NAL/PUR/CAD/067/20-Z
Date: SEP 02 & 09, 2020

The Pre-bid Conference was held and the following T&PC members attended the meeting: -

Sr. No.	Name & Designation	Role
1	Dr. M. Manjuprasad, Chief Scientist, STTD	Chairman
2	Dr.Abhay Pashilkar, Chief Scientist, PGD-CAP	PL & Member
3	Vineet Kumar, Chief Scientist, PD-SARAS	Member
4	Satish R Rohidekar, Chief Scientist, Dy-Head CCADD	Member
5	Mr. Dilip Kumar Sahu,Sr.Technical Officer-2, CCAD	Member
6	Bhaskar Chakravarthy, Chief Scientist, CCADD	Specialist Member
6	Dr. Ravishankar S, Chief Scientist, Head APMF	Specialist Member
7	Soumendu Jana, Chief Scientist, PRD	Specialist Member
8	Abbani Rinku, PD-Hansa	Specialist Member
9	Gaddikeri Kotresh, TTL-Structures	Specialist Invitee
10	Manjunath P, Chief Scientist, Head PRD	Specialist Invitee
12	Vinay C A, Senior Scientist, CCADD	Member-Convenor, TSC
13	FAO or his representative	Member
14	AO or his representative	Member
15	CoSP/SPO or his representative	Member-Convenor, T&PC

The list of Prospective bidders who attended the Pre-bid Conference is as per **Annexure-I**.

At the outset, the Chairman welcomed all the Members and the representatives of the Bidders and briefed in general the scope of the Project and thereafter requested **SPO** to brief the Bidders on the salient features of the commercial terms. The Indenting Officer to read out the clarification sought by the bidders and the replied there to as detailed in **Annexure-II (Part A: Technical Clarification and Part B: Commercial Clarification, if any).**

The representatives present were satisfied with the replies given and it was informed that the corrections / additions / clarifications given, as discussed during the Pre-Bid Conference would be hosted on the website of CSIR-NAL and all prospective bidders are required to take cognizance of the proceedings of the Pre-Bid Conference before formulating and submitting their bids as stipulated in bidding Documents.

The meeting ended with a vote of thanks to the Chair.

Encl: as above.

Dr. M. Manjuprasad
Chairman

Dr. Abhay Pashilkar

CoSP/Member

Vinay C A

Bhaskar Chakravarthy

Abbani Rinku

Vineet Kumar

Dr. Ravishankar S

Dr. Soumendu Jana

Satish R Rohidekar

DilipKumar Sahu

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CSIR-NATIONAL AEROSPACE LABORATORIES
BENGALURU - 560 017

TENDER NO.: NAL/PUR/CAD/067/20-Z ANNEXURE- I
DATE & TIME: 2-SEP-2020 @ 11:00 AM
9-SEP-2020 @ 2:30 pm
VENUE: THROUGH WEBEX

Pre-Bid Conference for Design and Development of Nacelle for Tractor Aircraft with High Wing Mounted PT6A-67A Engine-Propeller.

ATTENDENCE SHEET- T&PC AND SPECIALIST MEMBERS

Sr. No.	Name		Signature
1	Dr. M. Manjuprasad, Chief Scientist, STTD	Chairman	
2	Dr.Abhay Pashilkar, Chief Scientist, PGD-CAP	PL & Member	
3	Vineet Kumar, Chief Scientist, PD-SARAS	Member	
4	Satish R Rohidekar, Chief Scientist, Dy-Head CCADD	Member	
5	Mr. Dilip Kumar Sahu,Sr.Technical Officer-2, CCAD	Member	
6	Bhaskar Chakravarthy, Chief Scientist, CCADD	Specialist Member	
6	Dr. Ravishankar S, Chief Scientist, Head APMF	Specialist Member	
7	Soumendu Jana, Chief Scientist, PRD	Specialist Member	
8	Abbani Rinku, PD-Hansa	Specialist Member	
9	Gaddikeri Kotresh, TTL-Structures	Specialist Invitee	
10	Manjunath P, Chief Scientist, Head PRD	Specialist Invitee	
12	Vinay C A, Senior Scientist, CCADD	Member-Convenor TSC	
13	FAO or his representative	Member	
14	AO or his representative	Member	
15	CoSP/SPO or his representative	Member-Convenor T&PC	

List of Prospective bidders : 1)Collins Aerospace; 2) LTTS; 3) TAML; 4) Infosys; 5) Cyient

PURCHASE SECTION NAL BENGALURU

Technical clarification of pre-bid meeting for Design and Development of Nacelle for Tractor Aircraft with High Wing Mounted PT6A-67A Engine-Propeller.

Table 1.0 Technical Clarifications

Sl. No.	Query Description	NAL Response	Remarks
1	Will NAL provide initial preliminary aero lines Nacelle, Intake, Exhaust Ducts or is it Vendor's responsibility to generate aero lines?	Yes. Preliminary aero-lines of nacelle, exhaust ducts will be given. Vendor should do its independent analysis and make improvements where necessary to the geometry.	
2	Are the interaction requirements between wing/nacelle and nacelle/rotor blades part of inputs provided to vendor? (Drag and airflow uniformity and AOA?)	As for the aerodynamic interactions, we have qualitative requirements: wing-nacelle drag should be minimized; for the propeller blade wing-nacelle interaction, the installed efficiency of the propellers should be maximized. Airflow uniformity at AOA, required thrust line inclination to minimize propeller vibrations/noise at cruise conditions would be assessed by vendor. Relevant interface & models such as wing/nacelle and nacelle prop blades will be provided as part inputs.	
3	Is the lip profile design responsibility of the vendor? What are the de-icing requirements?	The lip profile (internal and external) will conform to the engine OEM recommendations and the details will be provided for review to the vendor. De-icing interface requirements data will be provided for the design consideration.	
4	Does the thrust come from propeller or with a combination of propeller and exhaust?	Both (~96% thrust generated by prop and rest is from exhaust jet at low speeds. As Mach number rises, exhaust jet thrust tends to become negative)	
5	Is reverse thrust obtained by reversing the propeller rotation or by using exhaust air from engine? If thrust reverser is required what may be the requirement of reverse thrust?	Reverse thrust is obtained by reversing the propeller angle. Propeller rotation is not reversed. No thrust reverser requirements.	
6	-	-	-
7	Do concept layouts involves 2D drawings? Will engineering output be 2D drawing or MBD?	Both.	
8	No information on auxiliary system in the documents? Such as ECS, Pneumatics etc.,	Relevant interface data of other mechanical systems will be provided. CSIR-NAL would need to sign NDA before sharing data.	
9	What is the weight target for Nacelle?	Weight target will be provided.	

10	Does supplier need to follow NAL design guidelines and process specification? Or follow their own design guide lines and processes specifications?	Design, Drawing & process specifications must follow NAL standard. (In case of any deviations NAL concurrence required.)	
11	Details of acoustic requirements not mentioned	As per chapter 4 section 4.2 (4) missing data will be provided as and when required.	
12	PDM used and engineering release tools/process not mentioned	As per section 4.2 (4) missing data will be provided as and when required.	
13	Which composite design work bench to be used, CPD or Fibersim?	'CPD ' to be used.	
14	Will wing details be provided by NAL?	YES	
15	3D CATIA V5-6R2020 CAD model of the engine nacelle external shape and internal shape	Preliminary external nacelle shape will be provided.	
16	Starter duct configuration?	Preliminary configuration will be provided.	
17	The selection of materials to be done in consultation with CSIR-NAL design team. What's the level of consultation?	If material selected as per NAL's recommendation design allowable will be provided, if new material is proposed, vendor to define allowable and get NAL concurrence. (However for composite materials, the materials to be used will be provided by NAL composites manufacturing team and the same needs to be used by the vendor)	
18	Design allowable to be provided by whom?	If material selected as per NAL's recommendation design allowable will be provided, if new material is proposed, vendor to define allowable and get NAL concurrence.	

Table 1.1 General

Sl. No.	Query Description	NAL Response
29	From our prior experience the time lines are challenging, is there any buffer in schedule?	Timelines are drawn based on previous NAL's experience and to meet aircraft program schedules.
30	What is Supplier's role and responsibilities with respect to fabrication, testing and certification?	As per tender doc chapter 4, section 4.4.3 acceptance criteria. In case of any deviations/snag during fabrication, design change request must be complied by vendor. Similarly during testing & certification. During flight testing

		validation of design simulation results and test results must be completed.
31	What are expectations with regards to Technology Transfer?	During the design & development phase in case of development novel solution/technology to the problem to meet the performance target, technology/design must be completed shared to NAL.
32	Flexibility on change/usage of software packages and versions	Not acceptable.
33	What is vendor role is selected of suppliers for subsystems {Ref boQ SI 1}	BOI's, LRU's selected (ex: actuators, special fasteners, camlocks, QAD's etc) source of supplier and details must be shared.

Table 2.0 Technical Clarifications

Sl. No.	Queries	Response from NAL-CSIR	Remarks
2	In qualification requirements it is specified as minimum 10 years' experience in manufacturing and supply of similar activity But the activity is mainly of Design and testing and vendor does not have manufacturing experience, is it that can we have JV with manufacturer with 10 years' experience or it is necessary that JV only should be of 10 years	Manufacturing support experience in-order to realize nacelle integration to aircraft (generation of process, method sheets etc) is must. (Design for manufacturing, DOA etc are to be considered in design stage itself thus, prior similar work is very much appreciated). As part deliverables & work involved, fabrication process, method sheets etc needs to be supplied.	SOW revised and restricted design of nacelle.(Chapter 4 & 6 revised)
3	In qualification requirements it is mentioned as bidder should have manufactured and supplied at least 1 numbers engineering services, it means its Design and testing as per requirement of this RFP or actual manufacturing of product	This work is end to end solution except fabrication.	SOW revised and restricted design of nacelle.(Chapter 4 & 6 revised)
4	Given as Quantity can increase or decrease by 25%, if there is increase in quantity whether timeline is moved accordingly and also the cost is billed separately	No hardware delivery involved in this proposal.	SOW revised and restricted design of nacelle.(Chapter 4 & 6 revised)

Table 3.0 Technical Clarifications

Sl. No.	Queries	NAL Responses	Remarks
2	No clause in the Chapter 4.	AMC not applicable as there are no hardware delivery involved in the scope.	SOW revised and restricted design of nacelle.(Chapter 4 & 6 revised)
3	How the Warranty be provided for a Design Work? - what is the scope? Fabrication is in scope of NAL. How can Vendor provide the warranty covering a year if there is a delay from NAL.	Warranty not applicable. Its only acceptance criteria & it is as per section 4.4.3 table.	SOW revised and restricted design of nacelle.(Chapter 4 & 6 revised)
4	For the vendor, Scope is only for Design of Nacelle. Fabrication of Nacelle is on NAL.	Yes. Support during manufacturing/testing is defined as per section 4.4.3 table/or as per BoQ	SOW revised and restricted design of nacelle.(Chapter 4 & 6 revised)

Table 4.0 Technical Clarifications

Sl. No	Clarification Sought/Query	NAL Responses	Remarks
1	We cannot agree to this clause and hence should be deleted. The design approval and manufacturing responsibility lies with CSIR-NAL.	Manufacturing support experience inorder to realize nacelle integration to aircraft (generation of process, method sheets etc) is must.	SOW revised and restricted design of nacelle.(Chapter 4 & 6 revised)
2	CSIR-NAL to provide: Material specifications / properties / factors/curves, required for design and analysis at room and elevated temperatures including the corrosion and erosion resistance details for composite / metallic materials. - Standard parts catalogue - fasteners, rubber seals, latches, sealants, fire blankets / insulations, etc. - Standard surface protection process approved by CSIR-NAL However, vendor will refer to the global standards (MMPDS, MIL handbook etc.) and will use the material data post approval from NAL.	Vendor to arrive based on the previous experience. (Similar product experience is useful in ascertaining this) If material selected as per NAL's recommendation design allowable will be provided, if new material is proposed, vendor to define allowable and get NAL concurrence.	SOW revised and restricted design of nacelle.(Chapter 4 & 6 revised)
3	CSIR-NAL provided loads covers mission extremities like standard / hot/cold day conditions and also particular risk conditions like fan blade-off and burst duct etc.	YES	
4	CSIR-NAL to provide detailed Pylon mounting interfaces on the wing.	As per section 4.2 (4) & missing data will be provided as and when required.	
5	CSIR-NAL to provide QTP /ATP followed for SARAS MK1.	No/Not applicable.	
6	CSIR-NAL to provide the NMG (3d) for the assumed Nacelle and wing	YES	
7	CSIR-NAL to provide enveloping conditions for CFD, like critical points from the mission envelope covering aircraft various flying altitude, ascent/decent and speeds.	YES	

8	Lot of other inputs are required and we believe that CSIR-NAL will provide based on vendor request.	As per section 4.2 (4) & missing data will be provided as and when required.	SOW revised and restricted design of nacelle.(Chapter 4 & 6 revised)
9	It is assumed that thermal analysis of simple flow distribution, not a detailed aero thermal analysis with conjugate heat transfer.	Detailed aero-thermal analysis	
10	The clause mentions about the experience the relevant Date'), manufactured and supplied (/erected/ commissioned 1 similar engineering service [This bid is opened to qualified firms, nationally based companies, having appropriate background and expertise in Turboprop tractor configured engine-nacelle design, development, installation and certification for small and medium sized aircraft as per FAR23/25 or equivalent. Vendor's engineering service provider and has similar experience in design and development of nacelle for medium and large commercial airplane. Hence vendor proposes the new clause reworded as below: The bidder (manufacturer or principal of authorised representative – hereinafter referred simply as 'The Bidder') should have regularly for at least the last 10 years, ending 31st March of the previous financial year (hereinafter called 'The relevant Date'), has involved in the design and development of similar engineering service [This bid is opened to qualified firms, nationally based companies, having appropriate background and expertise in engine-nacelle design, development, installation and certification for small and medium and large sized aircraft as per FAR23/25 or equivalent. Only those firms with a substantial, proven track record of performance and resources in the above field of activities are encouraged to participate. Original Equipment Manufacturers (OEMs) / Consultants / design organizations who have proven expertise in providing the complete design solutions for Nacelles' on any	Manufacturing support experience inorder to realize nacelle integration to aircraft (generation of process, method sheets etc) is must.	SOW revised and restricted design of nacelle.(Chapter 4 & 6 revised)

	FAR23/25/equivalent aircraft followed by certification support expertise of the nacelle for such aircraft. with the same or higher specifications having/with nacelle design & development parameters (hereinafter called 'The Product').		
11	The table requests the confidential details of the customer data. Vendor will provide the similar experience details in different format by considering the customer confidentiality	Agreed	
12	Both b &c clauses are related to manufacturer and hence will not be applicable. Even from the design and development perspective for the programs which vendor have worked "successful operation for at least 20 years on the date of bid opening." will not hold good.	Refer comments of #1 & 10.	

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Table 5.0 Technical Clarifications

Sl. No.	Query Description	NAL Response	Remarks
1	Please confirm if the engine specifications & drawing from NAL include all the available engine sub system details also.	YES.	
2	Do NAL provide basic configuration of Nacelle and Mounts? (In Inputs section it is mentioned that they will provide "Nacelle envelope constraint diagram")	Inputs are as per section chapter 4, 4.2(4).	
3	Whether Vendor is responsible for Oil cooler selection/design and performance analysis, or this is a part of sub-system.	Oil cooler to be an Off-The Shelf item. Vendor to design the oil cooling system including ducting design.	
4	Whether vendor need to supply 2D manufacturing drawings or MBDs are fine.	Both to be supplied	
5	Since manufacturing is not in vendor scope, how the can vendor provide Comprehensive Warranty (section 4.4, page 44)	Acceptance criteria only. No Warranty applicable.	
6	Vendor is required quote firm fixed bid. Please confirm the extent of support required for "Need basis technical support/engineering support during Prototype aircraft testing, certification and participation." (Sl. No. 9 of list of deliverables, page 42).	Vendor to arrive based on the previous experience. (Similar product experience is useful in ascertaining this). A total duration of support till certification may be defined Say 4 years. Vendor can make his estimate based on Man Hour Rate. In case of any deviations/snag during fabrication, design change request must be complied by vendor. Similarly during testing & certification. During flight testing validation of design simulation results and test results must be completed.	SOW revised and restricted design of nacelle.(Chapter 4 & 6 revised)
7	In responsibility matrix it is mentioned as NAL & Vendor in 5 sections. Please confirm what are support required from vendor under these sections.	In case of any deviations/snag during fabrication design change request must be complied by vendor. Similarly during testing & certification. During flight testing validation of design simulation results and test results must be completed.	SOW revised and restricted design of nacelle.(Chapter 4 & 6 revised)

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9	Many of the clauses refer to manufacturing whereas the requirement under is the tender enquiry is engineering services. Please confirm what are the applicable clauses.	Manufacturing support experience in-order to realize nacelle integration to aircraft (generation of process, method sheets etc) is must.	SOW revised and restricted design of nacelle.(Chapter 4 & 6 revised)

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CSIR-NATIONAL AEROSPACE LABORATORIES
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TECHNICAL QUERIES & CLARIFICATION

Tender No. : NAL/PUR/CAD/067/20-Z
Item Description : Design and Development of Nacelle for Tractor Aircraft with High Wing Mounted PT6A-67A Engine-Propeller.

Sr. No.	Query / Clarification Sought	Clarification/Amendment
1	**Chapter 6 Section 4.1.1** a) The bidder (manufacturer or principal of authorised representative – hereinafter referred simply as 'The Bidder') should have regularly for at least the last 10 years, ending 31st March of the previous financial year (hereinafter called 'The relevant Date'), manufactured and supplied (/erected/ commissioned 1 similar engineering service [This bid is opened to qualified firms, nationally based companies, having appropriate background and expertise in Turboprop tractor configured engine-nacelle design, development, installation and certification for small and medium sized aircraft as per FAR23/25 or equivalent. Only those firms with a substantial, proven track record of performance and resources in the above field of activities are encouraged to participate. Original Equipment Manufacturers (OEMs) / Consultants / design organizations who have proven expertise in providing the complete design solutions for 'Turboprop tractor configuration Nacelles' on any FAR23/25/equivalent aircraft followed by certification expertise of the nacelle for such aircraft.	Chapter 6 revised.
2	Chapter 4, Technical Specifications	Chapter 4 scope of work revised

Signature of IO & PL
(VINAY. C.A)
21/10/2020

PL.
Dr. Abhay Pashilkar

PURCHASE SECTION
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CSIR-NATIONAL AEROSPACE LABORATORIES
BENGALURU

COMMERCIAL QUERIES & CLARIFICATION

Tender No. : NAL/PUR/CAD/067/20-Z
Item Description : Design and Development of Nacelle for Tractor Aircraft with High wing Mounted PT6A-67A Engine-Propeller.

Sr. No	Query / Clarification Sought	Clarification/Amendment
1	Annexure L – Integrity Pact Section 2 (d) page No. 64	Copy of the guidelines on Indian agent for Foreign suppliers are **not** applicable, as a result of make in India guidelines.
2	Option clause 1.38.1	Not applicable.
3	Warranty GCC/SCC-Clause No. 2.21.3 and Chapter-4-Clause No.4.3(iii)	Not applicable / Stands deleted
4	AMC Chapter-4-Clause No.4.3(iv) and BoQ	Not applicable / Stands deleted. Hence, the value in BoQ to be used as ZERO to complete the uploading of BoQ process.
5	Extension of due date for submission of Bid 23-Nov-2020	Extension of due date for submission of Bid 24-Nov-2020
6	Refer revised chapter – 4 & 6 along with the pre-bid proceedings.	

Stores & Purchase Officer
For and on behalf of CSIR

भण्डार एवं क्रय अधिकारी
Stores & Purchase Officer
सीएसआईआर-राष्ट्रीय वांतरिक्ष प्रयोगशाला
CSIR-National Aerospace Laboratories
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बेंगलुरु/Bengaluru-560 017

Chapter4

Specifications and Allied Technical Details for
Design and Development of Nacelle for Tractor Aircraft with High-Wing Mounted and Powered by PT6A-67A Engine-Compatible Propeller Configuration

4.1 End Use:

Tractor propeller configured SARAS MK2 Aircraft

4.2 Detailed Specifications

4.2.1 Introduction:

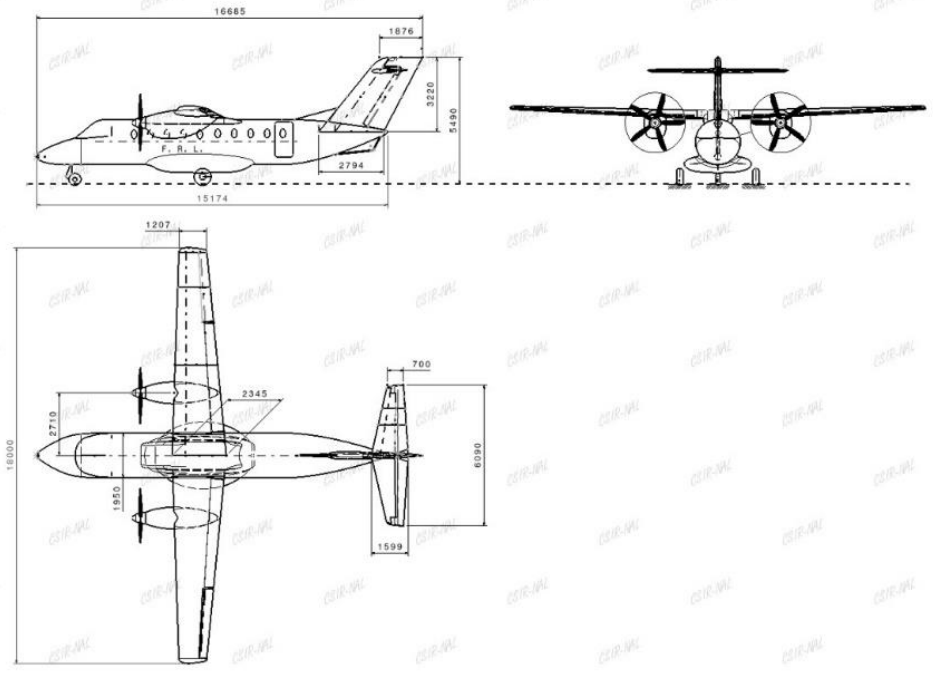
Organization Background

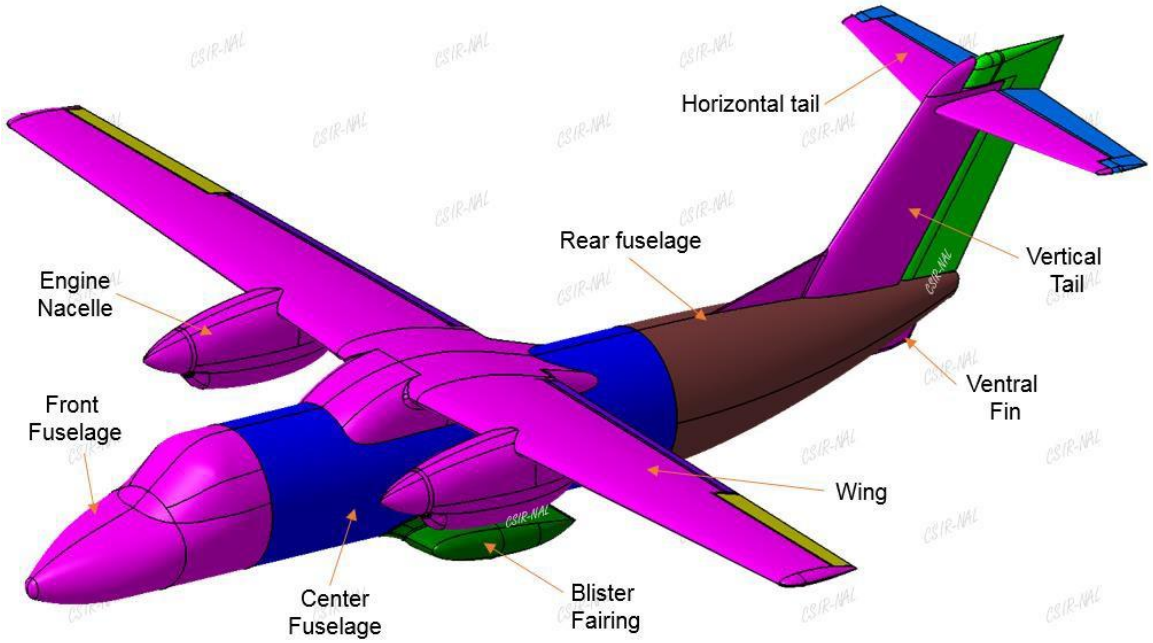
National Aerospace Laboratories (NAL), a constituent of the Council of Scientific and Industrial Research (CSIR), India, established in the year 1959 is the only government aerospace R&D laboratory in the country's civilian sector. CSIR-NAL is a high-technology oriented institution focusing on advanced disciplines in aerospace. CSIR-NAL has several advanced test facilities, and many of them are recognized as National Facilities. These are not only the best in the country, but are also comparable to other similar facilities in the world. CSIR-NAL has provided significant value-added inputs to all the Indian national aerospace programmes. Its contributions over the last six decades have enabled it to create a niche for itself in advanced aerospace research and technology development. CSIR-NAL has also developed many critical technologies for the strategic sector and continues to support the mission-mode programmes of the country.

CSIR-NAL's mandate is to develop aerospace technologies with strong science content, design and build small, medium sized civil aircraft, and support all national aerospace programmes.

Project SARAS Mk-II

CSIR-NAL, India is in the process of Design and Development of a 19 seat commuter aircraft SARAS Mk II in 7400 kg AUW with Tractor configuration. The Aircraft will be fitted with two Pratt & Whitney's PT6A-67A Engines with Mt-Propeller's 5 bladed composite propeller configuration. The aircraft will be certified by Indian Military Certification agency CEMILAC & Civil certification agency DGCA. NAL is opting for outsourcing the design and development of Nacelle to be fitted in prototype aircrafts for flight testing. Based on the ground test data analysis, modification/refinement to be carried out by the Vendor/Bidder for final Nacelle configuration freeze, qualification and transfer full technology to manufacture in India by CSIR-NAL and its associates.





SARAS Mk-II configuration

Table: Mk II Typical Flight Conditions

Sl. No.	H (ft)	OAT	Mach	Normalized Mass flow (lb/sec)	Remarks
1.	12000	ISA	0.20 - 0.25	11.0	Climb segment
2.	25000	ISA	0.40 - 0.547	12.0	Max. cruise segment
3.	25000	ISA	0.358 - 0.40	11	Econ. cruise segment
4.	15000	ISA	0.30 - 0.354	10	Econ. Cruise

4.2.2 Objective:

The objective of this work package would be to undertake design of the nacelle from the conceptual design phase to detail design phase including creation and streamlining of nacelle shape, main air intake, inertial particle separator (IPS) & its mechanism, oil cooling ducting and associated structures, plenum sealing, detailed design of nacelle and development. Fabrication of nacelle assemblies for integration and testing will be carried out by CSIR- NAL. Conceptual design phase of Nacelle to be completed by Preliminary Design Review (PDR) phase of aircraft; Detail Nacelle design phase to be completed by Critical Design Review (CDR) phase of aircraft followed by prototype development phase, testing phase, engineering changes after testing etc., with Intermittent/Periodic reviews.

Purpose and service outcomes statement of the assignment

The outcome of this service are described in Section 4.2.9 of this document. For the achievement of these work packages, the Engineering Service Provider shall meet the regulations of

- FAA Title 14, FAR Part 23, amendment 63 and associated Advisory Circulars.
- Top-level aircraft requirement (TLAR) for Saras MK2, specific to the work packages.
- Any other requirements specified by CEMILAC (DDPMAS) / DGCA (CAR 21) and ASR (IAF).

CSIR-NAL reserves the right to split, add, remove or modify any of the Work Package.

4.2.3 Scope of the work package

Work Package – Conceptual & Detail Design and Engineering for Nacelle.
Statement of work between customer and the Engineering service providers are detailed below:

Detailed scope

Scope pertains to SARAS MK2 Nacelle which includes, Aerodynamic, dynamic, thermal, CFD and structural analysis, conceptual & detail design and engineering of Nacelle which include the following subsystem(s). Design should meet the engine operating conditions for the given aircraft envelope must be within acceptable limits, while maximizing the system performance.

(a) Main Air inlet with ducting system with bypass and its actuators (Expected Ram Recovery at Max cruise Condition ~95%, Intake pressure loss ~1%, more details will be shared in further stages)
(b) Engine Oil cooling system and its ducting (to maintain main engine oil temperature with in permissible limits specified by engine manufacturer. (Aircraft operating ambient condition ISA -40°C to ISA +55°C). (It is desirable to maintain engine main oil temperature between 80-85°C for increased service life of the engine for in-flight segments and between 90-95°C for engine operation in static condition)

Table: Typical Engine Operating conditions (open source: word press, Training PT6A-60 series)

Power Setting	SHP	Torque		Max ITT	Ng		NP	Oil Pressure	Oil Temp.
		lb-ft		°C	RPM	%	RPM	PSI	°C
Take-off	1200	3708	44.34	850	39,000	104	1700/100%	90 to 135	10 to 110
Max Cont	1200	3708	44.34	840	39,000	104	1700	90 to 135	10 to 110
Max. Cruise / Climb	1000	3625	43.35	840	39,000		1700	90 to 135	10 to 105
Norm Cruise / Climb	1000	3625	43.35	820	39,000		1700	90 to 135	10 to 105
Min. Idle	-	-	-	750	19,000	51	-	60 minimum	-40 to 110
Starting	-	-	-	1000	-	-	-	200 max	-40 minimum
Transient		5100	60.98	870	39,000	104	1870/110%	40 to 200	0 to 110
Max. Reverse	900	-	-	760	-	-	1650/97%	90 to 135	10 to 105

(c) Engine Mounts system and isolators. (to maintain the engine vibration limits <~2 g-pk)
(d) Fire extinguishing system
(e) Nacelle structure and surfaces

The objective of this work package is to carry out the detail design and associated stress analysis, Fatigue and Damage Tolerance (F&DT) of Critical areas, CAD model generation, drawings for manufacturing, installation, assembly and support during manufacturing for Non-conformance and higher issues. The Engineering Service Provider will take up the design definitions from PDP (Preliminary Design Phase) for detail design, which would be including a number of contoured composite parts such as air inlet and oil cooling ducting & metallic parts such as Nacelle support frames, actuator brackets, engine mount trusses, etc.

As part of this work package, the Engineering Service Provider has to carry out detailed sizing, Detailed FEM (DFEM), stress analysis reports, create manufacturable detailed part definitions (3D), part & assembly drawings to meet budgeted weight. The considerations for detail design are as quoted below but not limited to meeting FAR 23 requirements, load requirements, safety factors requirements, weight & C.G. limits, Design for Manufacturing and Assembly (DFMA), tooling requirements, materials & processes, adjoining sections/assembly, system installations, clash and clearances, Interchangeability (ICY) requirements, lower manufacturing cost etc.

This work package would also include engineering support during (i) Component manufacturing and assembly (non – conformity support), (ii) Jig(s) and fixture(s) design (to resolve interface issues with tool design team of NAL), (iii) static test (to resolve design issues of component) and ground evaluation test in simulated test rig such as performance of air inlet and (iv) flight test (non – conformity support). The anticipated work involved is approximately 700 drawings (number of Left Handed, unhanded and unrepeated part/assembly drawings with associated models, including secondary parts). The given number of drawings is indicative in nature based on earlier variant. It is to be noted that the detail design phase is iterative in nature. The engineering service provider shall estimate the number of drawings and effort involved independently.

4.2.4 Work Content

Work Content for Nacelle Major Components Air inlet (composite) with main and bypass duct, Oil cooling ducting (composite), Engine mounts (metallic frame structure, welded or fastened) Nacelle support frame (metallic) enveloped with composite panels, access panels for inspections and maintenance.

Work involved (to be satisfied for the complete flight envelope/critical flight conditions to be selected & studied by the Vendor/Bidder):

1. Preparation/Upgradation of Nacelle concept 3-D layouts for the tractor configuration with independent analysis & finalizing the layout for Joint Design Review during CDR & PDR including Envelope, Development and design of geometry of Primary/main & Secondary air intakes, Oil cooling duct, main air intake, De-Icing, Engine mounting scheme. (NAL will provide the preliminary/baseline design)
2. 3D CATIA V5-6R2020 CAD Model of the engine nacelle external shape and internal shape. (NAL will provide the preliminary/baseline design)
3. 3D CATIA V5-6R2020 CAD Models of all the ducts (primary intake & secondary intakes) (NAL will provide the preliminary/baseline design)
4. Aerodynamic analysis of the nacelle external shape without and with wing to determine lift, drag and pitching moment characteristics of wing-nacelle.
5. Aerodynamic analysis of internal flow of ducts (NAL will provide the preliminary/baseline results) to determine minimum pressure losses. Flow quality details to be captured for later reference of CSIR-NAL.
6. Engine air intake and ducts, including door mechanism of the inertial particle separator
7. Choice of airworthy/certified Oil cooler and oil cooler performance analysis. (NAL will provide the preliminary/baseline results)
8. Oil cooler air intake and discharge ducts design. (NAL will provide the preliminary/baseline results)
9. Starter generator air intake cum air exit and their duct(s) design to keep temperature of starter generator within acceptable limits.
10. Design of engine air intake lip to cater for de-icing/anti-icing system. (NAL will provide the preliminary/baseline design)
11. Design of engine mounting structural system and shock mount installation considering
    - Rotor burst requirements
        - Engine mount structure—wing: interface and attachments. (NAL will provide the preliminary/baseline design)
    - Fail safe/Damage tolerant approach to be followed for engine mounting systems & attachment to the wing.
    - Design of Nacelle-Pylon & Wing attachment cum interfaces
12. Intake actuator, kinematics and its door mechanisms.
13. Thermal analysis of bay and zone ventilation
14. Plenum chamber/area sealing design to minimize charge heating (To maintain charge heating <3°C)
15. Exhaust duct system design for integration & testing on aircraft. (NAL will provide the preliminary/baseline design)
16. Fire extinguishing agent concentration analysis & tests on nacelle structure
17. Design of firewalls interface on nacelle for nacelle fire protection
18. Design for fire detection, indication and extinguishing.
19. Design for optimised weight based on the aircraft weight matrix provided from NAL: use of composite material as applicable
20. Selection of material should cater for high temperature/ fire resistance/ fire proof requirements wherever applicable.
21. Design to meet fatigue, damage tolerant and dynamics & flutter (including propeller whirl flutter) requirements.
22. Corrosion resistance, Erosion resistance, external paint etc. to meet the operating environment.
23. The selection of materials to be done in consultation with CSIR-NAL design team.
24. Design of fuel venting and environmental protection compliance.
25. Design for manufacture and assembly
26. Design for maintenance requirements (Viz., Inspection panels, drains & breather ports)
27. Design for quick assembly & disassembly of engine from nacelle structure. (Expected time: 4 hrs with 2 technicians) for removal of installed engine and replace it with new engine with optimum usage of standard tools.
28. CSIR-NAL's Drafting and drawing tolerance standards to be followed.
29. Inspection panels and hinged door mechanism for nacelle

NOTE: At appropriate stages of work, the Vendor/Bidder should provide sufficient design information to NAL so that CSIR-NAL may obtain concurrences of OEMs of Engine and Propeller etc. Design to meet appropriate regulations, OEM (For BOIs like engines, propellers, Fuel system and ACOC) and interface requirements as follows

1. Design must comply with certification requirements as per FAR23 prescriptive requirements vide amendment FAR23-63, CAR21, DGCA, DDPMAS and TLAR (A/C requirements applicable to engine-nacelle as well as operational requirements of SARAS Mk II tractor aircraft configuration will be provided by CSIR-NAL.
2. Design should comply engine, propeller, Fuel-system and ACOCs' (Air-Cooled Oil Cooler), OEM requirements.

3. Design must meet nacelle interface requirements of sub systems (electrical, aircraft mounted accessories, engine control, lubrication system, propeller system and secondary air systems, fire protection systems).
4. Design must meet interface requirements of aircraft systems housed in the nacelle (Avionics, Environmental systems and Flight Test Instrumentation systems. Ex: Tacho-generator, bleed line size, temperature & pressure sensor interface etc).

4.2.5 Project review & Schedule

Reviews like Requirement Capture Review, Critical Design Review and Technical Progress Reviews shall be conducted. The support of engineering service provider is envisaged during Ground Tests and Flight Readiness Reviews. Regular Technical Progress Reviews (TPR) are mandated between Technical coordination team and Service co-ordination team for all technical reviews and clarifications. Project progress review is to ensure that the subcontracted activity is progressing satisfactorily and is being performed correctly.

Description	Period	Remarks
Technical Progress Reviews (TPR)	Minimum twice a week	
Dedicated technical meeting	Need basis	
Management review	Monthly	

Quality of Deliverables

As the timely delivery of reports, drawings and models is critical to the programme, the Engineering Service Provider should set up a Quality Check team with Subject Matter Experts for ensuring their correctness and completeness. Product Quality Targets: The Engineering Service Provider will have to meet the following quality targets for First Time Right (FTR) and aim for Zero Error goals:

- Part and assembly drawings: > 95%
- Part and assembly models: > 95%
- Technical content of stress reports: > 98%

On time Delivery

- On time delivery of CAD & FE models / CFD models/ drawings / stress reports: >98%
- Design non-conformity lead times to be as mutually agreed.

Schedule

The representative schedule for the Work Package is indicated as below:

Work Package	Requirement Capture Review and Deliverable D1	Completion of layout & CFD studies	(Deliverable D2+D3)	Drawing Release (Deliverable D4)	Engineering Support (Deliverable D5)
Nacelle	T0 + 8 weeks	T0+16 weeks	T0 + 30 weeks	T0 + 40 weeks	T0 + 50 weeks
In Months	2M	2M + 2M = 4M	4M + 3M = 7M	7M + 3M = 10M	10M + 2M = 12M

T_0 is the placement of PO and signing of contract with the successful bidder as defined in section 10 of this document. Expected requirements of D1 to D5 is explained in section 4.2.7

4.2.6 Input data

Background material, data, reports, inputs to be provided from CSIR-NAL

- Following inputs will be provided by CSIR-NAL for design
    - Preliminary nacelle design layout

- Nacelle envelope constraint diagram
- Engine specifications and drawings
- Thrust line details
- Power plant system design goals/limits
- Flight condition/Mission profile and aircraft envelope diagram
- Engine mount loads, Propeller shaft loads and engine vibration limits
- Structural and Aero loads based on preliminary Nacelle shape assumed by CSIR-NAL
- Weight target
- The wing-engine attachment stiffness will be checked from wing flutter analysis point of view. This analysis will be done by NAL and based on the results, stiffness of the brackets has to be finalized, if inadequate
- Aircraft drafting and drawing GD&T standards
- Any other missing data as and when required.

➢ CSIR-NAL would provide the following additional details to execute these work packages

- Documents related to Design Guidelines and standards to address the 3D models and drawings
- Part definition guidelines - Machined parts - Sheet metal parts - Extruded part - Composite parts - Assembly / joints
- CAD modelling Methodologies
- Drafting methodologies
- Fastener specification
- Fastener Manual
- Part numbering system
- Tolerances
- Part marking

➢ Following attributes need to be finalized by Vendor/Bidder in consultation with CSIR-NAL

- Materials and Process Standards
- Material properties
- Heat treatment
- Surface treatment
- Protection requirements
- NDT Methods
- Cutting tools list
- Curing and post curing processes

The above listed requirement/ data are tentative and the detailed list will be finalized during the signing of the contract.

➢ Seed/initiating/template Files
- 3D CAD model
- Drafting model with Title block and frame
- Bill of Material/Material schedule
- Weight and C.G. Document Format.
- Drawing Applicability list Document format.
- Drawing Change Notice (DCN)/Project Slip (PS)/Deviation notes

➢ Checklists
- CFD analysis reports (model, mesh files, case, data files & reports)
- Stress reports (model, mesh files, case, data files & reports)
- FE models
- F & DT reports
- CAD models and drawings
- Machined Parts
- Sheet metal parts

- Composite parts
- Assembly

Other necessary inputs electrical bonding, Lightning protection schemes, Tooling hole locations, PLM flowchart, etc. will be provided as the project progresses.

4.2.7 Requirements

In these work packages, the Engineering Service Provider is required to carry out, but not limited to, the following activities.

D1- Analysis documents as indicated

Guidelines, manuals and standards covering the following for this work package.

- CFD simulations and analysis aspects
- Thermal analysis/analytical calculations
- Finite Element Modelling and analysis aspects
- Methods (SOM/ Hand Calculations)
- F&DT Methodology
- Stress Report Format
- F&DT Report Format

CSIR-NAL team would review the methods/approaches proposed by Engineering Service Provider before the formal release of documents.

D2-Detailed Analysis as indicated

- Boundary conditions assumed, CFD validation method followed.
- Derive loads for detailed sizing from the GFEM data provided.
- The weight targets of assemblies specified during kick-off meeting to be met. Reduce the weight of the structure in DDP.
- Generate DFEM models based on detail design.
- The stress analysis shall cover static, fatigue, damage tolerance requirements specified by FAR23 and associated Advisory Circulars. The simulation results are to be supported by hand calculations/aircraft industry standard analytical procedures, as applicable.

Prepare CFD, engineering analysis and stress reports for the detail design phase for CDR.

D3 Interface Clearance Arrangement models and drawings

It consists of the following

- Define the parts thickness as per detailed load requirements, required factor of safety, suitable material and its processes.
- Materials for components need to be selected from the standard approved material list provided by CSIR-NAL.
- Numerical Master Geometry (NMG) surfaces are not to be edited. In case of any higher issue release, the same will be communicated by CSIR-NAL.
- Adjoining system equipment and its parts like cables, tubes etc. are not to be edited. In case of any updates/changes, the same will be communicated by CSIR-NAL.
- Define the 3D parts considering comprehensive manufacturing and assembly procedures (DFMA) following industry best practices. The 3D modelling methodology to be followed as per manuals provided.
- Assembly design is to be done considering tooling (jigs and fixtures) requirements, ease of assembly and access clearances for maintenance personnel.
- Fasteners to be selected from the approved list.
- All fasteners are to be cleared for relevant loads. Each fastener hole/axis has to be co- axially aligned

with the adjacent parts/assembly following representation as per the provided manuals.

- All fasteners called in the assembly are to be verified for inter-rivet pitch, edge distances, head clearance, head placement (outer or inner), type, material, grip length etc.
- Detail sizing of metallic and composite parts including skins Engineering such as zonal thickness distribution, ply details & stacking sequence for composite parts.
- All the composite parts (including composite skins) are to be modelled using Part design module (plies not needed). Additionally, composite skins to be also modelled using CD3/CPD module of CATIA V5 for ply wise modelling and creation of ply-book.
- Parts, joints, fasteners definitions
- Clearance and clash resolution
- No Fowling of the control surface's structure with parent structure during the motion simulation/kinematics.
- Communization of Brackets, cleats, clips and parts like splice plated in Joints, etc.
- Assembly and part Numbering to be assigned in assembly hierarchy.

All design issues are to be resolved on currently as the Engineering Service Provider progresses and completes activities listed in D1, D2and D3. During this stage, the Engineering Service Provider shall provide Interface clearance Arrangement 3Dmodels, assemblies & Interface clearance drawing defined for these work packages. After acceptance of Interface Clearance drawings and models, the Engineering Service Provider can proceed with generation of 2D part drawings and assemblies.

Interface Clearance drawings to contain the views of overall structure of the finalized 3D parts assembled with fasteners, with major dimensions. The Interface Clearance drawing views to contain the assembled views of ribs or frames along with skins, stringers, access doors, brackets, cleat/clips, system interface components with major apart from the 3D Interface checks, 3D clash/clearance checks between parts and between parts and fasteners. The information of the different views that would be needed to generate the views can be provided during the execution of the project.
Review of this Interface Clearance arrangement models and drawing is from the start of the project on a weekly basis. This activity should be completed before CDR to facilitate the release of part drawings after CDR.

<u>D4-Drawing Generation</u>

- Generate 2D drawings by following the manuals and sample drawings provided. The part and assembly drawings shall coverall dimensions, tolerances, sealant requirements, suitable notes (including material process and finish), part markings, weight, EBOM, etc. The drawings have to follow the drafting methodology manual and part numbering scheme provided by CSIR-NAL.
- The sheet metal parts to have a view of the developed part in the drawing, that is generated using CATIA V5SL3 license.
- The drawings of pneumatic pipe-line/tubings carrying hot-air should have pressure-test notes.
- 3D part and 2D drawings are to be linked with indicated software version.
- The tolerance for the drawings is to be as per the tolerance manual provided by CSIR- NAL.
- 2D drawings are to be associated with Bill of Materials (part list) as per the manuals provided.
- Installation drawings of mechanical, electrical and avionics systems onto the nacelle structure.
- Tracking of all the technical queries with its responses.
- Deviation notes (if any) to be provided with detail description.
- Updates of Models and Drawings to address the Manufacturing/assembly issues arising before the release of last drawing.

<u>D5-Engineering Support during Prototype Manufacturing and ground testing phases: -</u>

The work packages also include the engineering support from the Engineering Service Provider to update models, drawings, EBOM, DAL resulting due to manufacturing/design issues during component manufacturing and assembly (non–conformity support), Jig Fixture Design (to resolve interface issues with tool design team of CSIR-NAL or its representatives), static test (to resolve design issues of component) and flight test (non–conformity support).

During manufacturing and assembly, non-conformance (NC) are anticipated namely on drawings, 3D models and physical parts/assemblies. These are broadly classified as (i) Production Queries (PQ) and/or Request for Action (RFA) (ii) Design disposition in the form of Project Slips and/or Repair/Rework Project Slips (iii) Snags disposition. The support team should bring in the execution knowledge of these work packages and update the models and drawings.

4.2.8 Software Tools to be used for Execution

The applications and connections required for the achievement of the service are the following ones: PLM Teamcenter or 3D Experience Modelling & Drafting: CATIA V5 R2020 Composite: CD3/CPD (for composite skins only) Sheetmetal Development: SL3 FEA (Pre/Post Processor): Hyperworks 2020 or Latest FEA (Solvers): MSC NASTRAN, Hyperworks (Opti struct) Fatigue & Damage Tolerance MSC NASTRAN (embedded Fatigue) / FRANC 3D / NASGRO / MSC MARC, ANSYS Fluent, Documentation: MS Office 2016 Word, Excel, PowerPoint. Adobe PDF, etc. Tools

4.2.9 Deliverables

List of deliverables

- Design Document (Aerodynamics, CFD, Thermal/Analytical, Structures and Power plant integration to airframe),
- Detailed Design Drawings, assembly, sub-assembly drawings, standards used data (2D)
- Interface control documents,
- Fabrication drawings,
- complete 3D CATIA V5-6R2020 CAD Models,
- Material Specification (s-n curve, elevated temperature data etc.),
- Fasteners/camlocks/latches used with installation data, analytical calculations in arriving design,
- Numerical analysis results (including geometry, mesh file and case-data files-generated by using a competent RANS-type CFD software and preferably compatible with ANSYS Fluent),
- Finite element method (FEM) analysis results (including geometry, mesh file and case-data files),
- Structural static test schedule/plan/procedure.
- For both composite material and sheet metal components, form tools 3D CATIA V5-6R 2020 models and drawings to be provided.
- Detailed integration procedure, tools required, inspection stages required should be defined.
- Maintenance manuals like Component Maintenance Manual, Illustrated Part Catalogue, FMECA report, reliability analysis report, Corrosion Preventive Manual etc., wherever applicable.
- Complete transfer of technology to manufacture nacelle within India by CSIR-NAL and its associates. Thus, the material, fastener and any other items whose source of the procurement to be given.

Format of deliverables

The Deliverables format for work package are as below:

Description	Deliverable /format
Manuals and formats –D1	
CFD & Finite Element Modelling and analysis aspects	Word Document
Methods (SOM/Hand Calculations)	Word Document
F&DT Methodology	Word Document
Stress Report Format	Word Document
F&DT Report Format	Word Document
CDR RelatedActivities-D2	
DFEM/ local FE models that are associated to respective assembly/parts/attachments. Updated FE models based on approved design.	Hypermesh FE Models(*.HM), Input data in NASTRAN format (*.DAT/ *.BDF) and output data in MSC NASTRAN format (*.F06, *.PCH, *.OP2).
CFD Analysis	Cleaned Geometry files (.iges/CAT Part), *.msh, *.cas & *.dat files. ANSYS V16 and above.
CFD, thermal, analytical & Stress reports as per the scope of these work packages containing respective assembly / parts/ attachments.	Softcopy of Word Documents and 10 sets of printed copy of the report
List of all associated FE reports, stress report and the corresponding FE models and CAD Assembly/parts used.	Word Document
CDR Related Activities -D3	
Interface clearance arrangement Models and Drawing	CATIA V5 CAT Part, CAT Product& CAT Drawing
Release of Drawings and Models in PLM–D4	
3D parametric models of parts (LH) and unhanded parts positioned as needed in PLM RH parts to be mirrored and positioned in PLM)	CATIA V5 CAT Part/ PLM
3D models of Assemblies with tree structure	CATIA V5 CAT Product / PLM
2D drawings of each part	CATIA V5 CAT Drawing/DraftSight
2D drawings of assemblies	CATIA V5 CAT Drawing
Bill of Material/material schedule asper tree structure	Word Document
Installation drawings for each system assembly with its LRUs	CATIA V5 CAT Drawing
Tolerance Stack up analysis reports	Word Document
Sequence of Assembly for all major assemblies	Power point
Drawing Change Notice (DCN) /Project Slip (PS) / Deviation notes or Equivalent documents as per PLM	CATIA V5 Models /Drawings /PLM
Drawing Applicability List (DAL)Document	Word Document
Weight and C.G. reports As part of the weight & C.G report, Station wise weight distribution to be also furnished.	Word Document / Excel

Drawings with EBOM	One set of paper(80-100GSM) print for signature Scanned softcopy of signed drawings with EBOM 7 sets of photo copies in 1:1, after signature
Macros/ Automation files/ knowledge ware files	Excel / .exe /CATIA files/as applicable
Engineering Support during Prototype Manufacturing and ground testing phases – D5	
Updating of CAD&FE models, drawings, EBOM, during Manufacturing and assembly of prototypes.	Stress reports, CATIA V5Models, And Drawings for affected parts and assemblies.
Resolutions of PQs, Snags, DCNs and Project Slips during Manufacturing assembly and ground testing of prototypes.	One set of paper(80-100GSM) print with signature for DCN and PS along with higher issue drawings. Scanned softcopy of signed Drawings with EBOM 8 sets of photocopies in 1:1, after signature

All deliverables & communication shall be in English.

4.2.10 Responsibility, Approver, Support, Integrator

Activity	Responsibility	Approver/ Concurrence	Support	Integrator
Nacelle Conceptual Layout	NAL (conceptual layout will be provided by NAL. Vendor/Bidder to add value by independent analysis)	NAL	NAL team to spend upto 3 weeks at Vendor/Bidder location	Not applicable
Finalizing Nacelle Design & review of numerical studies	Vendor/Bidder (Preliminary concept will be provided by NAL)	NAL		Not applicable
Design of primary & secondary air intake, Review of numerical and analytical results	Vendor/Bidder (Preliminary concept will be provided by NAL)	NAL	NAL	Not applicable
Oil cooling System design	Vendor/Bidder (Preliminary concept will be provided by NAL)	NAL	NAL	Not applicable
Design of engine Mount system and review of analytical & FEM results	Vendor/Bidder (Preliminary concept will be provided by NAL)	NAL	NAL	Not applicable
Design & review of fire protection system	Vendor/Bidder (Preliminary concept will be provided by NAL)	NAL	NAL	Not applicable
Design of nacelle-pylon to wing interface	Vendor/Bidder (Preliminary concept will be provided by NAL)	NAL	NAL	Not applicable
Design of engine Exhaust system	Vendor/Bidder (Preliminary concept will be provided by NAL)	NAL	NAL	Not applicable
Release of component(s), sub-assembly(s), assembly(s), equipment(s) drawings	Vendor/Bidder	NAL	NAL NAL team to spend upto 3 weeks at Vendor/Bidder location	Not applicable
Fabrication of components, sub-assembly(s), assembly(s) and maintenance aspects Manufacturing and integration, snag clearance	NAL	NAL & Vendor/Bidder	Vendor/Bi dder Short visit of Vendor/Bidder team to NAL	NAL
Nacelle Integration and Equipping	NAL	NAL & Vendor/Bidder		NAL
Ground Testing	NAL	NAL & Vendor/Bidder	Vendor/Bidder	NAL

4.3 Scope of Supply and incidental works:

Scope of Supply includes the following:

(i) Delivery Schedule as per clause No.4.5.

4.4 Inspection & Tests

4.4.1 General

1. The Supplier shall at its own expense and at no cost to the Purchaser carry out all such tests and/or inspections of the Goods and Related Services as are specified here.

2. The inspections and tests may be conducted on the premises of the Supplier or its subcontractor(s), at the point of delivery and/or at the Goods final destination.

3. Whenever the Supplier is ready to carry out any such test and inspection, it shall give a reasonable advance notice, including the place and time, to the Purchaser. The Supplier shall obtain from any relevant third party or manufacturer any necessary permission or consent to enable the Purchaser or its designated representative to attend the test and/or inspection.

4. Should any inspected or tested Goods fail to conform to the specifications, the Purchaser may reject the goods and the Supplier shall either replace the rejected Goods or make alterations necessary to meet specification requirements free of cost to the Purchaser.

5. The Purchaser's right to inspect, test and, where necessary, reject the Goods after the Goods' arrival at final destination shall in no way be limited or waived by reason of the Goods having previously been inspected, tested and passed by the Purchaser or its representative prior to the Goods shipment.

6. The Supplier shall provide the Purchaser with a report of the results of any such test and/or inspection.

7. With a view to ensure that claims on insurance companies, if any, are lodged in time, the bidders and /or the Indian agent, if any, shall be responsible for follow up with their principals for ascertaining the dispatch details and informing the same to the Purchaser and he shall also liaise with the Purchaser to ascertain the arrival of the consignment after customs clearance so that immediately thereafter in his presence the consignment could be opened and the insurance claim be lodged, if required, without any loss of time. Any delay on the part of the bidder/ Indian Agent would be viewed seriously and he shall be directly responsible for any loss sustained by the purchaser on the event of the delay.
8. Before the goods and equipment are taken over by the Purchaser, the Supplier shall supply operation and maintenance Manuals together with Drawings of the goods and equipment built. These shall be in such details as will enable the Purchase to operate, maintain, adjust and repair all parts of the works as stated in the specifications.

9. The Manuals and Drawings shall be in the ruling language (English) and in such form and numbers as stated in the Contract.

10. Unless and otherwise agreed, the goods and equipment shall not be considered to be completed for the purposes of taking over until such Manuals and Drawing have been supplied to the Purchaser.

11. On successful completion of acceptability test, receipt of deliverables, etc. and after the Purchaser is satisfied with the working of the equipment, the acceptance certificate signed by the Supplier and the representative of the Purchaser will be issued. The date on which such certificate is signed shall be deemed to be the date of successful commissioning of the equipment.

4.5 Delivery Schedule (including supply, installation, commissioning, training & acceptance)

Delivery of the Item		Installation & Commissioning		Training At CSIR_NAL, if any	Acceptance of the item
Days/ Weeks/Months	Location	Days/ Weeks/Months from the date Of receipt of equipment	Location	Days/ Weeks/Months From the date of Installation &Commissioning	Days/ Weeks/Months from the date Of Installation, Commissioning &Training
50 weeks	CSIR-NAL Bangalore-560037	-	-	-	-

The Vendor/Bidder shall execute the entire project and supply the nacelles in 50weeks' duration. Joint review will be conducted at each milestone unless otherwise specified. T0= Purchase order placement

Milestone 1 (D1)	Requirement Capture (T0+8 Weeks) D1 (Payment 10%)
Milestone 2	Completion of layout & CFD studies(T0+16weeks) (Payment 20%)
Milestone 3 (D2+D3)	Interference clearance model + completion of Detailed Analysis and Drawings (D2+D3) (T0+32weeks) (Payment 20%)
Milestone 4 (D4)	Completion of detailed drawings(D4) (T0+40 weeks) (Payment 15%)
Milestone 5 (D5)	Completion of project with deliverables support (D5) (T0+50weeks) (Payment 15%)
Milestone 6	Continuing Support (T0+208 Weeks) (Payment 20%)

Note: Component fabrication, Sub-Assembly, Assembly, Integration, Equipping and testing at NAL/NAL authorized Vendor/Bidders.

CHAPTER-6

Qualification Requirements

Criteria 1 - Experience and Past Performance:

1.1.1 The bidder (manufacturer or principal of authorised representative – hereinafter referred simply as 'The Bidder') should have regularly for at least the last 3 years, ending 31st March of the previous financial year (hereinafter called 'The relevant Date'), (/erected/ commissioned___1 similar engineering service. The bidder should have undertaken at least one design of Turboprop Engine nacelle/s. [This bid is opened to qualified firms, nationally based companies, having appropriate background and expertise in Turboprop engine nacelle design and development for small and medium sized aircraft as per FAR23/25 or equivalent. Only those firms with a substantial, proven track record of performance and resources in the above field of activities are encouraged to participate. Original Equipment Manufacturers (OEMs) /design organizations/Engineering service providers who have proven expertise in providing the complete design solutions for 'Turboprop configuration Nacelles' on any FAR23/25/equivalent aircraft expertise of the engine-nacelle for such aircraft.

Similar Work Experience Details:

Sl. No.	Name of the work with location	Date & Ref. no of completion certificate (If available)	Date of start Cost of work	Reference document (Work Order/ Work Completion Certificate) to be attached, mention page no

a) with the same or higher specifications having/with _Turboprop engine nacelle design & development parameters (hereinafter called 'The Product'). The bidder should submit the manufacturer authorisation form as appended in Chapter-8 and

Criteria 2 - Financial Standing – under all conditions

a) The average annual financial turnover of 'The bidder' during the last three years, ending on 'The relevant Date', should be at ₹2.0 Crore as per the annual report (audited balance sheet and profit &loss account) of the relevant period, duly authenticated by a Chartered Accountant/Cost Accountant in India or equivalent in relevant countries.

Ministry of MSME have clarified that all Central Ministries/Departments/Central Public Section Undertakings may relax condition of prior turnover and prior experience with respect to Micro and Small Enterprises in all public procurements subject to meeting of quality and technical specifications. Further, the condition of prior turnover and prior experience may be relaxed for Start-ups (as defined by Department of Industrial Policy and Promotion) subject to meeting of quality & technical specifications and making suitable provisions in the bidding document (rule 173 (i) of GFR 2017))

b) Bidder Firm (manufacturer or principal of authorised representative) should not have suffered any financial loss for more than one year during the last three years, ending on 'The Relevant Date'.

c) The net worth of the Bidder firm (manufacturer or principal of authorised representative) should not be negative on 'The Relevant Date' and also ii) should have not eroded by more than 30% (thirty percent) in the last three years, ending on 'The Relevant Date'.

Note: In case of Indian Bidders/companies (manufacturer or principal of authorised representative) who have been restructured by Banks in India, under the statutory guidelines, they would be deemed to have qualified the Financial standing criteria considering the institutional financial backing available to them.

Applicability in Special Cases:

a) Applicability to 'Make in India': Bidders (manufacturer or principal of authorised representative) who have a valid/approved ongoing 'Make in India' agreement/ program and who while meeting all other criteria above, except for any or more of sub-criteria in Experience and Past Performance above, would also be considered to be qualified provided:

i)	their foreign 'Make-in-India' associates meet all the criteria above without exemption, and
ii)	the Bidder submits appropriate documentary proof for a valid/approved ongoing 'Make in India' agreement/program.
iii)	the bidder (manufacturer or principal of authorised representative) furnishes along with the bid a legally enforceable undertaking jointly executed by himself and such foreign Manufacturer for satisfactory manufacture, Supply (and erection, commissioning if applicable) and performance of 'The Product' offered including all warranty obligations as per the general and special conditions of contract.

b) Authorized Representatives: Bids of bidders quoting as authorised representative of a principal manufacturer would also be considered to be qualified, provided:

i)	their principal manufacturer meets all the criteria above without exemption, and
ii)	the principal manufacturer furnishes a legally enforceable tender-specific authorisation in the prescribed form assuring full guarantee and warranty obligations as per the general and special conditions of contract; and
iii)	the bidder himself should have been associated, as authorised representative of the same or other Principal Manufacturer for same set of services as in present bid (supply, installation, satisfactorily commissioning, after sales service as the case may be) for same or similar 'Product' for past three years ending on 'The Relevant Date'.

c) Joint Ventures and Holding Companies: Credentials of the partners of Joint ventures cannot (repeat cannot) be clubbed for the purpose of compliance of PQC in supply of Goods/Equipment, and each partner must comply with all the PQC criteria independently. However, for the purpose of qualifying the Financial Standing Criteria, the Financial Standing credentials of a Holding Company can be clubbed with only one of the fully owned subsidiary bidding company, with appropriate legal documents proving such ownership.

Note for Bidders:

a) 'Doctrine of Substantial Compliance': The Pre-Qualification Bidding (PQB) and Pre- Qualification Criteria (PQC) are for shortlisting of sources who are competent to perform this contract to ensure best value for money from expenditure of Public Money. This process is neither intended to bestow any entitlement upon nor to create any rights or privileges for the Bidders, by way of overly hair-splitting or viciously legalistic interpretations of these criteria, disregarding the very rationale of the PQB and PQC. Keeping this caveat in view, interpretation by the Purchaser would be based on common usage of terminologies and phrases in public procurement in accordance with the 'Doctrine of Substantial Compliance' and would be final.

b) The Bidder must declare, whether asked or not in a bid document, any previous transgressions of such a code of integrity with any entity in any country during the last three years or of being debarred by any other Procuring Entity. Failure to do so would amount to violation of this code of integrity.

c) In case of agents quoting in offshore procurements, on behalf of their principal manufacturers, one agent cannot represent two manufacturers or quote on their behalf in a particular tender enquiry. One manufacturer can also authorize only one agent/ dealer. There can be only one bid from the following:

i)	The Principal manufacturer directly or through one Indian agent on his behalf; and
ii)	Indian/foreign agent on behalf of only one principal.

d) Along with all the necessary documents/certificates required as per the tender conditions, the bidder should furnish a brief write-up, backed with adequate data, explaining his available capacity (both technical and financial), for manufacture and supply of the required goods/equipment, within the specified time of completion, after meeting all their current commitments.

e) Supporting documents submitted by the bidder must be certified as follows:

i)	All copy of supply/work order; respective completion certificate and contact details of clients; documents issued by the relevant Industries Department/National Small Industries Corporation (NSIC)/ manufacturing license; annual report, etc., in support of experience, past performance and capacity/capability should be authenticated by the by the person authorised to sign the tender on behalf of the bidder. Original Documents must be submitted for inspection, if so demanded.
ii)	All financial standing data should be certified by certified accountants, for example, Chartered Accountants/Cost Accountants or equivalent in relevant countries; and Indian bidder or Indian counterparts of foreign bidders should furnish their Permanent Account Number.

f) A bidder or any of its affiliates who participated as a consultant in the preparation of the design or technical specifications of the contract i.e. the subject of the bid; cannot participate in the bidding process.

g) Indian agents quoting on behalf of its foreign principal need to submit a copy of the agency agreement with the foreign principal detailing the services to be rendered by them on behalf of the principals, failing which its bid shall not be considered.

(h) Foreign bidders to disclose the name and address of agent and representatives in India and Indian bidder to disclose their foreign principal or associates.