	4890	1220			
3	Retuning of Injectors/ thrusters as per Flow chart 2 & 3	30	1000										
	Total		38440	2500	9980	17470	12470	9980	9980	2490	7480		

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NOTE:

- Normal working hours: 8.45 hrs to 17.15 hrs (Monday to Saturday)
- The standard parts, individual LSRV for the AOCS Thrusters shall be supplied as Free Issue of Materials (FIM) by LPSC to the Service Provider.
- The monthly deliverables shall be more or less uniform and the variations may be within $\pm 10\%$ of the annual quantity except for the initial three months.

Qualification criteria:

Graduate Engineer - B.E., / B.Tech in Engineering (Mechanical, Electronics/Instrumentation, Chemical)

Diploma Engineer - Diploma in Engineering (Mechanical, Electronics/Instrumentation) for Assembly & Testing

ITI Technician- ITI (Fitter/*Welder/Electronics/Instrumentation) for Assembly & Testing

Data Entry Operator (DEO) - Any Graduate (such as B.Com./B.Sc.,) with proficiency in computer operations & MS - Office/Windows)

Helper - Pass in upper primary level (Minimum)

Since, the nature of job in precise assembly, testing & delivery requires skill and experience, SERVICE PROVIDER shall position the requested workforce w.r.t. Graduate Engineer & Diploma engineer category, with minimum of 1 year of Industrial experience & for ITI Technician category, with minimum of 1 year of experience in relevant areas.

- ***Welder** shall hold ITI welder qualification certified by any recognized institute/NCVT with minimum 2 years' of TIG/EBW welding experience. Apart from this, the welder shall be required to undergo periodic welder qualification as per standards and those who successfully qualify alone will be allowed to carry out the tasks.

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14. Essential criteria for scrutiny of proposals:

14.1. General:

14.1.1. The quote shall contain information on the company, financial standing and line of business.

14.1.2. Documentary evidences shall be furnished for supporting the stated facts.

14.2. Criteria for scrutiny and evaluation of parties:

14.2.1. The companies desirous of submitting proposals shall mandatorily be accredited with AS 9100 / ISO 9001:2015 or equivalent standard for the last 3 years for the company's existing operations.

14.2.2. Prior experience of more than 1 years is essential in working with Aerospace / Defence sectors manufacturing/assembly/testing/evaluation/production of similar aerospace products.

14.2.3. The Service provider shall possess human resource with adequate knowledge, skill and experience in the areas of manufacturing, metrology, assembly / testing, NDI and quality control.

14.2.4. Annual turnover of the company should be greater than Rs. 6.00 Crores for each of the last 2 financial years (FY: 2016-17 & 2017-18).

14.2.5. Certified copies of Annual financial turnover and balance sheets showing profit / loss for the last 2 years shall be furnished.

14.2.6. The company should have proven heritage of having successfully executed orders / Purchase orders of value not less than Rs. 5.00 Crores each for realisation of similar services for ISRO / Defence/Aerospace sectors during last 1 year.

14.2.7. Companies shall have at least Class 1,00,000 clean-rooms and/or familiar with Clean-room practices.

14.2.8. Companies shall be familiar with Aerospace/ISO Quality System Requirements.

Note: For clauses 14.2.1 to 14.2.8, the information provided by the companies shall be backed by documentary evidences.

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15. Pre-bid meeting

A Pre-bid meeting is planned at LPSC Valiamala by inviting the parties who are interested to participate in the two-part tender for giving them an overall idea about the critical and complex Assembly & Test activities/processes involved during the course of Thruster realisation. This is to enable the parties to understand the complexity of activities/processes involved during the course of Thruster realisation thoroughly before submitting their price bid. **Please note that bids from the parties who do not participate in the Pre-bid meeting will be summarily rejected.**

16. How to quote? Quotation template

All-inclusive unit rate for Assembly & Testing of each AOCS thruster shall be given as quote. The template for the same is as follows.

S.No	Component	All-inclusive* unit rate (Rs.)
1.	10 N AOCS Thruster	
2.	22 N AOCS Thruster	
3.	For carrying out Retuning Thruster Activities as per Flow chart No.2	
4.	For carrying out Retuning Injector Activities as per Flow char No. 3	
Total		

* Party shall quote for all-inclusive unit rate including **GST**.

(**GST** rate included shall be mentioned for information.)

17. PAYMENT TERMS

17.1. A Joint Review Team (JRT) shall meet before 25th of every month, to finalize the targeted deliverables for the forthcoming month. The monthly targets of deliverables shall be a subset of the annual quantities envisaged. Based on the mutually agreed target, the SERVICE PROVIDER shall position required man-hours in respective category for realizing the targets agreed upon.

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17.2. Payments shall be made on monthly pro-rata basis for the submitted bills duly certified by focal point within 30 days from date of completion of work. The performance of the SERVICE PROVIDER shall be reviewed by JRT, in terms of hardware realization and the quantum of milestone payment (as detailed in Section 17.4 below) will be decided.

17.3. Considering the learning curve for acquiring the technology involved in precision assembly & testing of Thrusters, the targets for first 3 months, shall be low (which shall be defined by JRT) and it shall be progressively increased by the SERVICE PROVIDER to meet the overall annual targets envisaged within the next 9 months.

17.4. Considering the long drawn process of the realisation of thrusters from Assembly to final Delivery of the hardware, it is proposed to make payment for each major milestone achievements which are given below and shall be decided by JRT:

17.4.1. On satisfactory completion of the Injectors' Characterisation Test at Sea level test facility - 20 % payment.

17.4.2. On completion of the Chambers Silicide coating process which is duly completed and accepted – 10 % payment.

17.4.3. On satisfactory completion of the Thruster assembly and other realisation activities & Acceptance hot firing – 25 % payment.

17.4.4. On satisfactory completion of the post Acceptance tests and accepted by the JRT – Balance payment.

17.4.5. No other payment terms will be entertained.

18. PERIOD OF CONTRACT

18.1. Period of contract is for two years from the date of start of executing the contract. The start of execution of contract shall not exceed one month from date of receipt of the Purchase order. This one month is provided for positioning of workforce personnel etc.,

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18.2. At the end of second year, based on satisfactory performance and mutual consent, the Purchase order shall be amended for two more years based on the review at the end of 2nd and 3rd year with the approval of Department.

19. PERFORMANCE BANK GUARANTEE-CUM-SECURITY DEPOSIT (PBG/SD):

PBG-cum-SD equivalent to 10% of the total Order Value shall be submitted to the Department in the form of Bank Guarantee issued from a Nationalized Bank in Rs.200/- Non-Judicial Stamp paper valid for a period of 27 months. This PBG-cum-SD shall be returned to the Service Provider on successful completion of all contractual obligations as per Purchase order or shall be adjusted/ forfeited against non-fulfillment of any of the contractual obligations.

20. LIQUIDATED DAMAGES:

If the Service Provider fails to execute the Purchase order/deliver the item satisfactorily within the time specified by JRT in each month, Liquidated damages @ 0.5% (zero point five percent) of the value of thrusters for each calendar week of delay shall be recovered from the Service Provider's bill. However, total Liquidated Damages recovered shall not exceed 10% (ten percent) of the total Order Value.

21. FORCE MAJEURE

Neither party shall bear responsibility for the complete or partial non- performance of any of their obligations (except for failure to pay any sum which has become due on account of receipt of goods under the provisions of the present purchase order) if the non- performance results from such force majeure circumstances such as, but not restricted to, flood, fire, earthquake, civil commotion, sabotage, explosion, epidemic, quarantine restriction, strike, lock- out, freight embargo, acts of the Government either in its sovereign or contractual capacity, hostility, acts of public enemy and other acts of God as well as war or revolution, military operation, blockade, acts or actions of State authorities or any other circumstance beyond the control of the parties that have risen after the conclusion of the present purchase order. In such a case, you shall notify the purchaser in writing, not later than 21 days from the date of commencement of the unforeseeable event. Unless otherwise directed by the Centre in writing, you

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shall continue to perform your obligations under the Purchase Order as far as is practical and shall seek all reasonable alternative means for performance not prevented by the force majeure event.

22. SECRECY & PATENT RIGHTS

- 22.1.** The Documents/Drawings/Route cards/Process sheet/Data of the results are strictly confidential and the Service Provider or his employees shall not divulge any information that is made known to him or he has come across to any person not authorized to receive such information.
- 22.2.** The Service Provider or his employees shall not take any document/process sheet/data of the results/CD/USB etc., issued containing work details, outside the place of work.
- 22.3.** Any violation of secrecy, detected at any time of the contract, by the Service Provider or any of his employees may lead to termination of services of the employee/Purchase order itself as deemed fit by Department. This will also attract serious action.
- 22.4.** The plant designs etc. whether or not protected by patent, are to be strictly treated as secret & the Service Provider shall not disclose any details of the above to any unauthorized person or to any other party not directly linked with LPSC and shall not use the same for any other purpose.

23. GRIEVANCE REDRESSAL AND ARBITRATIONS

- 23.1.** The provisions relating to grievance redressal mechanism, including the details of the authority to which the Service provider may submit an application for review of any decision or action taken by the Department, shall be incorporated in the Purchase order.
- 23.2.** In the event of any dispute or difference arising out of or in connection with any of the terms and conditions of this Purchase Order, such dispute or difference shall be settled amicably by mutual consultations or through the good offices of the respective parties. If such resolution is not possible, then the unresolved

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dispute or difference shall be referred to the sole arbitrator appointed by Director-LPSC, in accordance with the rules and procedures of the Arbitration and Conciliation Act of 1996 or any re-enactment or modification/ alteration thereof. The decision of the Arbitrator shall be final and binding upon the parties and the expenses for the arbitration shall be borne by the respective parties unless otherwise determined by the Arbitrator.

The Arbitrator may, with the consent of both the parties, extend the time for making the Award. The Arbitration shall be held at Thiruvananthapuram, Kerala.

24. TRANSFER OR SUBLETTING OF PURCHASE ORDER

- 24.1.** The Service Provider shall not sublet the work under the purchase order either in whole or in part for the fulfillment of the contractual obligations vested with them.

25. SHORT CLOSING/ TERMINATION OF THE PURCHASE ORDER

- 25.1.** In case of failure on the part of SERVICE PROVIDER for commencing the work within a period of one month from the date of getting the Purchase order, Department reserves the right to terminate the purchase order and Service Provider shall forfeit the security deposit in total.
- 25.2.** In case of non-performance of the Service Provider in fulfillment of the Purchase order obligations vested with them, Department reserves the right to terminate the purchase order and notify the SERVICE PROVIDER accordingly. In such case also, the SERVICE PROVIDER shall forfeit the security deposit in total. On receipt of short closing/termination notice the SERVICE PROVIDER shall take all necessary steps for winding up of the activities in line with the notice within a reasonable period but in any case not later than one month from the date of posting of this notice. In case of such termination, payments towards any service already rendered by the Service provider and remaining unpaid at the time of termination shall be payable by LPSC. No other payment will be made.

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25.3. If any of the workforces of the SERVICE PROVIDER misbehaves or commits any misconduct, LPSC reserves the right to refuse permission to such persons to enter LPSC. Any violation in this regard shall result in the termination of the Purchase order without any notice.

25.4. In case of major changes in the policies of the Government of India, as a result of which the Department is compelled to curtail the requirements wholly or partly, Department and the SERVICE PROVIDER shall enter into negotiation to mutually agree to terminate this Purchase order wholly or partly. The compensation if any, to be paid to the SERVICE PROVIDER shall be agreed to by the mutual negotiations and the compensation along with payments already made or due for payment to the SERVICE PROVIDER shall in no case exceed the total order value.

26. APPLICABLE LAW

This Purchase order shall be governed by and interpreted and construed in accordance with the Rule of Law in India. The Department shall not be responsible and shall be totally absolved if the Service Provider infringes the laws or statutes in force during the currency of the Purchase order.