REQUEST FOR INFORMATION FOR PROCUREMENT OF FIGHTER AIRCRAFT FOR THE INDIAN AIR FORCE

1. The Ministry of Defence, Government of India, intends to procure Fighter Aircraft for the Indian Air Force (IAF) which is to be Made in India. The proposal is to procure approximately 110 fighter aircraft (about 75% single seat and rest twin seat aircraft). The procurement should have a maximum of 15% aircraft in flyaway state and the remaining 85% aircraft will have to be made in India by a Strategic Partner/ Indian Production Agency (SP/ IPA).

2. This Request for Information (RFI) consists of three parts as indicated below: -

(a) **Part I**. This part of the RFI incorporates the intended use, technical characteristics and features that should be met by the aircraft. .

(b) **Part II.** This part of the RFI incorporates ToT requirements, associated equipment and standard contract terms.

(c) **Part III**. This part of the RFI states the methodology of seeking response of the vendors.

PART – I

3. **Intended Use**. The aircraft are intended as day and night capable, all weather multi-role combat aircraft which can be used for the following roles:-

(a) Air Superiority

(b) Air Defence

(c) Air to Surface Operations

(d) Reconnaissance

(e) Maritime

(f) EW missions, Buddy Refuelling etc.

4. **Technical Parameters**. Queries on technical parameters for the aircraft are as per **Appendix A**. The Original Equipment Manufacturer (OEM) is to provide para-wise response for each aspect specified at **Appendix A** along with necessary additional information.

PART II

5. The Original Equipment Manufacturer (OEM) needs to elaborate on the following aspects:-

(a) **Transfer of Technology (ToT)**. GoI is desirous of production of fighter aircraft in India after acquiring ToT. Is OEM willing to transfer design, development, manufacturing and repair expertise within India? The OEM should specify scope, depth and range of ToT and key technologies which would be shared with its SP/ IPA in India. The details and guidelines on ToT aspects are defined in **Schedule I to chapter II of DPP 2016.** Vendors are required to provide information in the tabular format attached as **Appendix B.**

(b) **Indigenisation Content**. Level of indigenisation in content and design, in percentage, is to be clearly indicated for all components of the main and associated equipment that is being quoted by the OEM. The vendors to indicate Indigenisation Content (IC) that is planned to be achieved. The acquisition category, as detailed in DPP-2016, will be based on this information.

(c) **Performance Based Logistics Package (PBL).** The OEM along with SP/ IPA is to propose a PBL package for an aircraft availability of 75% with an average flying effort of 150 hrs per aircraft per year for a period of ten years.

(d) OEMs would be required to provide details of clearances required from their government regarding transfer of technology as specified in **Schedule I to chapter II of DPP 2016**. RFI may be considered as advance information to seek government clearances.

(e) The OEM to provide details of all the weapons integrated on the aircraft and confirm willingness to supply these to the IAF.

(f) **Integration of Weapons, Systems and Sensors.** Aircraft would be integrated with weapons/ sensors/ systems of Indian origin/ any other origin, at any time of its service life. The vendor is to provide the user the capability to unilaterally upgrade/ integrate such systems, weapons or sensors. The vendor would be required to integrate certain Buyer Furnished Equipment / Buyer Nominated Equipment (BFE / BNE) and it is essential that test pilots and engineers of the IAF or their assignees be involved in flight testing of such equipment during integration and certification phase.

(g) **Tentative Delivery Schedule.** The initial delivery of aircraft in FF state from the OEM would commence from T0+ 36 months or earlier and complete by T0+60 months. Delivery of aircraft produced by the SP/ IPA should commence by T0+5 years and complete by T0+12 year. (T0 would be the date of signing of the contract.)

(h) **Training of Aircrew and Maintenance Personnel.** OEM would be responsible for training of aircrew and maintenance personnel at suitable facilities to enable quick absorption of the aircraft and its technology by the IAF and SP/ IPA.

(j) **Warranty.** The vendors are required to furnish the expected duration of warranty for the aircraft and its subsystems including role equipment. Mean Time between Failures (MTBF) and Performance Linked Warranty for an average utilisation of 150hr per aircraft per year for a period of ten years is to be stipulated.

(k) **Obsolescence Management Plan.** The OEM should present a phased obsolescence management plan. The plan should offer adequate assurance for life time product support. Will the vendor provide modifications required in the aircraft / system for the sake of obsolescence management or due to flight safety considerations for its service life?

(l) **Cost Estimate.** What would be the approximate budgetary estimates for the aircraft including production, customs duties, spares, installation, commissioning, training, and documentation? A comprehensive maintenance cost, cost of PBL for ten years and cost for obsolescence management(if applicable)for the 15 years life of the aircraft is to be included. Vendors are required to fill this information in the tabular form provided as **Appendix C.**

(m) OEM should indicate willingness to conduct FET at no-cost no - commitment basis.

(n) Does the OEM have any strategic partnership with any Government/ private aircraft manufacturer/ designer? Specify the details.

(p) Any other relevant information on capability of performing the roles, additional roles possible and maintenance philosophy may also be specified.

6. Vendors should confirm that following conditions are acceptable:-

(a) **Integrity Pact**. An integrity pact along with appropriate IPBG is a mandatory requirement in the instant case (Refer Annexure I to Appendix M of Schedule I of Chapter II of DPP-2016).

(b) **Option Clause**. An Option Clause may be exercised in the procurement case. Vendors must express their willingness or otherwise for Option Clause, including the duration for which the Option clause would be valid.

(c) **Performance-cum-Warranty Bond**. Performance-cum-Warranty Bond of 5% of value of the contract is required to be submitted after signing of contract.

PART – III

7. **Procedure for Response**. Vendors are to furnish information sequentially as per the Para Numbers. Vendors are also expected to furnish information in tabular form, where ever tables are provided. Additional information if any is to be attached at the end of the respective Appendix / Annexure with appropriate reference to serial number in the

RFI. The information needs to be sequential and in separate Folders / Books as mentioned in the succeeding paragraphs.

(a) **Book 1**:- Book1 is to contain para wise response to Part I and Part II of the RFI. It is also to include the information as per Appendix A in tabular format (including Annexure III, IV and V).

(b) **Book 2**:- Book 2 is to contain the following information

(i)Form of response as given in Appendix B to Chapter 2 of DPP-2016. Apart from filling details about company, details about the exact product meeting our generic technical specifications, should also be carefully filled.

(ii) Information as per Appendix B to RFI.

(iii) Information as per Appendix C to RFI.

(c) The response to the RFI should be clearly labelled as RFI RESPONSE - FIGHTER AIRCRAFT. The vendors are required to dispatch two hard copies and one soft copy of the RFI to the following address:-

Principal Director,
Dte of ASR, Room No 442
Air HQ (VB), Rafi Marg
New Delhi-110011
Fax No: 00-91-11-23011836
Tel No: 00-91-11-23014917
Email: jaguar442@mail.gov.in

(d) Last date of acceptance of filled form is **06 July 2018**. The vendors short listed for issue of RFP would be intimated at appropriate stage. Submission of incomplete response will render the vendor liable for rejection.

8. The Government of India invites responses to this request only from Original Equipment Manufacturers/ Government sponsored export agencies(applicable only in the case of countries where domestic laws do not permit direct export by OEMs). The end user of the equipment is the Indian Air Force.

9. This information is being issued with no financial commitment and the Ministry of Defence reserves the right to change or vary any part thereof at any stage. The Government of India also reserves the right to withdraw it should it be so necessary at any stage. **The acquisition process would be carried out under the provisions of DPP 2016 (includes provisions of Chapter VII of this DPP), as amended from time to time.**

Appendix A
(Refers to Para 4
of the RFI)

TECHNICAL PARAMETERS

Sl No	Parameter/ Specification	Queries
Section I - General Information		
1.	Physical Parameters and Features	(a) What are the external dimensions of the aircraft, height, weight, span, wheel track, wheel base, overall length etc.? (b) Twin seat variant should retain all operational attributes of the single seat variant (Radar, Air to Air Refuelling (AAR) probe, Internal Gun, weapons and Infra Red Search and Track (IRST) etc). (c) In case of twin seat aircraft, workload should be manageable by a single pilot and it should be possible to undertake single seat operation in all roles.
2.	Conditions of use (environmental conditions)	(a) Is the aircraft and its systems tropicalised? (b) Are associated testers, tools and equipment tropicalised and ruggedized? Vendor to provide the cleared operating temperature range and relative humidity. (c) Is the aircraft adequately protected against effects of lightning strike as per MIL-STD or equivalent standards? (d) Electro-Magnetic Pulse (EMP) hardening should exist for flight safety related systems. Specify the details. (e) Are the aircraft and the pilot adequately protected whilst operating in Nuclear Biological and Chemical (NBC) environment? If so, details thereof. (f) Aircraft should meet its performance and maintenance conditions under Indian Reference Atmosphere (IRA) conditions unless specified otherwise. IRA conditions are placed at **Annexure I**.
Section II - Conditions of Use		
3.	Aircraft Mass	Provide values for the following parameters:- (a) Operational Empty Mass (weight of the complete aircraft with all systems and permanent fluids, mandatory launchers/pylons and the equipped pilots).

Sl No	Parameter/ Specification	Queries
		(b) Certified Maximum Take-off Weight (MToW) (c) Certified Maximum Landing Weight. Specify permissible sink rate for landing. (d) Maximum weapon load carrying capability. Specify configuration. (e) What is the maximum external load, consisting of air to air and air to ground weapons and other external stores, (includes pylons and launchers) capacity of the aircraft? Specify total jettisonable load carrying capability of the aircraft.
Section III – Portability		
4.	Slinging	Is the aircraft capable of being under slung from a crane? Will the vendor provide slings? If yes, what is the lifting load capacity of the slings? Vendor to provide required specifications of the salvage crane? If no, then what is the means of aircraft removal device (inflatable devices etc)?
Section IV - Physical and General Features		
5.	General Characteristics	(a) What is the Total Technical Life (TTL) and total calendar life of the aircraft? (b) Aircraft should be capable of sustaining 'g' < 0 with full afterburner engaged for more than 10 sec. If not then, what is the time with 'g' < 0 in this condition? (c) Do all mission and safety critical systems have adequate redundancy and are they adequately separated and protected? Specify redundancy of each system. (d) Vendors are to define aspect and relevant radar frequency bands for calculation of Radar Cross Section (RCS) for the aircraft in the following configurations:- (i) Clean configuration with landing gear retracted (ii) Air to surface strike (2 PGMs + 1 Designator Pod + 2 BVRs + 2 x A4Ms + Ext Fuel) (iii) Air to Air configurations (4 BVRs + 2 A4Ms + Ext Fuel). (e) What is the static Thrust-to-Weight (TWR) ratio of the aircraft at sea level, in ISA conditions and (with 50% internal fuel and BVR missiles with full complement of gun ammunition) with maximum afterburner? What is the static

Sl No	Parameter/ Specification	Queries
		TWR ratio of the aircraft at sea level under ISA conditions at Max All-Up Weight? (Thrust for calculation should be un-installed thrust) (f) Can the aircraft fly in excess of 10 hr with Air to Air Refuelling (AAR)? How many AAR engagements would be required to accomplish this duration of flight? Specify flight conditions. (g) Are Operational Turn Round Servicing (Op TRS) timings inclusive of rearming, refueling and replenishment in cleared Air to surface strike and Air Defence role with one team, of not more than five technicians per aircraft, with any combination of weapon / reconnaissance load? (h) What is the Op TRS time for the following configurations (amount of fuel carried should be same as used for calculation of RoA/ loiter in Annexure V). (i) Air to air configuration (4 BVRs + 2 A4Ms + Ext Fuel) (ii) Air to surface configuration (2 PGMs + 1 Designator Pod + 2 BVRs + 2 x A4Ms + Ext Fuel) (j) Depending on the external loading, the aircraft configuration should be sensed automatically or else it should be possible to select it through a selection panel located inside the cockpit. (k) Are there any restriction/ limitation to fly in icing conditions? Specify.
6.	Power Plant and Intake	(a) What is the minimum structural life of the life limited engine modules/parts? List the parts that are life limited and specify their life. Mission Profile for calculation of the engine life is attached as Annexure II. (b) Does the engine have any TTL? Is there any difference in hot and cold section modules? Provide details. (c) The aircraft should be powered by an advanced technology dual redundant FADEC engine/s with auto throttle capability. (d) Is the starter system self-contained? How many consecutive starts can it provide without cooling/break (between starts) requirements?

Sl No	Parameter/ Specification	Queries
		(e) Does the aircraft engine/s have capability to start at an altitude of 3300m AMSL (IRA) without any modifications/adjustments or any special starting procedure? (f) Does the engine/s have life monitoring mechanism such as Health Usage and Monitoring System (HUMS)? (g) Does the air-intake/ engine/s combination permit surge free engine operation throughout the flight envelope of the aircraft? Are there any engine slam restrictions? If yes, details thereof, to be provided. (h) Is the engine/intake design capable of withstanding impact of a bird at the maximum low level speed as specified in the relevant US Military specifications or equivalent standards? Quantify bird mass and CAS/ Mach number and altitude, and the resulting condition eg restricted throttle/thrust, with/without AB operation, with/without loss of thrust, time restriction etc. (j) Is the engine/s exhaust smoke free at all power (including maximum after burner rating) settings within the flight envelope? (k) Is the engine capable of air start (relight in air)? If yes, what is maximum altitude for relight? Define envelope for in-flight start? (l) Is there any requirement of warming the engine(s) in terms of time and RPM under various temperature conditions? (m) Does the engine incorporate automatic cold rotor thrust droop compensation? If so, what is its impact on life of hot-end components? (n) Is the aircraft capable of scrambling for quick reaction alert missions? Does the engine/s require engine warm-up/ special procedure for such missions? Will there be any impact on engine/s performance or engine/s life without warm-up? (p) What is time required for engine removal and installation using minimum manpower and Ground Support Equipment (GSE)? State time, manpower and GSE required for this task. (q) Does engine change require any ground running/ test

Sl No	Parameter/ Specification	Queries
		flight post engine/s change? Are cold checks of the engine sufficient for flight clearance? (r) Are any thrust check algorithms available to validate Max Reheat thrust in the cockpit before brakes release? Is thrust deterioration expected at the end of qualified engine life? Specify if any. (s) Describe the jet fuel starter/ starter motor provided on the aircraft. What functions does it cover, besides autonomous engine/s starting on the ground? Can it provide electrical, hydraulic and pneumatic services on ground and in flight? What is its rating for maximum duration for continuous operation? Can it assist engine start in air? Specify engine start (assisted by starter) envelope. (t) Does the aircraft engine/s conform to Mil-E-5007E/ any other military standard? Specify the standard. (u) What are the protection measures to prevent engine icing? Elaborate the measures.
7.	Fuel System	(a) Are all the internal fuel tanks of the aircraft self-sealing or have redundancy mechanisms to prevent further fuel leak? Post battle damage resulting in a fuel leak, what is the minimum duration of flying permitted before recovering safely? (b) Is the aircraft fuel system dual redundant? (c) Is it possible to refuel from a single pressure refuelling point? (d) Are the refuelling couplings/ adapters of NATO Standard? (e) Is there a provision for partial refuelling and hot refuelling on the aircraft? Specify details. (f) What all types of fuel can be used on the aircraft? Is there any requirement to mix anti-freeze solution in the fuel? What is the limitation in flight envelope/ engine/s life in case the aircraft is flown without any anti-freeze solution? (g) Is de-fuelling the aircraft possible from a single point without the need for extra ground support equipment? (h) Is the fuel system of the aircraft capable of gauging the entire fuel capacity and indicate the usable fuel on cockpit

Sl No	Parameter/ Specification	Queries
		gauge at all times? Is drop tank fuel also gauged? (j) Does the aircraft have day and night Air-to-Air Refueling (AAR) capability using the 'Probe and Drogue' method? Is it capable of replenishing all its internal and external tanks? Is the refuelling probe fixed or retractable? If fixed, what is flight envelope or any other restrictions due to installation of the probe? (k) What is the maximum AAR rate at 50 % of the internal fuel capacity? (l) Does the aircraft have facility for rapid jettisoning of fuel to facilitate immediate landing after takeoff? What is the auto cut-off value of fuel jettison, if any? If yes, what is the endurance of the aircraft with the remaining fuel? Are there any limitations on jettisoning of fuel in dry and afterburner regime of the engine/s? Can drop tank fuel be jettisoned? (m) Is the aircraft integrated with a NATO Standard buddy refueling pod? What is the minimum refuelling rate from this pod? (n) What are the types of external removable fuel tanks with capacity, and associated speed & g limits of the aircraft? (p) What is the maximum internal fuel capacity (liters & kg)?
8.	Hydraulics	(a) What is the type and number of hydraulic systems with redundancy to operate essential services (such as Ram Air Turbine etc)? (b) Does failure of any single hydraulic component result in a situation where an essential service/s cannot be operated either by the main or the standby/ emergency system? (c) Are the hydraulic lines shielded by the airframe protective structures? (d) What is the specification of hydraulic fluid used and operating pressure of the system? Also, the specification of the couplings/ adapters, are to be indicated?
9.	Flights Controls	(a) What type of the Flight Control system is available and what is the level of redundancy? (b) In case of a failure, is reversion to standby system/

Sl No	Parameter/ Specification	Queries
		manual mode possible? (c) Is it possible to manually override the flight control system safeties, such as surpass the 'g' limits to allow recovery from a dive? (d) What is the duration up to which the flight control system is able to perform without cooling air in case of failure of the Environmental Control System (ECS)? (e) Are the pipelines/cables for the duplicated flying controls adequately separated and protected to ensure safety? (f) Does the flight controls provide carefree handling of the aircraft throughout its flight envelope?
10.	Landing Gear	(a) What is the type of landing gear in the aircraft? (b) What are the maximum ground speed limits for main and nose tyres? (c) What is the main and standby mode of lowering the undercarriage? (d) What is the maximum certified landing weight at sink rate of 10 ft/s and 6 ft/s?
11.	Brake System	(a) How many brake systems are provided for redundancy? (b) Is there provision for parking brakes in the cockpit? (c) What is the provision for emergency braking in the cockpit? (d) What are the types of Anti-skid devices fitted on the wheel brake system (nose and main)? (e) What is the maximum Take-off weight up to which Reject Take-off (RTO) can be achieved from rotation speed with / without use of brake parachute, both at sea level (RW length = 2700 m) and at 3300 m elevation (RW length = 3000 m), under IRA conditions? Assume dry, level runway without use of any arrester gear.
12.	Auxiliary Braking Device	(a) Does the aircraft have an auxiliary braking device (such as brake chute, hook etc)?

Sl No	Parameter/ Specification	Queries
		(b) If an auxiliary braking device is not available, will it meet all landing/ deceleration performance requirements under IRA conditions without damage to/ or requirement of replacement of components of, the braking system, including during emergency landing at maximum landing weight at airfield of 2700 m length at sea level? (c) What is brake cooling limited turnaround time, after landing in Air Superiority configuration (4xBVR + 2xA4M + 75% internal fuel) at SL (runway length=2700 m) and at 3300 m elevation (runway length=3000 m) airfield in IRA without using any auxiliary braking device?
13.	Cockpit Layout and Ergonomics	How much of the space/volume in 'cu cm' is available for integration of IAF specified controls/functionality for future systems in the cockpit?
14.	Human-Machine Interface	(a) Would it be possible for the vendor to incorporate symbology and display pages as per IAF specifications and finalise the Human Machine Interface, mutually agreed between the vendor and IAF? (b) Would it be possible for the production agency/user to upgrade/integrate the MFD, HUD and HMSD display symbologies without the help of OEM.
15.	HOTAS Ergonomics	Does the aircraft cockpit have Hands On Throttle and Stick (HOTAS) ergonomics?
16.	Environmental Control System	(a) Does the aircraft's air conditioning system cater for cooling in tropical conditions at temperature exceeding 45°C? (b) Is there provision for cooling reserves for integration of additional equipment? Specify cooling reserves. (c) Is there a provision of de-pressuring the cockpit externally on ground in the event of system malfunction? (d) For the cockpit noise level, which MIL or equivalent standard does the aircraft conform to?
17.	External Vision Requirements	(a) Do the canopy, windshield and the surrounding structure provide good all round external vision from the cockpit (indicate field of view)? (b) Is the canopy material resistant to 'crazing' and cracking? (c) Does the aircraft provide adequate clearance between

Sl No	Parameter/ Specification	Queries
		the pilot's Helmet Mounted Sight and Display (HMSD/ Night Vision Goggle (NVG) and the canopy, during movement of pilot's head to either extreme? (d) Is the windscreen capable of withstanding impact of a bird hit and which relevant MIL or equivalent standards does it conform to? Quantify bird mass and CAS/ Mach no. (e) In the twin-seat variant aircraft, is the external vision from the rear cockpit adequate for instructional purposes, including combat and armament training/ demonstration, from the rear cockpit? If not, what are the alternate methods to achieve the same? (f) Provide external vision plot from front and rear cockpits (from DEP).
18.	Instrumentation	(a) Does the aircraft have a glass cockpit concept and does it have Multi-Functional Display (MFD) or Large Area Display (LAD) concepts? (b) Are all mission/safety parameters displayed on the Head Up Display (HUD) and MFDs? What is redundancy provided on these systems? Specify details. (c) Is the cockpit lighting and instrumentation NVG compatible? If yes, then up to which Gen standards? (d) Does the NVG goggle need to be manually removed for safe ejection, or is safe ejection permitted without removing NVG goggles?
19.	Oxygen	(a) What is the type and capacity of integral onboard oxygen system? Does the system have Onboard Oxygen Generating System (OBOGS)? (b) What is the capability (in terms of duration of flight in hours and minutes) of the oxygen system? (c) What is the capability (in terms of duration of flight in hours and minutes) of standby oxygen system for safe recovery?
20.	Crew Amenities	Is there a facility to allow the crew members to relieve themselves and take provisions in flight? Is there a specific stowage area for carrying provisions onboard?
21.	Escape System (Ejection System)	(a) What is the make and type of ejection seat fitted on the aircraft and does it ensure safe ejection under Zero-Zero

Sl No	Parameter/ Specification	Queries
		conditions (zero height and zero speed)? (b) Define the operating envelope of the aircraft when the system ensures safe ejection? (c) Does the aircraft have command ejection system in twin-seat variant? (d) Does the aircraft have canopy severance system or canopy jettison system?
22.	Escape System (Life preserver/ Parachute)	(a) What is the make and type of Automatic Inflatable Life Jacket provided on the aircraft? (b) What is the make and type of main pilot parachute provided on the aircraft? Also, what is the parachute separation mechanism in case of landing in water?
23.	Escape System (Survival Pack)	(a) Is the survival pack composite or does it incorporate interchangeable survival packs for maritime, desert, mountainous and tropical forests? (b) Does it form part of the aircrew escape system? (c) Does it have a provision to carry a Personal Rescue Beacon (PRB)/ Personal Locator Beacon (PLB)? Would it be possible for vendor to integrate PRB/PLB specified by the IAF? (d) Does the PRB offered by vendor have Search and Rescue (SAR) and Combat SAR (CSAR) mode?
24.	Electrical System	(a) What are the type, capacity and number of power generating systems on the aircraft? (b) What is the spare capacity of each of the power generating systems on the aircraft at maximum load? (c) Does the aircraft have adequate redundancy in both AC and DC systems to cater for uninterrupted mission accomplishment despite failure of the single most critical generator? If not, what degradation in mission capability can be expected? (d) How many internal starts of the engine/s or auxiliary power unit is possible on the internal battery? Does the aircraft have provision for start with external power supply source? (e) What is the duration up to which the internal batteries

Sl No	Parameter/ Specification	Queries
		are capable of giving emergency electric supply to essential systems to allow safe recovery of the aircraft?
25.	General Avionics	(a) Does the aircraft have data fusion to optimize mission accomplishment? (b) How much is spare space (in terms of cu cm and number of ATRs) available in the avionics/ any other compartment for integration of additional systems? Specify. (c) Are there spare cooling capacity, computation and electrical power for additional systems integration? Specify. (d) Do the systems on-board, permit the aircraft to fly in RVSM airspace? (e) Are the aircraft compliant to relevant ICAO standards for executing IFR flights, Precision/Non-precision Approaches using onboard avionics? Specify capability (Performance Based Navigation)/certification of the aircraft.
26.	Radio Communication	(a) What is the type of communication suite provided? Does this communication suite have following capability: (i) SATCOM (ii) V/UHF radio (iii) Datalink (b) Is there a provision to integrate BFE/ BNE SDR? (c) Is there a provision for integrating BFE/ BNE SDR with onboard RADAR, missile uplink, mission computer and displays? (d) Is there a provision to create codes of the secure mode specific to the IAF and the ownership of these codes should lie with IAF? (e) Specify SATCOM interoperability and customisation possibilities.
27.	Navigation and Attack System	(a) System should have an open architecture mission computer and avionics system with redundancy and provision for adequate capability for integration of future weapons/sensors? (b) Does the aircraft have an Inertial Ring Laser Gyro (RLG)/ Fibre Optic Gyro (FOG) with Embedded Satellite

Sl No	Parameter/ Specification	Queries
		Navigation System (SNS)? Are they dual redundant? The SNS should have dual band receiver and should be capable of receiving signals from GLONSS/Galileo/IRNSS along with NAVSTAR satellites. (i) Compatibility of SNS with WAAS/GAGAN should be built in. (ii) Compatibility with IRNSS should also be provided. (iii) What are the types and time for alignment? Is the full and rapid alignment time less than 4 min and one minute respectively? (iv) Is the aircraft capable of carrying out full mission in the absence of SNS (stand alone mode)? If not, then what is the capability? (v) Are the INS navigation errors less than 0.6 nm/hr (Circular Error Probability) in stand-alone mode (without SNS)? (vi) Is the INS capable of alignment in flight? If yes, what are the limitations of aircraft motion and manoeuvring? (vii) Is there a provision for DGPS enhanced navigation system for landing? (viii) Is the system capable of 'transfer alignment' to any other weapon/sensor? (ix) Is there protection against GPS Jamming / Spoofing? Specify. (c) **Head Up Display (HUD)** (i) What is the type of HUD on the aircraft and what is the type of scan? What are the IFOV and TFOV of the HUD? (ii) What is the capability of the HUD to display relevant symbology, including information from additional sensors, for the air to surface strike role, air to air role and air to sea role? (iii) What is the redundancy for HUD failure?

Sl No	Parameter/ Specification	Queries
		(iv) Does the HUD have raster capability? (d) Is there a provision of an integral IRST on the aircraft and is it capable of carrying a laser range finder which could be used for both air-to-air and air-to-ground applications? (e) What is the maximum and minimum height determination capability of the radio/ laser altimeter? (f) Is there a provision of a Digital Map Generation (DMG) display on the aircraft? Vendor to ensure transfer of format and necessary means to provide capability of IAF to use its own maps and load when required. (g) What are the technical specifications of the Multi-Mode Radar as per **Annexure III**? (h) Is the aircraft equipped with VOR, DME TACAN and ILS receivers? (j) Can the aircraft carry out safe recovery (approach and landing) in standalone mode without using any ground based aid? Is this system dual redundant? (k) **Helmet Mounted Sight and Display (HMSD)** (i) What is the capability of HMSD by day and night? Specify accuracy. (ii) Does the HMSD have the ability to slave all aircraft sensors to pilot(s) line of sight (LOS) and cue the pilot? (iii) Is there a provision to record HMSD view? (l) **Mission Planning and Debrief System (MPDS)** (i) Can the aircraft MPDS (Mission Planning and Debriefing System) system be integrated with existing unified mission planning system of IAF? Specify possibility of providing ICD and requirements for integration. (ii) Does it have a provision for a single point loading and retrieval of mission data, EW, Nav data? (iii) Is the MPDS tropicalised and rugged for transportation? Is the MPDS PC based and is there

Sl No	Parameter/ Specification	Queries
		a provision for portable system (tough book/ laptop)?
28.	Identification	(a) What is the type (Mk XII (S) standard or better) of Combined Interrogator Transponder (CIT) fitted on the aircraft? (b) Does the CIT have Mode 'S' facility and does it have the facility for selective interrogation and crypto transmissions? (c) Is the CIT provided with a crypto computer and is it possible for IAF to utilize indigenous encryption software on the crypto computer for the secure modes? (d) Provision should exist to integrate an IFF system specified by the IAF? (e) Does it have Non-Cooperative Target Recognition (NCTR)capability? Can IAF specified NCTR data be integrated?
29.	EW Systems	Specification for EW systems is attached at **Annexure IV.**
30.	Additional Equipment	Is it feasible to integrate and carry the following additional equipment on the aircraft for operations:- (a) Panoramic cameras, targeting pods and EO/IR sensors for Reconnaissance Pod (Recce Pod). (b) Laser Designator Pod (LDP). (c) ECM and ESM pods. (d) Buddy Refuelling pod. (e) Stand Off Jammer (f) Specify optional equipment that can be offered.
31.	Data Bus	(a) Is there a provision for integrated avionics open architecture with data exchange on dual redundant digital data bus at high data rates on open standard protocols? (b) How much spare capacity is available on the data bus (at its peak load)?
32.	Miscellaneous Systems	(a) **Flight Data Recorder (FDR)**

Sl No	Parameter/ Specification	Queries
		(i) Is the recording medium crash and fire proof as per relevant standards? Does it have RF/ sonar locator beacon? (ii) What is the recording capacity (time/flight hours) for data and audio? (iii) Is there a provision to retrieve FDR data from the aircraft from a single point without removal of FDR? (iv) Is there a provision for playing back the 3D flight profile from the FDR data? (v) Provision should exist to supply required set of specialised equipment/ equipments, required for extraction of data from a crashed aircraft FDR. (b) Does the aircraft have a Health and Usage Monitoring (HUMS) to monitor and analyse the aircraft fatigue data? (c) Can the HUMS data be utilized by the existing Electronic Maintenance Management System (e-MMS) of IAF? Elaborate. (d) **Digital Video Recording System (DVRS)** (i) Provision should exist for a solid state multi-channel recording system for all displays such as HUD, HMSD, MFDs, voice etc. Is it possible to simultaneously record all these parameters? (ii) Is the capability of recording all operationally relevant symbols in the field of view of the HUD and HMSD, both by day and night? Is there a possibility of using a single device for uploading and downloading mission related data from the aircraft? (iii) Is the ground replay station capable of replaying mission parameters like 3D track, weapon trajectory simulation etc along with the recorded video channels? (iv) Is it possible to supply COTS based data transfer device? (e) **Autopilot**. Does the autopilot have the following modes:-

Sl No	Parameter/ Specification	Queries
		(i) Attitude Stabilization Mode (Bank & Pitch) (ii) Auto Trim Function (iii) Horizontal and Vertical Navigation Mode (iv) Course & Track Capture Mode (v) Altitude Selection Mode (vi) Altitude Hold& Alert (RVSM capability) (vii) Auto Weapon Delivery in conjunction with the Nav-attack system (viii) MLS/ ILS capture (both Localiser & Glide Slope) and auto land facility (ix) Critical Altitude Recovery/ Ground Collision Avoidance System (x) Critical Attitude Recovery Mode / Level Mode (to recover the aircraft automatically to straight and level flight from an unusual attitude). What is the flight envelope limitation of this mode? (xi) AP should be integrated with auto throttle for precision landing (till touchdown) with adequate built-in redundancy. (xii) In case of twin-engine aircraft, is aircraft capable of single engine landing in auto-land mode?
33.	Night Flying Capability	(a) Is the external lighting of the aircraft NVG compatible? If yes, then up to which Gen standards? (b) Is there provision for night formation lights?
34.	Survivability (System Redundancy)	(a) Is there adequate redundancy for safe recovery of aircraft with at least up to two levels of failures in FBW system? Overall probability of loss of control due to FBW failure should be less than 10^{-7} per flight hour? (b) In case of total electrical failure, what is the duration of safe flight? (c) Systems/ parts considered critical should have adequate redundancy.

Section V - Maintainability and Reliability		
35.	Interchangeability	(a) What is the degree of interchangeability on the aircraft? Will all major components/ parts / panels, sub-assemblies, including canopy, Ejection Seat be fully interchangeable between aircraft? (b) Is the engine/s modular in design with separate hot and cold section modules such as low pressure compressor, high pressure compressor, combustion chamber, turbine, exhaust nozzle etc? (c) Are the engine/s modules (including engine sub-assemblies) replaceable/ interchangeable at 'I' level engine repair and is the engine performance testing required at 'I' level? (d) Is the OEM willing to provide unilateral upgrade capability to IAF for integration of future indigenous equipment?
36.	Accessibility	(a) Are all components/ parts requiring inspection/ servicing/ repairs easily accessible and permit inspection, servicing, removal or installation? (b) Are the inspection/ access panels provided with quick release fasteners?
37.	Servicing Requirements	(a) What are the external feeds that are required to service and operate the aircraft? (b) Does the aircraft have Built-in-Test Equipment (BITE) and system check facility to ascertain its suitability for flight without any specialized equipment/tester/gauge? (c) What is the coverage of BITE? (d) Does the maintenance philosophy of the aircraft permit 'on-condition' maintenance? (e) Does the FADEC have provision for retrieval of engine parameters / failure mode, during its operation by ground crew, through a control test both in dynamic/ static mode? Does the control test set have a provision for engine fault diagnosis and rectification? (f) Does the maintenance philosophy permit all 'O' level (flight line) servicing operations without special maintenance

		ladders, stands and other special ground equipment? (g) What is the minimum periodicity of first and subsequent scheduled maintenance in flying hours and time period? (h) What is the duration, at 'O' level, to replace / remove and install an engine and clear the aircraft? Specify time and manpower requirement. (j) What are servicing man hours per flight hour for scheduled first and second line servicing? (k) Is there a provision for cooling of avionics spaces while testing and operation on ground for extended periods without engine power? (l) Does the aircraft have a computer based health monitoring and maintenance management system for comprehensive management of maintenance activities for the aircraft? (m) **Pilot Turn Round Servicing (PTRS)** (i) Is it possible to carry out PTRS by refuelling alone? Is any servicing support equipment required for PTRS? (ii) Are suitable check-out points available to enable quick confirmation of flight worthiness of aircraft? (iii) What is the time required for PTRS (by a single pilot)?
38.	Reliability	(a) What is the reliability of the aircraft systems for a ten hour mission? (b) What is the MTBF of major systems for maintenance under all Indian environmental conditions? Specify values for each system. (c) Do the aircraft systems provide high operational reliability and have necessary reliability monitoring provisions? (d) Does the aircraft have any Reliability and Maintainability Program plan which details the methods, definitions, standards and timescales for the in-service phase?
39.	Servicing Periodicity	(a) What is the maximum flying effort achievable while

		operating the aircraft from forward airfields without the need for routine 'I' level servicing? (b) Is the life of aircraft and engine/s monitored on Fatigue Cycles? Provide details. (c) Is engine/s 'O' & 'I' level servicing based on on-condition maintenance philosophy? (d) What is the Mean Time to Repair (MTTR) for 'O' level servicing?
40.	Obsolescence Management Plan	What is the total cost for obsolescence management (if applicable) for the 15 years life of the aircraft? This cost should be indicated along with the overall ROM cost for procurement (Appendix C).
41.	Simulator/ Ground Training	(a) Where and what degree of training will the vendor provide to pilots and technicians? (b) Vendors to indicate the availability of following training aids for the aircraft:- (i) Fixed base Full Mission Simulators (FMS) (ii) Cockpit Procedure Trainers (CPT) (iii) Aircraft Systems Maintenance Simulator (ASMS) (iv) Engine Maintenance Systems Simulator (EMSS) (v) Computer Based Training (CBT) Aid for technical training (TETTRA) of technicians? (vi) Is there any other modern training aid/facility to train economically? Specify facility and savings in cost/time. (vii) Will unlimited site license for all training software be provided? (c) Can these training aids be maintained by OEM under Annual Maintenance plan for initial 10 Yrs or more?
42.	Ground Support Equipment (GSE)/ Ground Handling Equipment (GHE)	What are GSE/ GHE/ role equipment/ test/ servicing equipment etc that would be offered for operations of the aircraft?
43.	Electro–Magnetic Compatibility(EMC) and/Electro–Magnetic	Are the systems on board the aircraft adequately EMI & EMC protected and do the systems comply with the relevant military standards? Specify the standards.

	Interference (EMI)	
44.	Standardization	(a) Which are the applicable military and other quality standards met in the design development and production of the aircraft and equipment? Specify the standards. (b) "Metric" system should be used in maintenance, and other associated systems used for maintenance. (c) It is desirable that the aircraft flying and associated parameters displayed in the cockpit are in "Anglo-Saxon" system? Parameters and their desired units are listed below: (i) Flying parameters • Velocity in knot • Altitude in feet • ROC/ROD in feet per minute (ii) Distance in nm (distance >1nm) and in meters (distance <1nm) (iii) Weight (eg fuel/aircraft) in kg (iv) Volume of fluids (hydraulic/oil etc) in liters (v) Pressure (eg Hydraulic) in Bar
45.	Logistic Support	Performance Based Logistics: (a) What is the ROM cost of PBL for an aircraft availability of 75% and an average flying effort of 150 hrs/ aircraft/ year for a period of ten years? (150 hr /aircraft/year is equivalent to 225 hr per Sqn/ month, for a Sqnwith18 aircraft.) (b) What is the maximum duration which is possible to fly during one month over a rolling period of six months under this PBL or what is the maximum activity flying per month per Sqn which could be repeated during a maximum consecutive period of three months over a rolling period of six months? Specify any other condition/s.
46.	Publications	(a) Would the vendor supply all publications including Flight Manuals, technical description manuals, servicing schedules, wiring diagrams, illustrated spare parts catalogue, structural repair manuals etc, pertaining to the aircraft, its sub-systems? (b) Are all document sets/ publications in English in conformity with latest standards for technical publications? Specify the standards.

		(c) Would amendments and revisions in publications concerning maintenance and operations be provided regularly?
47.	Airworthiness Certification	(a) Does the aircraft conform to the current governing military airworthiness regulations of the country of origin/ US standards? Specify the standard/s. (b) Will the vendor provision service bulletins, service instructions and special technical instructions affecting the airworthiness of the aircraft on a regular basis?

Section VI - Operational Characteristics

Note 1: For calculating performance, consider the following Aircraft Configurations (AC):-

(i) **Clean Configuration** : Aircraft with full internal fuel without any payload (pylons/launchers which are necessary for the aircraft to fly, are to be retained for calculations)

(ii) **AC1:** 4 BVR + 2 WVR + Gun with Full Ammo+75% internal fuel

(iii) **AC2:** 2 WVR + Gun with Full Ammo+ 50% internal fuel

Note2: Aircraft that are capable of carrying conformal tanks are to consider conformal tanks as integral part of the aircraft if these tanks are included for computations of any performance and operational parameter.

Note 3: All speeds are CAS.

Note 4: Reference atmosphere for computation is IRA unless specified. (IRA conditions are attached as Annexure I).

Note 5:An altitude of 300 ft/100m AMSL is to be considered as sea level for computation of aircraft performance.

48.	Take-Off	(a) At MToW, what is the takeoff ground roll (to unstick) at sea level? (b) Is the aircraft capable of takeoff and landing with useful external load with runway length of 3000m/ 10000 ft at an elevation of 3300m/ 10,800 ft AMSL? Specify load. (c) What is maximum load carrying capability from an airfield located at 3300m AMSL under hot summer day (IRA) at Outside Air Temperature (OAT) of 25 deg C?

		(d) What is the **Payload Fraction** of the aircraft? Payload Fraction is the ratio of **Maximum Takeoff Weight** (MTOW) to **Basic Empty Weight** (weight of the complete aircraft with all systems and permanent fluids except fuel, mandatory launchers/ pylons and the equipped pilots)?
49.	Landing	(a) Does the maximum landing weight cater to landing with max external load with diversion fuel remainder as defined in Annexure V? (b) What is the landing speed of aircraft in clean configuration immediately after takeoff (catering to an emergency after takeoff) and at max landing weight? (c) What is the Landing Distance Available (LDA) and Landing Distance Roll (LDR) from a height of 15m at the maximum permitted landing weight at sea level at an of OAT 40°C without the auxiliary braking device? (d) Is aircraft capable of turn around and launch for next sortie without replacement of any component of the deceleration system after landing as defined in Para (c) above on a 2700m /9000 ft long runway? (e) What is max ground roll speed of main/nose wheel? Is there any limitation of max ground roll speed in worst case scenario of high airfield elevation of 3300m/ 10800 ft (runway length=3000m/10000 ft), OAT of +25°C and at max permissible external load? (f) What is the max cross wind limit of the aircraft for landing? Is there restriction in this limit with asymmetric store/load?
50.	Climb and Ceiling	(a) What is the operational envelope of the aircraft in **AC1 and AC2**? (b) What is the time to climb in the AC1 and AC2 with full fuel from brake release at sea level to an altitude of 3 km with afterburner? (c) What is the time to climb from brake release at sea level to a height of 10 km with afterburner in the AC1 and AC2 with full fuel?
51.	Max/ Min Level Speeds	(a) **Sea Level** (i) What is the maximum sustained speed of the aircraft in level flight in **AC1** and **AC2**? (ii) What is the maximum speed of the aircraft in level

		flight at maximum AUW (define the configuration and engine setting)? State whether this speed is a performance limit or stores carriage limit. (b) **Max Mach Number (Clean Configuration)**. What is maximum Mach Number which the aircraft is capable of achieving at sea level in level flight. (c) **Max Mach Number (AC1).** What is maximum Mach Number which the aircraft is capable of sustaining at 6km AMSL and at 11km AMSL in level flight? (d) What is the minimum speed of the aircraft in straight and level flight at sea level:- (i) In Landing Configuration (landing gear extended and flaps at landing position) with no external load and 30% of the internal fuel capacity? (ii) In cruise configuration (undercarriage and flaps retracted with 75% of the internal fuel capacity?
52.	Acceleration	What is the time (in sec) for acceleration under following conditions:- (a) **Sea Level (Clean configuration with 75% internal fuel).** From 600 km/h to 1100 km/h. (b) **6 km (20,000 ft) AMSL (AC1)**. From 0.9 M to 1.1 M. (c) **11km (36,000 ft) AMSL (AC1).** From 0.9 M to 1.4 M.
53.	Manoeuvrability	(a) Is the aircraft spin resistant? If not, then, what are the inbuilt measures to ensure safe recovery? (b) 'What is the 'g' envelope of the aircraft? What is the maximum attainable and sustainable 'g' at sea level in AC2 with afterburner? (c) What is the maximum Instantaneous Turn Rate (ITR) and Sustained Turn Rate (STR) at sea level and at 3 km/ 10,000 ft in **AC2** with maximum afterburner? (d) What is the maximum rate of roll and corresponding normal load factor of the aircraft in **AC2**?
54.	Weapon Load/ Armament	(a) **External Stations/ Load** (i) How many external stations (under fuselage/ wings) are available on the aircraft for carriage of a combination of bombs, rockets, air to air and air to surface missiles and

		ECM / reconnaissance / targeting pods, fuel etc? (ii) What is the load carrying capacity and corresponding normal load factor of each station for weapon load carriage? How many stations are capable of carrying stores of **1,500 kg** and **1,200 kg**? (iii) Is the aircraft capable of simultaneous carriage of air to surface weapons and air-to-air missiles to provide swing-role capability? (b) Is the aircraft capable of accurately navigating to the target and to deliver weapons accurately in a single pass in both level and dive attacks, by day and night? (c) What is the carriage and release envelope of **air to surface** and **air to air** weapons? Specify the carriage and release envelope for all weapons (including unguided munitions). (d) Provision should exist to cue the weapons through passive sensors such as RWR and IRST etc. Specify other suitable options. (e) What is the capability of following types of weapons integrated on the aircraft and likely to be offered:- (i) Beyond Visual Range (BVR) Air to Air Missiles. Guidance, LOAL & LOBL min/ max ranges, target parameters (ht envelope, speed, g etc), snap up/ down capability, Close Combat capability, ECCM features, warhead, data link etc. (ii) Within Visual Range (WVR) Air to Air Missiles. Guidance, LOAL & LOBL min/ max ranges, target parameters (ht envelope, speed, g etc), snap up/ down capability, Close Combat capability, ECCM features, warhead, data link etc. (iii) Precision Guided Munitions (PGM). (Guidance, min/ max ranges, target characteristics, ECCM features, warhead etc). (iv) Air to Ground Missiles. (Guidance, min/ max ranges, target characteristics, ECCM features, warhead, data link etc). (v) Anti-Radiation Missiles. (ARM) (Guidance, min/ max ranges, target characteristics, ECCM features, warhead, data link etc).

		(vi) Unguided Munitions. Weight and calibre of bombs, rockets etc
55.	Radius of Action/ Loiter Time	What are the Radii of Action (km)/loiter time (min) for various roles? Specific details of profiles and configuration to arrive at Radii of Action and loiter time are specified in the Annexure V.
56.	Quick Reaction Alert Mission	(a) Is it possible for the pilot to enter the cockpit of a prepared aircraft, strap-up and complete the aircraft start and post start procedure within 180 seconds for quick reaction air defence role? (b) Is it possible to commence takeoff within 60 seconds after completing the procedure mentioned in sub-para (a), from the operational readiness posts located at runway ends?

Annexure I
(Refers to Para 2 (f)
of Appendix A)

INDIAN REFERENCE ATMOSPHERE

1. For the purpose of aircraft performance, the average IRA is defined as follows:-

(a) Reference temp for takeoff and landing	: ISA + 20 degrees C
(b) Sea level mean temperature	: ISA +15 degrees C
(c) Lapse rate	: 6.5 degrees C/km From SL upto 16 km
(d) Temperature at 16 km	: -74 degrees C
(e) Lapse rate from 16 km to 20 km	: -2.5 degrees C/km
(f) Mean sea level pressure	: 1005 mb

2. Airfields at Elevated Altitudes. Temperature at elevated airfields would be calculated by assuming a lapse rate of 1º C per 300 meters from the base of 35º C at mean sea level. The temperature so worked out will be rounded off to the nearest whole number.

Annexure II
(Refers to Para 6 (a)
of Appendix A)

TYPICAL MISSION PROFILE

For the purpose of calculating engine life, a typical mission profile in strike role configuration (2 PGMs + 1 Designator Pod + 2 BVRs + 2 x A4Ms + Ext Fuel) of one hour duration (1 hour of flight duration is from brake release for takeoff to the touch down for landing) is defined as follows:-

(a) Take off with max AB. Afterburner to be switched off only when climb speeds at a safe height of at least 100m (AGL) are achieved.

(b) Climb to 6 km (20,000 ft) using Max dry power setting.

(c) Fly at 0.8 M for 15 min at 6km (20,000 ft).

(d) Decelerate to 0.6M and then accelerate from 0.6 M to 0.9 M at 6 km (20,000 ft).

(e) Accelerate to 550 kt and maintain it for 5 minutes.

(f) Combat for 5 min which includes 3 min at max dry and 2 min at max afterburner setting at 1.5km (5000 ft) at a mean speed of 450 kt.

(g) Climb to 6 km (20,000 ft) using Max AB, accelerate to 550 kt and maintain 550 kt for 2 minutes.

(h) Dive to 1.5 km (5,000 ft) at 550 kt.

(j) Maintain 600 kt at 1.5km (5000 ft) for 2 minutes, followed by max dry for 5 minutes.

(k) Maintain 300 kt for 10 minutes at 3 km (10,000 ft).

(l) Visual circuit at 600m (2000 ft), approach and landing.

Annexure III
(Refers to Para 27 (g)
of Appendix A)

AIRBORNE MULTI MODE RADAR		
Section I – General		
1.	General	(a) What kind of Transmit/Receive (T/R) modules are used in Active Electronically Scanned Array' (AESA) radar? Is Gallium Nitride (GaN) based technology used in AESA radar? (b) Does the radar have the capability to carry out simultaneous Air to Air and Air to Surface operation? (c) The radar should be able to deliver to its stated performance within its declared MTBF even with failure up to 10% of the TRMs, assuming a homogenous distribution of the failures across the antenna aperture. (d) Low probability of intercept features of the radar? (e) What is the radar bandwidth?
Section II- Air to Air		
2.	Modes of operation	What are the Air to Air modes of operation and does it include the following modes:- (i) Multi Target Detection and Track. (ii) Multi Target Air Combat Manoeuvring. (iii) High Resolution Multi Target Tracking.
3.	Velocity Search Mode	(a) What is the maximum (km) range for detecting a target with an RCS of 2 m2 with a probability of detection of 0.95? What is the Azimuth and Elevation scan zone in this case? (b) What is the range rate (m/s) difference at which the radar is able to discern two targets? (c) What are the total scan zones (deg) in azimuth and elevation? Does it have capability to scan beyond $\pm$ 60° azimuth?

4.	Track While Scan Mode	(a) What are the scan zones (deg) in azimuth and elevation? Does it have capability to scan beyond± 60° azimuth? (b) What is the maximum range (m) for detecting a target with an RCS of 2 m^2 (Probability of Detection = 0.95) in head on mode in range search mode? What is the Azimuth and Elevation scan zone in this case? (c) What is the minimum range (km) for detecting a target with an RCS of 2 m^2 (Probability of Detection = 0.95) in tail on mode? (d) How many targets can be displayed during track while scan mode? (e) How many targets can be engaged simultaneously with AA missiles?
5.	Raid Assessment	What is the minimum distance (m) between two targets so as to distinguish and display targets individually?
6.	Computation of intercept and Firing Solution	(a) Is this facility available in track while scan and Raid Assessment mode? (b) Is the firing and intercept solution possible on a designated target in the Raid Assessment mode?
7.	Performance Against Slow Speed Targets	(a) What is the Doppler discrimination (range in m/s) capability of the radar? (b) Are the Doppler discrimination values selectable by the pilot?
8.	Mutual Interference	(a) How many aircraft are able to operate in close proximity (in all relative positions and without any mutual interference), while operating any mode of the radar? (b) How many spot frequencies are provided?
9.	Firing of Air to Air Missiles	(a) Provision to support integration of user specified air to air missile? (b) How many missiles can be fired simultaneously in the track while scan / Raid Assessment mode? (c) Is there a provision of reverse slaving (missile to radar) in the Close Combat Mode?
10.	Close Combat Mode	(a) Are Close combat modes slewable by pilot? (b) Does the radar/IRST support Infra Red missiles by providing

		accurate data for seeker slaving and missile envelope calculation? (c) What is the maximum lock-on range in Close Combat Mode? (d) Availability of the following combat modes:- (i) The radar and missile heads are slaved to the Helmet Mounted Sight and Display (HMSD)/The radars bore-sight is slaved to the HMSD/ LOS and lock-on is on-demand, within the radar scan area. 8. (ii) Is HUD TFOV scanned? (iii) Is pilot designated sector searched and auto lock on facility provided?
11.	Slaving/ Reverse Slaving	(a) Are all active and Infra Red Air to Air weapons slaved to the radar and is reverse slaving facility provided? (b) Is auto lock-on facility provided with reverse slaving?
12.	Training Mode	(a) Vendor to confirm availability of several spot frequencies. Does the radar has an in-built and procedural feature that would permit its use for training without compromising its wartime operational characteristics/ parameters? (b) Is activation of ECCM features, especially those which induce the radar to change its operating frequency, and other relevant parameters on encountering active/ passive jamming manually selectable?
Section III - Air to Ground		
13.	Modes of Radar	What are the Air to Ground modes of operation and does it include the following modes:- (i) Real Beam Mapping (RBM) (ii) Synthetic Aperture Radar (SAR) (iii) Ground Moving Target Indication (GMTI) over RBM/SAR (iv) Ground Moving Target Track (GMTT) over RBM/SAR (v) Ground Target (Stationary) Track (GTT) (vi) Air to Ground Ranging (vii) Weather (viii) Terrain Avoidance

<table>
<tr><td></td><td></td><td></td></tr>
<tr><td>14.</td><td>RBM</td><td>(a) What is the maximum range and scanned area in RBM mode?

(b) What is resolution of ground maps at 120 km/ 60 nm scale?

(c) In this mode, are zoom and freeze functions provided?</td></tr>
<tr><td>15.</td><td>SAR</td><td>(a) What is the minimum ground map resolution in the SAR mode?

(b) Does SAR images have zoom feature?

(c) What is antenna bearing angles for generating SAR images?

(d) What is the resolution and ranges in the SAR mode:-

<table>
<tr><td>Patch Size (km)</td><td>Resolution (radial and transverse) (m)</td><td>Maximum Patch Range (km)</td><td>Time for Image Formation(s)</td></tr>
<tr><td>1 x 1</td><td></td><td></td><td></td></tr>
<tr><td>2 x 2</td><td></td><td></td><td></td></tr>
<tr><td>Any other patch size/s</td><td colspan="3">Resolution, maximum patch range and time for image formation of these patch sizes?</td></tr>
</table>
</td></tr>
<tr><td>16.</td><td>GMTI/GMTT</td><td>(a) What is the maximum range and accuracy for 50 m^2 target in GMTI mode?

(b) What is radial velocity (m/s) of the ground targets which permits their selection in GMTI mode?

(c) What are the angular and velocity accuracies in GMTT mode?</td></tr>
<tr><td>17.</td><td>Air to Ground Ranging</td><td>(a) What is the accuracy (%) provided at varying grazing angles and ranges?

(b) At a range of at least 30 km, what is the accuracy (%) provided at grazing angles > 5°? Specify accuracy and corresponding grazing angle.</td></tr>
<tr><td>18.</td><td>Air to Ground Mapping Features</td><td>(a) Is the range selectable by the pilot and are zoom and freeze functions provided?

(b) Is it possible to update the navigation system?

(c) Does the Freeze function permit transition to weapon delivery?

(d) Is the spot light mode available on SAR mapping and is it possible to designate targets on this mode for weapon delivery?</td></tr>
</table>

Section IV–Terrain Avoidance and Weather		
19.	Terrain Avoidance	Provision of terrain avoidance using radar ground-mapping modes should be available?
20.	Weather	(a) What are the ranges of radar in this mode for detecting cumulonimbus/ nimbostratus clouds? (b) Is there a provision for overlaying weather picture on NAV modes (route waypoints, flight plan and other navigation displays)?
Section V - Air to Sea		
21.	Modes of operation	(a) What is the detection and lock on range of a target of 100 m^2 and 1000 m^2 RCS target when flying at an altitude of 1 km, 3km, 5 km and 10 km? (b) What are the Air to Sea modes of operation and does it include the following modes:- (i) Sea Surveillance and Search While Track (ii) Sea Target Continuous Track (STCT) (iii)Inverse Synthetic Aperture Radar (ISAR) and Range Signature (RS) mode/ any other mode for identification of sea targets.
22.	Sea Surveillance and Search while Track	(a) Is RBM painting of coast line and sea targets possible in this mode? (b) What is the maximum operational range of the radar in this mode? (c) What is the maximum number and velocity range (m/s) of targets that can be displayed and designated? (d) Is raw and synthetic output available? (e) Does the radar generate course and velocity of targets? (f) Is there a provision to de-clutter sea targets depending on their velocity selectable by the pilot? (g) What is the range (m) and angular resolution in this mode? (h) Does the radar have the capability to provide a computed radar picture of sea targets in the radar silent mode, with high

		accuracy? If yes, upto what range?
23.	Surface Target Continuous Track (STCT)	(a) How many targets can be acquired and tracked simultaneously in this mode? (b) What is the maximum tracking range in this mode? (c) What are the velocity (m/s), angular (mrad) and range (m) accuracy in this mode? (d) Is simultaneous launch of two anti-shipping missiles/ PGMs possible in this mode?
24.	ISAR	Does the radar have ISAR mode? If yes, then provide specifications of resolution and the distance at which ISAR picture is achieved.
25.	RS	Does the radar have RS mode? If yes, then provide specifications of resolution and the distance at which RS picture is achieved.

Annexure IV
(Refers to Para 29
of Appendix A)

EW SYSTEMS		
Section I – General EW Requirements		
1.	EW systems	Does the EW suite of the aircraft include Radar Warning Receiver (RWR), Missile Approach Warning System (MAWS),Aircraft Self Protection Jammer (ASPJ), Counter Measure Dispensing System (CMDS) and Low Band Jammer (LBJ)?
2.	General	(a) Are all the EW systems, viz RWR, MAWS, CMDS, ASPJ and LBJ etc integrated to ensure proper time sharing? Is there any interference between each other and with the other onboard transreceiver such as radar/weapons? (b) Is there provision of Mission Planning and debriefing system (Windows/ Linux based) with appropriate uploading and downloading facility between the aircraft and mission-planning and debrief generator through a suitable secure media? (c) Is EW mission planning tool an integral part of the aircraft mission planning tool? If, no, then what is interface? (d) Would the vendor provide the capability for in-country programming (or Pre-Flight Message Generation (PFMG)) with intelligence data sourced either through the vendor (to be discussed) or generated by the IAF? (e) Does the BIT system need external/internal cooling for its operation? Would the vendor provide test equipment, tools, training and publications for O and I level of maintenance, for all the systems? (f) Are systems capable of being operated by the aircraft power supply and also able to receive power supply directly from the ground power supply unit for maintenance without the necessity to power up the complete aircraft? (g) Is there capability of operating EW systems at full flight envelope of the aircraft?

<table>
<tr><td colspan="5">Section II – RWR</td></tr>
<tr><td>3.</td><td>System capability</td><td colspan="3">(a) Does the RWR provide capability of intercepting, identifying and prioritizing multiple airborne and ground based RF emitters?

(b) Is the system capable of covering emitters from 1 to 18 GHz? (Additional expansion capability for 0.5 to 40 GHz as future expansion?

(c) Is the system flight line programmable?

(d) What is RWR coverage in azimuth and elevation? Specify details in all frequency bands.

(e) Is it capable of cueing an onboard CMDS, ASPJ and towed decoy?

(f) Is it possible to interface RWR and MAWS and CMDS, ASPJ, primary/secondary radar, towed decoy, other on-board avionics systems and real time data link?</td></tr>
<tr><td rowspan="8">4.</td><td rowspan="8">System specifications</td><td>Sl No</td><td>Specification</td><td>Characteristic</td></tr>
<tr><td>(a)</td><td>Frequency Coverage</td><td>Present and anticipated future expansion in frequency band of likely emitters.</td></tr>
<tr><td>(b)</td><td>DF Accuracy</td><td>(i) All around and specifically in frontal sector in deg RMS value.

(ii) Is there a provision to discriminate and indicate threats in the upper and lower hemisphere?</td></tr>
<tr><td>(c)</td><td colspan="2">Can the system handle following threats?</td></tr>
<tr><td></td><td>(i) Signal Type</td><td>Pulse, Pulse Doppler, CW, ICW, Pulse compression</td></tr>
<tr><td></td><td>(ii) Frequency Type</td><td>Fixed, Pulse to Pulse and Batch to Batch agile</td></tr>
<tr><td></td><td>(iii) PRI Type</td><td>Fixed and agile including stagger switcher and jitter</td></tr>
<tr><td>(d)</td><td>Pulse density handling</td><td>In PPS over the complete frequency band.</td></tr>
<tr><td>(e)</td><td>Sensitivity (at RF input port)</td><td>.... dBM (installed)</td></tr>
</table>

<table>
<tr><td colspan="4">Section III – MAWS</td></tr>
<tr><td>5.</td><td>System Capability</td><td colspan="2">(a) Is it capable of detecting any air launched and ground launched missiles?

(b) Is MAWS capable of cueing the CMDS (integrated operation) for initiating countermeasures against missiles?

(c) Is the MAWS capable of discriminating between the missile and a rapidly closing aircraft?

(d) What is the MAWS coverage in azimuth and elevation? Specify details.</td></tr>
<tr><td rowspan="10">6.</td><td rowspan="10">System Specifications</td><td>Sl No</td><td colspan="2">Specification</td><td>Characteristic</td></tr>
<tr><td>(a)</td><td colspan="2">Sensitivity</td><td>Better than …. W/cm^2 .</td></tr>
<tr><td rowspan="3">(b)</td><td colspan="3">Detection envelope</td></tr>
<tr><td>(i)</td><td>Max/Min Range</td><td>… Km</td></tr>
<tr><td>(ii)</td><td>Coverage</td><td>Azimuth and elevation in deg.</td></tr>
<tr><td>(c)</td><td colspan="2">Reaction Time</td><td>Less than … sec</td></tr>
<tr><td>(d)</td><td colspan="2">False Alarm Rate</td><td>Better than … in … flying hrs in high clutter conditions.</td></tr>
<tr><td>(e)</td><td colspan="2">DF Accuracy</td><td>Better than … deg RMS</td></tr>
<tr><td>(f)</td><td colspan="2">Probability of detection</td><td>Better than … %</td></tr>
<tr><td>(g)</td><td colspan="2">Target Approach speed</td><td>Min to max in m/s</td></tr>
<tr><td>7.</td><td>System Features</td><td colspan="2">(a) Is the system capable of operating in stand-alone and cued modes of operations with other systems like RWR etc?

(b) Is the system capable of recording all operational events along with time stamp for post mission analysis?

(c) Is the system capable of all-weather operation, unaffected by atmospheric conditions within max detection range and capable of detecting missiles in any background environment?

(d) Does the system have embedded training mode for simulating threats and to assess the correct cueing capabilities with appropriate indications?</td></tr>
</table>

<table>
<tr><td colspan="5">Section IV – Airborne Self Protection Jammer (ASPJ)</td></tr>
<tr><td>8.</td><td>Jamming Techniques</td><td colspan="3">(a) Are the ECM techniques provided capable of countering all new generation radars?

(b) Does the system provide ECM techniques noise (barrage, narrow band and doppler noise) and modern deception techniques like RGPI, VGPI, random range programming, multi-target generation or a combination of any of these techniques?</td></tr>
<tr><td>9.</td><td>Threat Environment</td><td colspan="3">(a) What are the types of radars that the ASPJ can handle? What is the frequency range covered by ASPJ?

(b) Is the ASPJ effective against threat radars using one or more state of the art ECCM features? If yes, which ECCM features is it capable of handling?

(c) Is system capable of handling multiple threats simultaneously? Specify the number and type of threats.

(d) What is the ASPJ coverage in azimuth and elevation? Specify details in all operating bands.</td></tr>
<tr><td>10.</td><td>System Capability</td><td colspan="3">(a) Is the system fully automatic, computer controlled and state of the art with provision for pilot intervention?

(b) Is it capable of intercepting, analysing, categorizing, prioritizing and initiating optimal counter-action against multiple threats in a dense environment by noise cum active deception jamming in front and rear hemispheres?</td></tr>
<tr><td rowspan="7">11.</td><td rowspan="7">System Specifications</td><td>Sl No</td><td>Specification</td><td>Characteristics</td></tr>
<tr><td>(a)</td><td>Frequency Range</td><td>.... to ....Ghz (internal SPJ)</td></tr>
<tr><td>(b)</td><td>Effective Radiated Power (ERP)</td><td>What is the ERP to tackle all the envisaged RF threats?</td></tr>
<tr><td>(c)</td><td>Polarisation</td><td>Is the system capable of countering all types of polarisations employed by threat radars?</td></tr>
<tr><td>(d)</td><td>Threat Countering</td><td>How many threats is the system capable of countering simultaneously?</td></tr>
<tr><td>(e)</td><td>Pulse Density</td><td>Upto ... million pulses per second at any frequency</td></tr>
<tr><td>(f)</td><td>Sensitivity (at</td><td>..... dBM (installed)</td></tr>
</table>

			RF input port)	
		(g)	Dynamic Range	Minimum.... dB
		(h)	Protection Limit	..... dBM
		(j)	Field MTBF	.... hrs

Section V – Counter Measure Dispensing System (CMDS)		
12.	System Capability	(a) What are the modes for dispensation of chaffs and flares? (b) Is the CMDS fully programmable? (c) Provision for chaff and flares for optimum aircraft protection against modern missile systems? (d) Is the system capable of deploying multi-spectral flares? Provide specifications. (e) How many chaff and flare can be carried onboard (combination and separately)? Is there any training mode? Specify. (f) Does the system have modern intelligent system which assesses the threat parameters before releasing chaff/flare as a counter measure?
13.	Operating Capability	(a) Is the system microprocessor based and capable of independent as well as simultaneous dispensations as per selection with capability to dispense combination of payloads? (b) Is the system capable of programming various dispensation programs and patterns through the mission-planning system provided to user? (c) Is the system capable of detection of misfires and corrections? If yes, in how much time (msec) is the correction possible? (d) What is the minimum firing interval between two successive carts? (e) Is the system interfaced with RWR, SPJ and MAWS for automatic/ semi-automatic dispensation of expendables appropriate to the threat environment?

		(f) Is there a provision of recording of events with a common time stamp with RWR and MAWS? (g) Does the system record BIT results and pilot actions encountered during operation for post sortie analysis?
14.	Modes of Operation and Control	Is the system provided with the following user selectable modes of operation. (i) Critical Quantity feature in Autonomous Mode. (ii) RWR/ MAWS/ ASPJ Automatic Mode. (iii) RWR/MAWS/ASPJ Semi-Automatic Mode. (iv) Autonomous Mode.

Section VI – Towed Decoys		
15.	Operational Characteristics	(a) What is the flight envelope with the deployed towed decoy? Does it restrict the aircraft manoeuvrability or the operational envelope? (b) What is the in-flight reel-out time? (c) How many threats is the system capable of countering simultaneously and what are the types of threats it is capable of countering? (d) Is the deployment of the decoy automatic or manual (with control in the cockpit)? (e) Is there a provision of automatic deployment of second decoy in case first decoy is lost due to threat interaction or malfunction? (f) Is it threat library flight line software Programmable and re-programmable (with facility provisioned)? (g) What is the spatial coverage of the system in azimuth and elevation?

Annexure V
(Refers to Para 49
of Appendix A)

RADIUS OF ACTION AND LOITER TIME

1. **Definition of Operational Take Off**. To calculate the fuel allowance for takeoff, the following criteria should be taken into consideration:-

(a)Afterburner to be switched off only when climb speeds at a safe height of at least 100m (AGL) are achieved in a Hi-Lo-Hi mission.

(b)Afterburner to be switched off on achieving the tactical speeds in a Lo -Lo mission.

(c)Standard fuel allowance for start up, warm up and taxi up-to brake release point, expressed as fuel equivalent to 20 minutes of operation at ground idle / required rating.

2. **Operational Reserve**. All operational profiles should include a combat reserve of **5 min which includes 3 min at max dry and 2 min at max afterburner** setting and a standard diversionary fuel allowance. Combat reserve should be at low level (<1.5 km) and at a speed of 900 km/h.

3. **Diversionary Reserve**. The diversionary reserves should cater for an economical cruise for 150 km at an altitude of 1.5 km and a circuit and overshoot followed by a circuit and landing followed by taxy to dispersal.

4. **Configuration and Profiles**. The table below gives various configurations and profiles in which the aircraft should achieve the desired radii of action/loiter time, without air-to-air refuelling. All the following configurations include full internal fuel and full gun ammunition as standard:-

Sl No	Configuration	Role	ROA / Endurance
(a)	(b)	(c)	(d)
1.	4 BVRs + 2 A4Ms + Ext Fuel	Air Superiority at 6km (20,000 ft)	Specify Loiter Time
2.	4 BVRs + 2 A4Ms + Ext Fuel	ML Escort at 6km (20,000 ft)	Specify Radius of Action
3.	2 PGMs + 1 Designator Pod + 2 BVRs + 2 x A4Ms + Ext Fuel	Lo-Lo-Lo Strike (Low Level at 150 m AOL)	
4.	1 ASMs + 4 BVRs + 2 A4Ms + Ext Fuel	Hi-Lo-Hi Anti-Shipping Strike (100 km Low Level* during both OB and IB leg)	
5.	1x Recce Pod + 4 BVRs + 2 A4Ms + Ext Fuel	Hi-Lo-Hi (100 km Low Level* during both OB and IB leg))	

Note:

(i) *Low Level altitude for calculation of the mission profiles is 150 m (500 ft) AMSL.

(ii) High level in all the profiles is defined at 6 km (20,000 ft).

(iii) External tanks are to be retained throughout for the calculations.

(iv) All calculations should not include any air to air refuelling.

Appendix B
(Refers to Para 5(a)
of the RFI)

TRANSFER OF TECHNOLOGY (ToT) REQUIREMENTS FOR FIGHTERS

1. **Product Offering**. The OEM should convey with adequate clarity, their ToT offer for indigenous manufacture of the aircraft in India towards 'Make in India' initiative of the Government of India.

2. **ToT Requirements.** The transferred technology should be state of art to ensure rapid build-up of indigenous design & development, production and maintenance capabilities for the aircraft, its sub-systems and support equipment. Transfer of Technology should encompass transfer of Know-how / Know-why and should be comprehensive, covering design, manufacturing know-how and detailed technical information which will enable the Indian Production Agency(ies) to manufacture, assemble, integrate, test, install and commission, use, repair, overhaul, support, obsolescence management, life extension and maintain the aircraft, including the capability for future integration of systems and weapons.

3. At the end of the technology transfer process, it is essential to indigenously manufacture as prescribed in relevant DPP. The mutual work share agreement between the OEM, major sub-contractors of the OEM and the Indian Production Agency(ies) should meet the prescribed indigenous content. The extent of ToT and the capabilities that are being provided should be indicated as per the *'Extent of Capabilities Provided'* chart placed at **Annexure 1**.

4. **Description on Filling Up of Appendix A**.The chart placed at **Appendix A** is meant to provide details and extent of the capabilities being provided. This chart may be filled as per the following guidelines:

(a) **Column 1 (Will the Capability, Technologies and Know-how / Know-why be transferred)**.In this column, the OEM should mention whether the listed **Capability Area/ ToT**will be transferred or not.

(b) **Column 2 (Description of Capability Area)**. In this column, the OEM should provide general description and content of the capabilities being transferred.

(c)**Column 3 (Description of Extent and Depth of ToT)**. In this column, the OEM should specify the depth and to what extent the ToT is being offered for each of the capability areas. The extent and depth of ToT being provided should enable the Indian Production Agency(ies) a long term and self-sustained capability.

(d) **Column 4 (Description of Specific Data, Technologies and Know-how / Know-why/ Software tools and models Transferred)**.In this column, the OEM should provide the following information for each capability area:

(i) Specific data and documentation required to enable ToT transfer to the Indian Production Agency(ies).

(ii) List and describe the key technologies required to be transferred to enable the ToT.

5. The transferred Know-how / Know-why should contain possibilities for design / development / sourcing / integration/ production / maintenance ('O', 'I' & 'D' levels) / upgrade, as applicable. Further, the transferred capabilities / technologies should be capable of being utilised / implemented across platforms, more significantly, in the on-going and futuristic programmes.

6. **General Guidelines for Transfer of Technology (ToT)**.It is essential to adhere to the general guidelines for ToT provided at Appendix G to Schedule I to Chapter II of DPP 2016.The specific requirements listed therein, which would not be feasible to be met, should be clearly brought out in the response to the RFI. In order to facilitate fair assessment of the depth of technology being transferred, OEMs are required to identify systems/sub-systems under Category 1 to 4. The system / sub-system / assembly / sub-assembly / module / detail parts classified as Category 5 should be listed and the total value of Category-5 items as a percentage of the total value of the aircraft must be specified. The definitions of Category 1 to 5 items and the ToT requirements of each category are placed at **Annexure 2**.

7. **Configuration Control**. The OEM would be required to provide the current version of Configuration Control Document to the Indian Production Agency(ies) having detailed breakdown of the product structure (aircraft, sub-systems and support equipment) in terms of lower level subsystems/ assemblies/ sub-assemblies/ modules/ detail parts/ PCBs/ wiring diagrams etc with latest modification status. The OEM should provide the data (i.e. appropriate procurement identification or nomenclature information) necessary to procure all the components including appropriate sub vendors identification. All updates during the term of the agreement should be provided as and when issued. Consolidated list of updates during the year should also be provided during the first quarter of the subsequent year.

8. Design data shall include the details that the Indian Production Agency(ies) would need to analyse, carryout trouble shooting, give design disposition during production and exploitation (i.e. operational use) of the aircraft, its engine, system/sub-systems and accessories on account of snags, deviations, concessions, modification, upgradation of the product and substitute parts and systems of the product as required by the Indian certifying agency and the Indian Production Agency(ies).

9. **Government Approvals**.The OEM should provide an assurance in the proposal that it will seek all necessary Government export approvals for ToT required for design / development, manufacture, repair / overhaul, upgrade are in place for the aircraft, engines and all its systems and components. The OEM should also provide an assurance that all subsequent governmental authorisations needed to allow the OEM to enter into negotiation, sign and execute contracts with the Government of India related to the product should be received in a timely manner as and when required. Final export approval should be obtained when contract negotiations are completed, the exact specifications of the product to be supplied have been agreed and the Inter-

Governmental Agreement (IGA) / Contract has been signed. At the time of IGA / Contract signature, the OEM will present required documents for GoI signature / approval allowing for the implementation of the ToT agreed upon in the IGA / Contract.

10. **Infrastructure Set-up**.The OEM should include the overall requirement and specifications for the infrastructure set-up required for satisfactory implementation of the envisaged development, production, tests and maintenance, as applicable. The GSE / GHE, with quantities and all other necessary requirements with specifications, required for implementation of the envisaged development, production, test and maintenance, as applicable, should also be provided to the Indian Production Agency(ies).

11. **Support**.The OEM's should provide and support complete ToT for the envisaged development, production, test and maintenance, as applicable, to the Indian Production Agency(ies) for the aircraft and its sub-systems, modules, assemblies and detailed parts/ components, including those from sub-vendors. OEM will also be responsible for providing lifetime support for all proprietary items. Availability of support is desirable for a long term basis with a goal of achieving minimum period of 40 years, beginning after the last aircraft is produced. The OEM should provide support and facilitate ToT of the sub-systems from his sub-vendors / OEMs. The OEM should resolve any design deficiency revealed during the operational utilisation of the aircraft in India by the user, which impact stipulated performance. The detail of how the design deficiency was addressed is to be conveyed to the user.

12. **Sub-assembly Details**. It is likely that some of the assemblies/ sub-assemblies/ modules/ PCBs used in the realization of higher level assemblies/ sub-systems and systems are manufactured by the OEM's vendors/ sub-contractors either based on Engineering documentation provided by the OEM or developed by the OEM's vendors / sub-contractors which are based on procurement specifications provided by the OEM. Detailed lists (including procurement information) of such items should be provided by the OEM.

13. **Proprietary Items**. Certain components / processes specifically developed by the OEMs for use in the manufacture of the aircraft, its sub-systems and support equipment may be classified `Proprietary' and not included within the scope of ToT offered to the Indian Production Agency(ies). The OEM shall make every effort to minimise proprietary items and if such items are necessary, shall provide details of the nature and scope of the specific items excluded. Further, no item in the product structure which is key either from the technology point of view or from the point of view of significant value addition or which constitutes a significant relative percentage of the product cost (>10%), should be included under the head "Proprietary items".

14. **Strategy for Future Capabilities**. The OEM should provide a strategy which describes how the transferred capabilities can be further developed, enhanced and used for other existing and future aircraft programs in India.

15. **Key Technologies**. The list of 'Key Technologies' is placed at **Appendix C**. The key technologies, which will be provided, should be indicated along with scope and depth being provided for each technology.

16. **Assistance to Indian Production Agency (ies)**. OEM shall assist the Indian Production Agency(ies) and ensure that maintenance ToT is to be provided as required, from his vendor/ sub-contractors for items not being provided under ToT.

17. OEM should permit the Indian Production Agency (ies) to sub contract components / assemblies to its sub-contractors. The arrangement ToT shall be such that the Indian Production Agency(ies) are able to procure components / sub-assemblies / raw material / test equipment directly from OEM's subcontractors / vendors. Exhaustive lists of the OEM's sub-vendors and the Part Numbers of the equipment shall be provided by the OEM to the Indian Production Agency (ies).

18. The option to produce aircraft / engines / sub-systems / spares for the user use, beyond the quantity indicated in the RFI shall rest with the Government of India. The option to export to third country, beyond the Indian requirement, would be subject to agreements with the Government of India and the Government of the OEM.

19. **Manufacturing Quality Standard Parameters (MQSP)**.OEM shall provide MQSP details such as Rejection Rate, Rework Rate, Concession Rate, Defect Rate, Quality Escape Rate, MTBF and Failure Rate etc.

20. **Documentation and Data to be Provided**.

(a)The documentation and data provided by the OEM shall be in English language and include documentation under the following heads:

(i) Engineering documentation, including design criteria, design standards, technical specifications, Interface Control Documents (ICDs), Systems Requirements Document, Digital Mock Up, Material selection criterion, certification and qualification standards and reports.

(ii) All user support manuals will be provided.

(iii) Manufacturing documentation, including Engineering Drawings and production documents, production documents for forgings and castings, Bill of materials with source of supplies, process sheets and work instructions, standard repair schemes, quality plans.

(iv) Test documentation.

(v) Technical Manuals.

(vi) General documentation including Company standards, National and International standards and specifications.

(vii) Additional documentation for repairs centre.

(viii) Illustrated parts catalogue.

(ix) Design data for stress, fatigue, performance, qualification, environmental test, life (calendar/total/overhaul), where applicable.

(x) Source identification for Bought Out Items (BOIs) and sub-contracted items; standard parts consumables etc.

(xi) Spares parts lists for 'O', 'I', and 'D' level maintenance.

(xii) Recertification / re-qualification test plan, series test, special category test due to change in venue of manufacture, where applicable.

(xiii) "Red band" units (i.e. "golden", non-flyable), calibration stands where applicable.

(xiv) Quality procedures, plans, ESS, Special tests during production other than ATP.

(xv) Data on reliability- Mean Time Between Failures (MTBF), Mean Time Between Overhaul (MTBO), Mean Time Between Repairs(MTBR).

(xvi) Software models in Model Based Systems Engineering (MBSE) in system and sub-system development.

(b) The documentation to be supplied by the OEM shall be that which is used by the OEM or its sub-contractors for the purpose of manufacturing, assembly and testing of the licensed product from raw material in their Plant. The OEM will ensure completeness and exhaustiveness of the documentation to be used by the Indian Production Agency(ies) for manufacturing, assembling, testing, installation and commissioning, maintenance and overhaul of the licensed product in his plant. Wherever approval of certification agency is relevant, approved documents will be provided. Certification standards as far as possible will be relevant Military (MIL) Specifications or as mutually agreed with the User's Certification Agency.

(c) Wherever software is used, software source code, software design and configuration control document, software development environment, software certification documents, Software requirement specification (SRS) and firmware development are to be provided.

(d) The OEM shall also provide the data in respect of MTBF, MTBO, MTBR, and Reliability of the products being offered.

(e) OEM to provide hardware design document of software intensive LRUs/Subsystems and corresponding application libraries, memory map, IO configuration, Hardware interface details, interface protocols, required for software upgrade.

21. **Product Upgrades**. The aircraft OEM would extend full support for technology insertion / upgradation / modification of the aircraft to meet user requirements over the life span of the entire fleet in the user inventory.

(a) **OEM Process / History of Upgrades**. OEM shall describe the process for future technology insertion.

(b) **Technical Data Provided for Upgrades**. Technical data, including relevant Documentation update in respect of any modifications / improvements / upgrades undertaken by the OEM in the licensed product during the entire life cycle of the product / licence Agreement, shall be provided to the Indian Production Agency(ies), along with manufacturing data for the same.

(c)**Indigenous Upgrade Capability**. It should be possible to indigenously integrate new weapons and avionics of Indian, Western and Russian origins. The ToT must include complete design data / Know-how / Know-why, such as Numeric Master Geometry (NMG), airframe strength characteristics, near flow field characteristics, control laws, software source codes, training and technical assistance. The OEM is required to provide adequate design information like design process, design data flow, design work flow, design option considered and the rationale for choice from among the chosen options to facilitate "Know-why" and provide skill development plan to the Indian Production Agency(ies)/ User trainees to enable indigenous upgrade capability subsequently.

22. **Training**.

(a)The training provided by the OEM should be adequate, such that it could be used for production, exploitation, product improvement and technology insertion with both, Indian Production Agency(ies) and the user.

(b)The Industrial Training shall be in 'English' language, covering all aspects of design, manufacture, software, installation and commissioning, system integration and checkout, and component level maintenance of the product down to sub-assembly, modules and PCB level, applicable to the indigenous production. Apart from classroom training covering the critical aspects, due emphasis should be given to on-the-job training.

(c)Software source codes / software tools are to be comprehensively covered during the software training module with a view to enable the software engineers of user and Indian Production Agency(ies) undergoing training to acquire skills in the use, maintenance and update of the software.

(d)Training on hardware for software intensive LRUs/Subsystems, to enable software upgrade and capability enhancement.

(e)Training on design evolution especially of the aerodynamic configuration

23. **Technical Assistance**. As part of ToT, OEM shall provide requisite technical assistance to the Indian engineers and technicians during the manufacturing programme and also during support, repair, overhaul and upgrade of the product.

24. **Special Maintenance Tools (SMTs) and Special Test Equipment (STEs)**.

(a)OEM shall provide its existing complete technical data of the SMTs and STEs used in the production, assembly, test and maintenance of the product. All necessary data will be provided associated with making a make-buy determination for SMTs and STEs.

(b)Details of special category test (recertification, production series testing) along with test rig / test set up shall also be provided. Complete details of the user support manual(s) shall be provided.

(c)OEM shall provide details of calibration and periodicity of calibration in respect of SMTs, STEs and associated special facilities Details of master tester and associated special facilities, if required.

25. **Consumables**. List of consumables along with specifications required for the manufacture / maintenance of product along with cost, source details and life data shall be provided by the OEM.

26. **Special Technologies / Processes**. The OEM shall mention in the ToT proposal about special technologies and special coatings and treating processes along with details of associated plant and machinery requirements.

27. **Technology Transfer Programme.** The complete transfer process, including the design, production and support capability, along with delivery timelines and the capacity build-up plan will be provided by the OEM with verifiable outcomes.

28. **Product Support**. OEM shall provide an effective approach / methodology for long term product support of the aircraft, including supply of spares and management of obsolescence, to facilitate the sustainment of the aircraft for 40 years following the completion of the final unit produced under the initial production Agreement / Contract.

Annexure 1
(Para-3 refers)

EXTENT OF CAPABILITIES PROVIDED

Sl No	Capability Area / ToT	Will the Capability, Technologies and Know-how / Know-why be Transferred (1)	Description of Capability Area (2)	Description of Extent and Depth of ToT (3)	Description of Specific Data, Technologies and Know-how / Know-why Transferred (4)
1	**CAPABILITIES TO UTILIZE GROWTH POTENTIAL OF THE PLATFORM**				
1.1	Methodology and tools for aircraft Program Management				
1.2	Operational Analysis				
1.3	System Safety & Reliability				
1.4	Survivability / Signature analysis, signature testing methodology and signature reduction measures				
1.5	Integrated Logistic Support design, availability and maintainability analysis				
1.6	Structural Services & Integrity				
1.7	Airframe and Installation				
1.8	Human Machine Interaction				
1.9	Electromagnetic and RF Compatibility Effects				
1.10	Aircraft system (fuel, electrical, propulsion)				
1.11	Avionic Systems				
1.12	Any other suggested by OEM				
1.13	Configuration Management				
1.14	Methodology for				

Sl No	Capability Area / ToT	Will the Capability, Technologies and Know-how / Know-why be Transferred (1)	Description of Capability Area (2)	Description of Extent and Depth of ToT (3)	Description of Specific Data, Technologies and Know-how / Know-why Transferred (4)
	aerodynamic/configuration analysis, testing and design on tackling nonlinear flow regimes.				
1.15	Engine performance decks				
2	**SYSTEM INTEGRATION**				
2.1	Radar				
2.2	Electronic Warfare (EW) System				
2.3	Weapons				
2.4	Communication and Data Link				
2.5	Decision Support and data Fusion System				
3	**SYSTEM DEVELOPMENT & INTEGRATION**				
3.1	Radar				
3.2	Electronic Warfare (EW) System				
3.3	Communication and Data Link Development				
3.4	Decision Support and Data Fusion System				
3.5	Geodata development and production				
3.6	Any other suggested by OEM				
3.7	Stores Management				
3.8	Human Machine Interaction Training				
3.9	Flight Control System				
4	**INDUSTRIALIZATION AND MANUFACTURING**				

Sl No	Capability Area / ToT	Will the Capability, Technologies and Know-how / Know-why be Transferred (1)	Description of Capability Area (2)	Description of Extent and Depth of ToT (3)	Description of Specific Data, Technologies and Know-how / Know-why Transferred (4)
4.1	Hangar and A/C delivery verification				
4.2	Final Assembly				
4.3	Structural assembly				
4.4	Structural sub-assembly				
4.5	Parts manufacturing				
4.6	Industrialization				
4.7	Tools manufacturing				
4.8	Sourcing and manufacture of equipment and components				
4.9	Obsolescence Management				
4.10	Training on application of radar absorbing paints and incorporation of radar absorbing materials.				
4.11	Any other suggested by OEM				
5	**TEST AND VERIFICATION**				
5.1	Verification and Validation				
5.2	Measurement system				
5.3	Flight Test operation				
5.4	Any other suggested by OEM				
6	**IN SERVICE SUPPORT**				
6.1	Logistic Support Analysis and Support solution design				
6.2	Continuous Airworthiness and Fleet Management				
6.3	On Aircraft Maintenance				
6.4	Off Aircraft Maintenance				

Sl No	Capability Area / ToT	Will the Capability, Technologies and Know-how / Know-why be Transferred (1)	Description of Capability Area (2)	Description of Extent and Depth of ToT (3)	Description of Specific Data, Technologies and Know-how / Know-why Transferred (4)
6.5	Logistics and Supply Chain Management				
6.6	Sustained Engineering				
6.7	Any other suggested by OEM				
7	**TRAINING**				
7.1	Pilot training				
7.2	Maintenance training				
7.3	Training Devices				
7.4	Production Training				
7.5	Aviation Project Management Training				
7.6	Any other suggested by OEM				
8	**TECHNICAL ASSISTANCE**				
8.1	Manufacturing Phase				
8.2	In Service Support				
8.3	Upgradations and Modifications				

Annexure 2
(Para6 refers)

GENERAL GUIDELINES FOR TRANSFER OF TECHNOLOGY

1. **Category –1**. Items, for which complete ToT, i.e., Engineering and Manufacturing documentation to enable the Production Agency carry out fabrication, assembly and test of the item from CKD/IM Kit level as the case maybe, is being provided by the OEM, may be classified under the head "CToT".

2. **Category –2**. Items which are manufactured by the OEM's Subcontractors based on engineering documentation provided by the OEM and these Engineering Documentation are being provided by the OEM to the Production Agency, may also be classified under the head "CToT".

3. **Category –3**.

(a) Items in respect of which development and manufacture by the OEM has been subcontracted to its vendors/ sub-contractors based on only the procurement specifications provided by him and the OEM is not in a position to provide any additional technical information to the Production Agency except the procurement drawings/ specifications provided by him to his vendors/ sub-contractors, may be classified under the head Single Vendor "Subcontract". For the purpose of evaluating the depth of ToT, it will be presumed that the ToT in respect of these items for indigenous manufacture is not provided. OEM shall ensure authorization to its vendors/ sub-contractors to supply items, manufactured against OEM's specifications to the Production Agency against its purchase orders.

(b) However in such case, the OEM in collaboration with his vendor/ subcontractor, is required to provide the Production Agency, maintenance Documentation, the recommended list of spares for repair and overhaul as may be applicable and maintenance training at the vendor's/subcontractor's premises, then such vendor items may be classified under the head 'Limited ToT for maintenance support', i.e, "MToT".

4. **Category – 4**.

(a) Items including catalogue/ standard items sourced by the OEM against his procurement specifications as 'Fully Finished', may be classified as "Bought Out". Evidently ToT for such items for indigenous manufacture will not be available and the OEM will be able to provide only the procurement drawings/ specifications, sources of supply. OEM has to ensure the availability of such items or its equivalents during the life cycle of the product. However, in respect of some of the selected items in this category, if the OEM, in collaboration with his vendor, is able to provide the Production Agency documentation for maintenance, recommended list of spares for repair and overhaul as may be applicable and maintenance training in the vendor's premises, then such items may also be classified under the head 'limited ToT for maintenance support' i.e. "MToT".

(b) OEM shall ensure periodical review of obsolescence, study of the Bill of Items (BOIs) and provide a retrieval scheme for a minimum period of 40 years from the production of last unit under the present proposal.

5. **Category –5**. Some of the items for which the ownership of Design and Manufacturing Documentation is available with the OEM, but the OEM is not willing to transfer the technology to the Production Agency may be classified under the head 'Proprietary' items. The list of such items shall be far and few and generally restricted to components/ processes specifically developed by the OEM for the licensed product. No item in the product structure which is critical either from the technology point of view or from the point of view of significant value addition or which constitutes a significant relative percentage of the product cost (say > 10%), will be acceptable under the head "Proprietary items". Further, at any stage during the life cycle of the Product, if the OEM intends to discontinue the production of Proprietary items, the complete technical documentation in respect of these items available with the OEM or his subcontractors will be passed on to the Production Agency to enable indigenous manufacture or establish alternative routes of meeting the requirement. Also, a base price for such items with an escalation formula for future supplies shall be given for slab quantities by OEM.

LIST OF KEY TECHNOLOGIES

Sl No	Key Technology Domain	Technologies Sought	Will the capability, Technologies &Know-how / Know-why be transferred	Description of Capability Area	Description of extent & depth of ToT	Description of specific data, technologies &Know-how / Know-why transferred
1.	**Airframe**	(a) Manufacturing Technology for Flight Control Servos. (b) Forgings for Airframe Components. (c) Composites Machining/ Cutting/Drilling Techniques. (d) On-site NDT Techniques for Composite Structures. (e) Wind Shield and Canopy forming techniques. (f) RAM coatings & processes. (g) Composite Radomes. (h) Hybrid composite/ metallic structures. (j) Composites machining techniques. (k) Sound absorption - Air System (CAU).				

Sl No	Key Technology Domain	Technologies Sought	Will the capability, Technologies &Know-how / Know-why be transferred	Description of Capability Area	Description of extent & depth of ToT	Description of specific data, technologies &Know-how / Know-why transferred
		(l) Al-Li alloy stretched plates for airframe structural application. (m) Residual stress free high strength Al-alloy near net shape forgings for Airframe bulkheads. (n) Aluminium alloys for high temperature applications (1800C-2500C). (p) High strength Titanium alloy forgings with welding/joining technology. (q) Auxiliary air intake door design. (r) Wing folding technology. (s) Design and materials used in weather proofing of airframe (with repeat of rain water). (t) Design and integration of retractable refuelling probe (u) Metallic tools for co-cured composite parts.				

Sl No	Key Technology Domain	Technologies Sought	Will the capability, Technologies &Know-how / Know-why be transferred	Description of Capability Area	Description of extent & depth of ToT	Description of specific data, technologies &Know-how / Know-why transferred
		(v) Thermoplastic composites usage in aircrafts. (w) Aircraft fuel tank design and leak proof joints design for reliability and maintainability. (x) CBRN protection measures. (y) Battle damage protection measures.				
2.	**Engine**	(a) Single Crystal Blade Manufacturing Process. (b) Blisk (Blade integrated with Disk) machining process. (c) Directionally Solidified (DS) castings technology. (d) FADEC and Sensors Technology. (e) High strength thin walled Aluminium investment castings. (f) Precision Blade Forgings. (g) Linear Friction Welding.				

Sl No	Key Technology Domain	Technologies Sought	Will the capability, Technologies &Know-how / Know-why be transferred	Description of Capability Area	Description of extent & depth of ToT	Description of specific data, technologies &Know-how / Know-why transferred
		(h) Profiled Rolled Rings –Near Net Shape. (i) Electron Beam Physical Vapour Deposit (EBPVD) and Directs Vapour Deposit (DVD) Processes. (j) Multi-axis Shot Peening. (k) Laser Shock Peening process for high stress areas. (l) Design & Manufacture of Wide Chord Fan. (m) Variable Exhaust Nozzle actuation for straight and vectored thrusts application. (n) Variable cycle engine technology				
3.	**Avionics**	(a) Active Electronic Scanned Array (AESA) radar. T/R module fabrication, Gallium Nitride (GaN) technology (b) Large Area/Smart Multi-function Touch Screen Displays.				

Sl No	Key Technology Domain	Technologies Sought	Will the capability, Technologies &Know-how / Know-why be transferred	Description of Capability Area	Description of extent & depth of ToT	Description of specific data, technologies &Know-how / Know-why transferred
		(c)Satellite Communication (SATCOM) – Design and development of multi-band diplexers, algorithms for low bit rate demodulator. (d) Sensors technology and integration of Infra Red Sight and Target (IRST). (e) Technology for design of wide band scanning receivers. (f) COMINT (1MHz-2GHz) and ELINT (0.5 Mhz-26 GHz). (g) Electro-Optic sensors technology and integration. (h) Manufacturing technology for RLG/FOG/MEMS /Solid state Sensors. (j) Automatic Flight Control System (AFCS) – Design process, Sensors, Control laws and Hardware. (k)HUMS/IVHM – sensors technology, integration, data storage and analysis.				

Sl No	Key Technology Domain	Technologies Sought	Will the capability, Technologies &Know-how / Know-why be transferred	Description of Capability Area	Description of extent & depth of ToT	Description of specific data, technologies &Know-how / Know-why transferred
		(l) Technology and Integration of MAWS, EW/ECM sensors and integrated jammers. (m) Technology for manufacture if Inertial Navigation sensors and integration of INS with GPS for hybrid Navigation.				
4.	**Systems and Accessories**	(a) Design & manufacture of Hydraulic Actuators & variable delivery hydraulic pump. (b) Lightening Protection techniques. (c) Filters for EMI/EMC applications. (d) Electrical Servo Actuators Manufacturing technology. (e) Solid State Alternators and brushless generators technology. (f) Self-sealing Fuel tanks – Development of polymer materials, manufacturing of tanks of desired shapes. (g) OBOGS System.				

Sl No	Key Technology Domain	Technologies Sought	Will the capability, Technologies &Know-how / Know-why be transferred	Description of Capability Area	Description of extent & depth of ToT	Description of specific data, technologies &Know-how / Know-why transferred
		(h) Hydraulic System (HS). (i) Design concept of dual pressure & variable flow system and conditions/margins for pressure change over. (ii) Design concept of variable pressure & variable flow system (Localized system/EHA). (iii) Pumps design concept for above mentioned system. (j) Landing Gear System (LGS) (i) Design philosophy. (ii) Design concept of LGS retraction/extension mechanism, which is normally operated by hydraulics and in emergency operated by electrical system. (k) Wheels and Brakes System (BS)				

Sl No	Key Technology Domain	Technologies Sought	Will the capability, Technologies &Know-how / Know-why be transferred	Description of Capability Area	Description of extent & depth of ToT	Description of specific data, technologies &Know-how / Know-why transferred
		(i) Design philosophy (ii) Design concept for Torque based Brake Management System (iii) Design concept of electrically operated brakes system (l) In-Flight Refuelling and Buddy Refuelling Pod. (m) Electrical System technologies such as; lightening protection, filters for EMI/EMC. (n) Instrumentation including Gyro Modules and Accelerometers. (p) Accessory Gear Box including Castings and Forgoing for Manufacture of Casings, Gears etc. Thin walled Mg/Al Alloy castings. (q) Heat Exchangers with Inconel Brazing of cores. (r) Pneumatic System Components.				

Sl No	Key Technology Domain	Technologies Sought	Will the capability, Technologies &Know-how / Know-why be transferred	Description of Capability Area	Description of extent & depth of ToT	Description of specific data, technologies &Know-how / Know-why transferred
		(s) Engine Starting System – APU and ATS/ATM integrated systems. (t) Decoupler Mechanism (remotely operated) for Aircraft Accessory Gearbox. (u) Integrated Emergency Power units (APU & EPU combined). (v) High temperature Valves and associated control systems. (w) Liquid cooling Power pack for RADAR and UEWS.				
5.	**Design & Development**	(a) Technologies for minimising RCS & IR Signatures, special coatings and measurement technologies (i) Top level concepts for low RCS & IRS (ii) High fidelity RCS & IRS software (iii) EM assessment of antennas and aircraft				

Sl No	Key Technology Domain	Technologies Sought	Will the capability, Technologies &Know-how / Know-why be transferred	Description of Capability Area	Description of extent & depth of ToT	Description of specific data, technologies &Know-how / Know-why transferred
		materials (iv) Aircraft design with LO materials – qualification & manufacturing considerations (v) Practical application of RAS in fighter aircraft (vi) Technologies for applying radar absorbing paint /material. (b) Air Intake Design (i) Computational Electro Magnetic (CEM) techniques for RCS (ii)CFD techniques for supersonic buzz and dynamic distortion characteristics (iii) Design of Diverter-less Intakes (iv) Intake shape optimization for low RCS and high performance (v) Flow control strategies for performance and				

Sl No	Key Technology Domain	Technologies Sought	Will the capability, Technologies &Know-how / Know-why be transferred	Description of Capability Area	Description of extent & depth of ToT	Description of specific data, technologies &Know-how / Know-why transferred
		engine compatibility (vi) Aircraft /intake design to minimise foreign object damage (c) Fluidic Flow Control (i) CFD modelling and validation cases (ii) Control surface design using Coanda effect (iii) Thrust vector control application (d) Mission Effectiveness Simulation Tool (i)Establish top level requirements, explore trade-offs and develop strategies (ii) Create performance databases of aircraft, sensors, weapons, communication link etc. (iii) Combat scenario simulation with multiple actors, dynamic behaviour, cooperation & communication				

Sl No	Key Technology Domain	Technologies Sought	Will the capability, Technologies &Know-how / Know-why be transferred	Description of Capability Area	Description of extent & depth of ToT	Description of specific data, technologies &Know-how / Know-why transferred
		(iv) Establish engagement effectiveness criteria (e) Technologies for minimising aural and visual signature. (f) Technologies for self protection suite and flare/chaff manufacturing (g) Specific requirements for carrier Aircraft (i)Establishing top level requirements – approach speed, flight controls, structural loads, man-machine interface etc. (ii) Wing fold technology (iii) Control law design for handling qualities, performance and auto-launch and recovery (iv) Direct Lift Control, auto-throttle & ship data link for landing				
6	Stealth Technologies	(a) Frequency Selective Surface based Radome				

Sl No	Key Technology Domain	Technologies Sought	Will the capability, Technologies &Know-how / Know-why be transferred	Description of Capability Area	Description of extent & depth of ToT	Description of specific data, technologies &Know-how / Know-why transferred
		(b) Low Observable Air Data Probe/Sensors; Flush Air Data Probes (c) Body Conformal Antennae (d) FSS based Low Observable Antennae (e) Optically Transparent Radio Reflecting Coatings/ post coatings for Canopy/ Wind Screen/Other optical windows (f) Infra Red Coating Material (g) Internal Weapon Bay design for • Low Observable • Acoustics • Aerodynamics • Weapons (h) Low Observable Fastener Design, fabrication, integration				

Appendix C
(Refers to Para 5 (l)
of the RFI)

COST ESTIMATES

Sl No	Items	ROM Cost	Remarks
1	Total Cost of Flyaway Aircraft (including launchers, Pylons, Flying Clothing)		
2	Role Equipment		
3	Tools, Testers & Ground Equipment (TTGE)		
4	Spares		
5	Operational Support Equipment & HUMS		
6	Performance Based Logistics (PBL as specified in the RFI)		
7	Simulator and Training Aids (FMS, APTT, CPT etc)		
9	Weapons		
10	Initial training cost for Aircrew, Technicians, Technical and Logistics Officers, QA personnel and Manufacturing agency		
11	Documentation		
12	Simulators And Training Aids Annual Maintenance		
13	Obsolescence Management		
14	Major overhaul of the aircraft		
15	Major overhaul of the engine		
16	Total Cost		