

MANDATORY INFORMATION FOR UPLOADING OF RFI/RFP

Ser	Title	Information
1.	Tender Title	Request for information(RFI) for setting of Naval Aircraft and Ship Instrumentation and Telemetry(NASI)
2.	Tender Reference Number	AO/10003/NASI
3.	Tender Type	Buy
4.	Bid Process	Two Bids
5.	Location	New Delhi
6.	First Announcement	27 Jun 18
7.	Last Date of Document Collection	NA
8.	Last Date of Submission	31 Aug 18
9.	Opening Date	NA
10.	Brief Work Description	IN intends to setup Naval Aircraft and Ship Instrumentation and Telemetry (NASI) Equipment. Instrumentation and telemetry hardware and software setup is an integral part of flight trials and is required for quantitative analysis. The IN requires ship and shore based compatible NASI setup.
11.	Contract address	The Principal Director Naval Air Staff Integrated Headquarters of Ministry of Defence(Navy) Directorate of Naval Air Staff(DNAS) Room No.85, 'A' Block Hutments Dalhousie Road New Delhi 110011,India
12.	Contact Telephone	011-23010592/ 011-23010940
13.	Date of Vendor Interaction	1000 hrs on 27 Jul 18

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Directorate of Naval Air Staff
Integrated Headquarters
Ministry of Defence (Navy)
'A' Block Hutments
New Delhi - 1100011

AO/10003/NASI

Jun 18

**REQUEST FOR INFORMATION (RFI) FOR SETTING OF
NAVAL AIRCRAFT AND SHIP INSTRUMENTATION AND TELEMETRY (NASI)
EQUIPMENT FOR THE INDIAN NAVY**

1. The Ministry of Defence, Government of India, intends to setup Naval Aircraft and Ship Instrumentation and Telemetry (NASI) EQUIPMENT. *Instrumentation and telemetry hardware and software* setup is an integral part of flight trials and is required for quantitative analysis. Trial agencies such as ASTE/ IAF, NFTC/ ADA, CABS have similar setups. However, these setups are primarily oriented towards shore based testing. The *IN* requires to have a ship and shore based compatible NASI setup.

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

(a) **Part I**. This part of RFI incorporates the intended use of NASI and its features that should be met by the vendor(s). Vendor specifications and other requirements as per Defence Procurement Procedure (DPP) 2016 are discussed in this part.

(b) **Part II**. The second part of the RFI states the methodology of seeking response of vendors / vendors. Submission of incomplete response format will render the vendors / vendors liable for rejection.

Part - I

3. **Explanation of Terms.** Following terminology would be used in the documents: -

(a) **Home Location (HL).** Naval Flight Test Squadron (NFTS), INAS 552, Goa would be the home location (HL) for all trials. This is the location where all resources are required to be created and primarily utilised.

(b) **Trial Location (TL).** Places where the trials are planned to be conducted are the trial location (TL). The TL could be any Naval, Army, Air Force, DRDO base, location of a defence PSU or as designated by the Indian Navy. Ships of the Indian Navy could also be nominated as TL.

4. **Ship Instrumentation and Telemetry (NASI).** NASI facilitates generation of data during ground and flight trial. NASI consists of instrumentation and telemetry setup on ground, ship and aircraft. With data gathered by NASI, quantitative assessments are performed.

5. **Composition of NASI.** NASI consists of following five modules:-

(a) **Fixed Wing and Carrier Suitability Trial Module.** This module will cover all fixed wing trials as well trials related to aircraft carrier compatibility. This module will cater for fighter as well as MR aircraft towards their ground and flight trials. During carrier compatibility trial of fight aircraft, high sink rate landings, ski jumps and arrested recoveries under various configurations would be performed which necessitate instrumentation of ship's equipments such as arresting gear, restraining gear, deck for motion and navigational parameters etc. Further, the aircraft is required to be instrumented for generation of stability, performance parameters. Details of parameters to be captured are placed at Appendix 'A' and 'B'. Accordingly, aircraft carrier equipment and one fixed wing aircraft are required to be instrumented and have telemetric capability. Details for utilization of this module is enumerated below:-

(i) **Platforms for Instrumentation and Telemetry.** Instrumentation and telemetry with real time data storage and indication needs to be incorporated on following platforms with capability to display own as well as telemetered data:-

(aa) **Aircraft.** Instrumentation consisting of integration of sensors, data acquisition system, displays with customised

monitoring for parameters, event marking provision needs to be incorporated on a nominated fixed wing aircraft. List of parameters which are required to be monitored is placed at Appendix 'A'. Each of these parameters are required to be telemetered to the ship. Parameters telemetered from the ship are required to be cross displayed on the aircraft in user configurable format.

(ab) Aircraft Carrier. Instrumentation of equipment of aircraft carrier consisting of integration of sensors, data acquisition system, displays with customised monitoring for parameters, event marking provision needs to be carried out. These equipment would be required to be portable for usage on either of aircraft carriers as well as usage as ground station. The telemetry equipment are required to relay information on real time basis to aircraft along with GPS information. List of parameters which are required to be monitored is placed at Appendix 'B'. Each of these parameters are required to be telemetered to the aircraft. Parameters telemetered from the aircraft are required to be cross displayed on the console in user configurable format.

(ii) Types of Trials. Instrumentation and Telemetry requirements for this module consist of following types of trials:-

Ser	Trial
(aa)	Stability Trial ¹
(ab)	Performance Trial ²
(ac)	Structural Integrity Evaluation ³
(ad)	Store Integration and Separation ⁴
(ae)	Avionics Evaluation ⁵
(af)	Parametric Identification Trials ⁶
(ag)	Miscellaneous Trials ⁷

¹ Stability trial is undertaken to ascertain that modifications to aircraft has not significantly altered stability of the aircraft.

² Performance evaluation is performed to bring out effect of modification on performance of aircraft w.r.t. Range, Endurance, Cruise, Take off, landing, hover (for helicopters), Climb and Descent.

³ Structural integrity assessment is to ascertain that modification has not caused adverse effect on structural soundness of the aircraft. This caters for limit load, flutter and fatigue testing.

⁴ Store integration trials are done to quantify safe adaptation, carriage, release, separation and accuracy of weapon from an aircraft.

⁵ Avionics trials cater for performance of avionics for the intended role of the system.

⁶ Parametric Identifications trials are done to determine aero-derivatives of the aircraft.

⁷ These trials involve usage of external camera pod for various trials like store release/ tyre trials etc.

(b) **Helicopter and SHOL Trials Module.** This module will cover all RW trials including Ship's Helicopter Operating Limits (SHOL) trials towards assessing the compatibility of helicopter with the ship. Details for utilisation of this module is enumerated below:-

(i) Platforms for Instrumentation and Telemetry. Instrumentation and telemetry with real time data storage and indication needs to be incorporated on following platforms:-

(aa) Helicopter. The scope of work involves integration of sensors, data acquisition system, telemetric equipment, displays (for monitoring for parameters) and event marker on the nominated helicopter. List of parameters which are required to be monitored is placed at Appendix 'C'. Each of these parameters are required to be telemetered to the ship as well as mobile telemtry. Parameters telemetered from the ship and mobile telemtry are required to be cross displayed on the aircraft in user configurable format.

(ab) Mobile Telemetry Platform. A mobile telemetry is required to be utilised towards real time data interpretation such as structural integrity, store separation, Pressure Error Correction (PEC) exercises and parametric identification trials. Many trials are undertaken at displaced locations owing to hot and cold weather trials, trials at EW range, armament ranges etc. Accordingly, there should be telemetry equipment installed on mobile platform for conduct of trials at displaced location (mobile platform should form part of the contract). The mobile telemetry should be capable of relaying parameters listed at Appendix 'D'. Each of these parameters are required to be telemetered to the ship as well as aircraft. Parameters telemetered from the ship and aircraft are required to be cross displayed on the mobile telemetry in user configurable format.

(ac) Ship. Instrumentation and telemetric equipment are required to be installed on ships to undertake SHOL trials. These equipment should be portable to be used on various ships. List of parameters which are required to be monitored is placed at Appendix 'E'. Each of these parameters are required to be telemetered to the aircraft as well as mobile telemtry. Parameters

telemetered from the aircraft and mobile telemetry are required to be cross displayed on the aircraft in user configurable format.

(ii) **Types of Trials.** Instrumentation and Telemetry requirements for this module consist of following types of trials:-

Ser	Trial
(aa)	SHOL Trials ⁸
(ab)	Stability Trial
(ac)	Performance Trial
(ad)	Structural Integrity Evaluation
(ae)	Store Integration and Separation
(af)	Avionics Evaluation
(ag)	Parametric Identification Trials
(ah)	Miscellaneous Trials

(c) **Data Handling Module.** Flight testing would generate immense amount of data. This module would be required to efficiently manage this data with prediction capability.

(d) **Aircraft Weighing Module.** Weighing of the aircraft is performed to determine the CG in all three (03) axes and weight. As handling qualities / performance are affected by weight and CG of the aircraft, weighing prior and post modification is a pre-requisite for handling qualities assessment. The vendor would be required to level a portion of 50 m patch at tarmac and provision minimum five (05) load cells to setup weighing provision at HL as per guidance by the Indian Navy.

(e) **Operation and Maintenance Module.** Operation, Maintenance and Warranty Support for all 4 modules above are required for duration of three (03) years w.e.f. supply of parts. The scope of work involves following:-

- (i) Preparation of instrumentation scheme for ship and aircraft instrumentation.
- (ii) Obtaining approval from certification agency.
- (iii) Undertaking modification of aircraft / ship.
- (iv) Configuring display console as per trial schedule and activating cognitive guidance.
- (v) Download recorded data.

⁸ SHOL trial is undertaken to define operating envelope of a helicopter variant over ship.

- (vi) Process downloaded data to engineering values.
- (vii) Carryout data reduction for suitable for analysis under guidance of trial team.
- (viii) Undertake data analysis for prediction and generate report.
- (ix) Telemetered data must be displayed in specified format.
- (x) The vendor should meet all requirements as brought out in preceding paragraphs. In addition, following conditions should be fulfilled by the vendor: -
 - (aa) The vendor should have a minimum 10 years of experience on Aircraft/Aerospace Instrumentation and telemetry.
 - (ab) Should have delivered Aviation Grade Instrumentation and telemetry products for last 20 years.
 - (ac) The vendor should be willing to share its balance sheet / yearly financial audit reports / turnover to ascertain its capacity to undertake the project.
 - (ad) The vendor should have a minimum strength of 50 engineers with relevant field experience in instrumentation / telemetry.
 - (ae) The vendor should be the OEM of Data Acquisition Unit.

Part II

6. **Procedure for Response.** The Vendor(s) fulfilling the criteria of Part I are required to respond to the parametric query as placed in Appendix 'F' along with their details as sought in Appendix 'G' and compliance matrix for Part I. Additional information on the product and product support facilities can be also furnished by the vendor(s).

7. **Vendor interaction.** Vendor interaction prior submission of responses will be held at 'A' Block conference room, 'A' Block Hutments, Dara Sukoh Road, New Delhi-110011 on 27 Jul 18.

8 **Address for Response.** The filled form and the response (hard and soft copies) should be dispatched to the under mentioned address:-

The Principal Director
Directorate of Naval Air Staff
IHQ MoD (Navy)
'A' Block Hutments
Dara Shukoh Road
New Delhi 110011

Fax: 011-23010351

Contact Details: JDNAS 011- 23010592

9 **Time for Response.** Last date of receipt of response is **31 Aug 18.**

10 The Government of India invites responses to this RFI only from those vendors who meet the criteria mentioned at Para 5. Reply to this RFI (and further communication on the case, including equipment description, training and documentation) are to be made in English Language only. Response to the RFI is to be provided in hard and soft copy. The compliance tables to all aspects are required to be provided in editable form (preferably word format). The questionnaire is placed at **Appendix 'F'**.

11 This RFI 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.

Appendix 'A'

HARDWARE (SENSORS) REQUIRED FOR PARAMETERS TO BE CAPTURED USING INSTRUMENTATION AND TELEMETRY ON FIXED WING AIRCRAFT

Ser	Data	Limits	Unit	Least Count	Sampling rate (Hz)	Stand Alone (S) / Tapped (T)	No of Sensors per Aircraft
1.	Video	Up to 10 MP	MP	-	1000	T	2
2.	Roll	-180-0-+180	Deg	0.1	1000	S	1
3.	Pitch	-90-0-+90	Deg	0.1	1000	S	1
4.	Yaw / Hdg	0-360	Deg	0.1	1000	S	1
5.	Linear acceleration along longitudinal axis (Nx)	3	G	0.1	1000	S	1
6.	Linear acceleration along lateral axis (Ny)	3	G	0.1	1000	S	1
7.	Linear acceleration along normal axis (Nz)	10	G	0.1	1000	S	1

<u>Ser</u>	<u>Data</u>	<u>Limits</u>	<u>Unit</u>	<u>Least Count</u>	<u>Sampling rate (Hz)</u>	<u>Stand Alone (S) / Tapped (T)</u>	<u>No of Sensors per Aircraft</u>
8.	Angular acceleration around longitudinal axis ω_x	-30-0-+30	Deg/s	0.1	1000	S	1
9.	Angular acceleration around lateral axis (ω_y)	-60-0-+60	Deg/s	0.1	1000	S	1
10.	Angular acceleration around normal axis (ω_z)	-10-0-+10	Deg/s	0.1	1000	S	1
11.	D ζ m (Displacement in Longitudinal) /D ζ e (Elevator displacement)	-30-0-+30	Deg	0.1	30	S	1
12.	D ζ n (Rudder displacement)	-30-0-+30	Deg	0.1	30	S	1

<u>Ser</u>	<u>Data</u>	<u>Limits</u>	<u>Unit</u>	<u>Least Count</u>	<u>Sampling rate (Hz)</u>	<u>Stand Alone (S) / Tapped (T)</u>	<u>No of Sensors per Aircraft</u>
13.	D _{zl} (Displacement in lateral) /D _{za} (Aileron displacement)	-30-0-+30	Deg	0.1	30	S	1
14.	D _{zt} (Displacement of throttle)	-5-0-+30	Deg	0.1	30	S	1
15.	Fuel Flow Rate per Engine q(FFR)	As Applicable	Ltr/Hrs	As Applicable	30	T	2
16.			Kgs/hrs				
17.			Lb/Hrs				
18.	Q (Torque per engine)	As Applicable	N-M	As Applicable	1000	S / T	2
19.	DGPS Time	As Applicable	S	As Applicable	1000	S	1
20.	DGPS Lat / Long	As Applicable	N/E	As Applicable	1000	S	1
21.	DGPS GS	As Applicable	Kt	As Applicable	1000	S	1

<u>Ser</u>	<u>Data</u>	<u>Limits</u>	<u>Unit</u>	<u>Least Count</u>	<u>Sampling rate (Hz)</u>	<u>Stand Alone (S) / Tapped (T)</u>	<u>No of Sensors per Aircraft</u>
22.	DGPS Track	As Applicable	Deg	As Applicable	1000	S	1
23.	TGT for each engine	As Applicable	deg C	As Applicable	30	T	2
24.	Engine RPM for each engine (N_g)	As Applicable	Rpm	As Applicable	30	T	2
25.	Fuel Q_T	As Applicable	Kgs/Ltr	As Applicable	10	T	1
26.	OAT	As Applicable	Deg C	As Applicable	10	T	1
27.	Radio Altimeter Z_{RA}	As Applicable	Ft	As Applicable	10	T	1
28.	Pressure Altitude Z_P	As Applicable	Ft	As Applicable	10	T	1
29.	Control Force Longitudinal Axis F_M in	-80-0-+80	DaN	0.1	30	S	1

<u>Ser</u>	<u>Data</u>	<u>Limits</u>	<u>Unit</u>	<u>Least Count</u>	<u>Sampling rate (Hz)</u>	<u>Stand Alone (S) / Tapped (T)</u>	<u>No of Sensors per Aircraft</u>
30.	Control Force in Lateral Axis F_L	-40-0-+40	DaN	0.1	30	S	1
31.	Rudder Control Force F_N	-80-0-+80	DaN	0.1	30	S	1
32.	Audio	50Hz-15KHz	As Applicable	As Applicable	As applicable (AA)	S	1
33.	Angle of attack	As Applicable	Deg	As Applicable	1000	S	1
34.	Side Slip angle	As Applicable	Deg	As Applicable	1000	S	1
35.	Tri axial accelerometer data for flutter analysis	As Applicable	G	As Applicable	1000	S	10
36.	Temperature compensated Strain gauges values for structural integrity tests *(Capability to measure force / stress / strain on arrester hook and under carriage system must	As Applicable	micro strains	As Applicable	1000	S	50

<u>Ser</u>	<u>Data</u>	<u>Limits</u>	<u>Unit</u>	<u>Least Count</u>	<u>Sampling rate (Hz)</u>	<u>Stand Alone (S) / Tapped (T)</u>	<u>No of Sensors per Aircraft</u>
	be provided						
37.	Total temperature	As Applicable	Deg C	As Applicable	10	S	1
38.	Absolute and differential pressures	As Applicable	P	As Applicable	30	S	1
39.	Externally mounted High-speed camera	As Applicable	Video	As Applicable	1000	S	1
40.	Cockpit mounted High speed camera displays	As Applicable	Video	As Applicable	1000	S	1
41.	Externally mounted High-speed IR camera	As Applicable	Video	As Applicable	1000	S	1

<u>Ser</u>	<u>Data</u>	<u>Limits</u>	<u>Unit</u>	<u>Least Count</u>	<u>Sampling rate (Hz)</u>	<u>Stand Alone (S) / Tapped (T)</u>	<u>No of Sensors per Aircraft</u>
42.	Mil bus data	As Applicable	As Applicable	As Applicable	As Applicable	T	1
43.	ARINC bus data	As Applicable	As Applicable	As Applicable	As Applicable	T	1
44.	Wind True(Speed/Dir)	As Applicable	Kt/Deg	0.1/0.1	30	S	1
45.	Oleo displacement	As Applicable	ft	0.01	1000	S	3

Appendix 'B'**HARDWARE (SENSORS) REQUIRED FOR PARAMETERS TO BE CAPTURED USING INSTRUMENTATION ON SHIP**

Ser	Data	Limits	Unit	Least Count	Sampling rate (Hz)	Stand Alone (S) / Tapped (T)	No of Sensors per Ship
1.	Video	Up to 10 MP	MP	-	1000	S	1
2.	Roll	-40-0-+40	Deg	0.1	1000	S	1
3.	Pitch	-30-0-+30	Deg	0.1	1000	S	1
4.	Roll rate	Up to 30 deg / sec	Deg / sec	0.1	1000	S	1
5.	Pitch rate	Up to 30 deg / sec	Deg / sec	0.1	1000	S	1
6.	Yaw rate	Up to 30 deg / sec	Deg / sec	0.1	1000	S	1
7.	HDG	0-360	Deg	0.1	1000	S	1
8.	Heave	-6-0-+6	Mp	0.1	1000	S	1
9.	Heel	-10-0-+10	Deg	0.1	1000	S	1
10.	List	-10-0-+10	Deg	0.1	1000	S	1
11.	DGPS Time	As Applicable	S	As Applicable	1000	S	1
12.	DGPS Lat/Long	As Applicable	N/E	As Applicable	1000	S	1

<u>Ser</u>	<u>Data</u>	<u>Limits</u>	<u>Unit</u>	<u>Least Count</u>	<u>Sampling rate (Hz)</u>	<u>Stand Alone (S) / Tapped (T)</u>	<u>No of Sensors per Ship</u>
13.	DGPS GS	As Applicable	Kt	As Applicable	1000	S	1
14.	DGPS Track	As Applicable	Deg	As Applicable	1000	S	1
15.	Wind True(Speed/Dir)	As Applicable	Kt/Deg	0.1/0.1	30	S	1
16.	Wind Relative(Speed/Dir)	As Applicable	Kt/Deg	0.1/0.1	30	S	1
17.	Density Altitude	As Applicable	Ft	As Applicable	30	S	1
18.	OAT	As Applicable	Deg C	As Applicable	10	T	1
19.	Audio	50Hz-15KHz	As Applicable	As Applicable	As applicable (AA)	S	2
20.	Arresting Gear instrumentation for pressure recording	As Applicable	Pa	0.01	1000	S	6
21.	Arresting Gear instrumentation for cylinder displacement	As Applicable	ft	0.01	1000	S	6

<u>Ser</u>	<u>Data</u>	<u>Limits</u>	<u>Unit</u>	<u>Least Count</u>	<u>Sampling rate (Hz)</u>	<u>Stand Alone (S) / Tapped (T)</u>	<u>No of Sensors per Ship</u>
	recording						
22.	Arresting wire instrumentation for wire pull out / Displacement recording	As Applicable	ft	0.01	1000	S	3
23.	Arresting wire strain measurement (towards computation of wire loads)	As Applicable	Micro strains	1	1000	S	6
24.	Arresting wire strain measurement at mounting bolts (towards computation of bolt loads)	As Applicable	Micro strains	1	1000	S	6
25.	RGS instrumentation for pressure recording	As Applicable	Pa	0.01	1000	S	6
26.	RGS instrumentation for cylinder displacement recording	As Applicable	ft	0.01	1000	S	6
27.	Status of engines, stabilisers, ship's displacement, ship's trim (as text msg from a						1

<u>Ser</u>	<u>Data</u>	<u>Limits</u>	<u>Unit</u>	<u>Least Count</u>	<u>Sampling rate (Hz)</u>	<u>Stand Alone (S) / Tapped (T)</u>	<u>No of Sensors per Ship</u>
	console on ship to be displayed in aircraft)						

HARDWARE (SENSORS) REQUIRED FOR PARAMETERS TO BE CAPTURED USING INSTRUMENTATION ON HELICOPTER

<u>Ser</u>	<u>Data</u>	<u>Limits</u>	<u>Unit</u>	<u>Least Count</u>	<u>Sampling rate (Hz)</u>	<u>Stand Alone (S) / Tapped (T)</u>	<u>No of Sensors</u>
1.	Video	Up to 10 MP	MP	-	1000	T	2
2.	Roll	-180-0-+180	Deg	0.1	1000	S	1
3.	Pitch	-90-0-+90	Deg	0.1	1000	S	1
4.	Yaw / Hdg	0-360	Deg	0.1	1000	S	1
5.	Linear acceleration along longitudinal axis (Nx)	3	G	0.1	1000	S	1
6.	Linear acceleration along lateral axis (Ny)	3	G	0.1	1000	S	1
7.	Linear acceleration along normal axis (Nz)	10	G	0.1	1000	S	1

<u>Ser</u>	<u>Data</u>	<u>Limits</u>	<u>Unit</u>	<u>Least Count</u>	<u>Sampling rate (Hz)</u>	<u>Stand Alone (S) / Tapped (T)</u>	<u>No of Sensors</u>
8.	Angular acceleration around longitudinal axis ω_x	-30-0-+30	Deg/s	0.1	1000	S	1
9.	Angular acceleration around lateral axis (ω_y)	-60-0-+60	Deg/s	0.1	1000	S	1
10.	Angular acceleration around normal axis (ω_z)	-10-0-+10	Deg/s	0.1	1000	S	1
11.	D ζ m (Displacement in Longitudinal)	-30-0-+30	Deg	0.1	30	S	1
12.	D ζ n (Rudder displacement)	-30-0-+30	Deg	0.1	30	S	1

<u>Ser</u>	<u>Data</u>	<u>Limits</u>	<u>Unit</u>	<u>Least Count</u>	<u>Sampling rate (Hz)</u>	<u>Stand Alone (S) / Tapped (T)</u>	<u>No of Sensors</u>
13.	D _{3l} (Displacement in lateral)	-30-0-+30	Deg	0.1	30	S	1
14.	D _{3q} (Collective displacement)	-5-0-+30	Deg	0.1	30	S	1
15.	Fuel Flow Rate per Engine q(FFR)	As Applicable	Ltr/Hrs	As Applicable	30	T	2
16.			Kgs/hrs				
17.			Lb/Hrs				
18.	Q (Torque per engine)	As Applicable	N-M	As Applicable	1000	S / T	2
19.	DGPS Time	As Applicable	S	As Applicable	1000	S	1
20.	DGPS Lat / Long	As Applicable	N/E	As Applicable	1000	S	1
21.	DGPS GS	As Applicable	Kt	As Applicable	1000	S	1

<u>Ser</u>	<u>Data</u>	<u>Limits</u>	<u>Unit</u>	<u>Least Count</u>	<u>Sampling rate (Hz)</u>	<u>Stand Alone (S) / Tapped (T)</u>	<u>No of Sensors</u>
22.	DGPS Track	As Applicable	Deg	As Applicable	1000	S	1
23.	Rotor RPM (N_R)	As Applicable	Rpm	As Applicable	30	T	1
24.	TGT for each engine	As Applicable	deg C	As Applicable	30	T	2
25.	Engine RPM for each engine (N_g)	As Applicable	Rpm	As Applicable	30	T	2
26.	Fuel Q_T	As Applicable	Kgs/Ltr	As Applicable	10	T	1
27.	OAT	As Applicable	Deg C	As Applicable	10	T	1
28.	Radio Altimeter Z_{RA}	As Applicable	Ft	As Applicable	10	T	1
29.	Pressure Altitude Z_P	As Applicable	Ft	As Applicable	10	T	1

<u>Ser</u>	<u>Data</u>	<u>Limits</u>	<u>Unit</u>	<u>Least Count</u>	<u>Sampling rate (Hz)</u>	<u>Stand Alone (S) / Tapped (T)</u>	<u>No of Sensors</u>
30.	Control Force in Longitudinal Axis F_M	-80-0-+80	DaN	0.1	30	S	1
31.	Control Force in Lateral Axis F_L	-40-0-+40	DaN	0.1	30	S	1
32.	Rudder Control Force F_N	-80-0-+80	DaN	0.1	30	S	1
33.	Audio	50Hz-15KHz	As Applicable	As Applicable	As applicable (AA)	S	1
34.	Angle of attack	As Applicable	Deg	As Applicable	1000	S	1
35.	Side Slip angle	As Applicable	Deg	As Applicable	1000	S	1
36.	Tri axial accelerometer data for flutter analysis	As Applicable	G	As Applicable	1000	S	10

<u>Ser</u>	<u>Data</u>	<u>Limits</u>	<u>Unit</u>	<u>Least Count</u>	<u>Sampling rate (Hz)</u>	<u>Stand Alone (S) / Tapped (T)</u>	<u>No of Sensors</u>
37.	Temperature compensated Strain gauges values for structural integrity tests for various locations	As Applicable	micro strains	As Applicable	1000	S	50
38.	Total temperature	As Applicable	Deg C	As Applicable	10	S	1
39.	Absolute and differential pressures	As Applicable	P	As Applicable	30	S	1
40.	Externally mounted High-speed camera	As Applicable	Video	As Applicable	1000	S	1
41.	Cockpit mounted High speed camera displays	As Applicable	Video	As Applicable	1000	S	1
42.	Externally mounted High-speed IR camera	As Applicable	Video	As Applicable	1000	S	1

<u>Ser</u>	<u>Data</u>	<u>Limits</u>	<u>Unit</u>	<u>Least Count</u>	<u>Sampling rate (Hz)</u>	<u>Stand Alone (S) / Tapped (T)</u>	<u>No of Sensors</u>
43.	Mil bus data	As Applicable	As Applicable	As Applicable	As Applicable	T	1
44.	ARINC bus data	As Applicable	As Applicable	As Applicable	As Applicable	T	1
45.	Wind True(Speed/Dir)	As Applicable	Kt/Deg	0.1/0.1	30	S	1
46.	Oleo displacement	As Applicable	ft	0.01	1000	S	3

Appendix 'D'**HARDWARE (SENSORS) REQUIRED FOR PARAMETERS TO BE CAPTURED USING INSTRUMENTATION ON
MOBILE TELEMTRY**

<u>Ser</u>	<u>Data</u>	<u>Limits</u>	<u>Unit</u>	<u>Least Count</u>	<u>Sampling rate (Hz)</u>	<u>Stand Alone (S) / Tapped (T)</u>	<u>No of Sensors per mobile telemetry</u>
1.	DGPS Time	As Applicable	S	As Applicable	>10	S	1
2.	DGPS Lat/Long	As Applicable	N/E	As Applicable	>10	S	1
3.	DGPS GS	As Applicable	Kt	As Applicable	>10	S	1
4.	DGPS Track	As Applicable	Deg	As Applicable	>10	S	1
5.	Wind True(Speed/Dir)	As Applicable	Kt/Deg	0.1/0.1	>2	S	1
6.	Wind Relative(Speed/Dir)	As Applicable	Kt/Deg	0.1/0.1	>2	S	1
7.	Density Altitude	As Applicable	Ft	As Applicable	>1	S	1

<u>Ser</u>	<u>Data</u>	<u>Limits</u>	<u>Unit</u>	<u>Least Count</u>	<u>Sampling rate (Hz)</u>	<u>Stand Alone (S) / Tapped (T)</u>	<u>No of Sensors per mobile telemetry</u>
8.	Pressure Altitude	As Applicable	Ft	As Applicable	>1	S	1
9.	OAT	As Applicable	Deg C	As Applicable	>1	T	1
10.	Video (the video camera must be able to capture / track the aircraft when in visual range)	Up to 10 MP	MP	-	30	T	1
11.	Pressure Error Correction (PEC) trials equipments encompassing :- (a) Provision of TV tracking system (b) Precision barometer (c) Thermometer (d) Laser based vehicle position and speed / direction measurement equipment (e) High Speed Camera	As per COTS					1 each

<u>Ser</u>	<u>Data</u>	<u>Limits</u>	<u>Unit</u>	<u>Least Count</u>	<u>Sampling rate (Hz)</u>	<u>Stand Alone (S) / Tapped (T)</u>	<u>No of Sensors per mobile telemetry</u>
12.	<p>Analysys provision and facilities :-</p> <p>(a) Work bench (b) Oscilloscope (c) Spectrum Analyser (d) Provision for two-way audio and video interface with aircraft (e) Associated monitoring consoles for minimum three receivers</p>			As per COTS			1 each

Appendix 'E'

HARDWARE (SENSORS) REQUIRED FOR PARAMETERS TO BE CAPTURED USING INSTRUMENTATION ON SHIP

Ser	Data	Limits	Unit	Least Count	Sampling rate (Hz)	Stand Alone (S) / Tapped (T)	No of Sensors per Ship
1.	Video	Up to 10 MP	MP	-	1000	S	1
2.	Roll	-40-0-+40	Deg	0.1	1000	S	1
3.	Pitch	-30-0-+30	Deg	0.1	1000	S	1
4.	Roll rate	Up to 30 deg / sec	Deg / sec	0.1	1000	S	1
5.	Pitch rate	Up to 30 deg / sec	Deg / sec	0.1	1000	S	1
6.	Yaw rate	Up to 30 deg / sec	Deg / sec	0.1	1000	S	1
7.	HDG	0-360	Deg	0.1	1000	S	1
8.	Heave	-6-0-+6	Mp	0.1	1000	S	1
9.	Heel	-10-0-+10	Deg	0.1	1000	S	1
10.	List	-10-0-+10	Deg	0.1	1000	S	1
11.	DGPS Time	As Applicable	S	As Applicable	1000	S	1
12.	DGPS Lat/Long	As Applicable	N/E	As Applicable	1000	S	1

<u>Ser</u>	<u>Data</u>	<u>Limits</u>	<u>Unit</u>	<u>Least Count</u>	<u>Sampling rate (Hz)</u>	<u>Stand Alone (S) / Tapped (T)</u>	<u>No of Sensors per Ship</u>
13.	DGPS GS	As Applicable	Kt	As Applicable	1000	S	1
14.	DGPS Track	As Applicable	Deg	As Applicable	1000	S	1
15.	Wind True(Speed/Dir)	As Applicable	Kt/Deg	0.1/0.1	30	S	1
16.	Wind Relative(Speed/Dir)	As Applicable	Kt/Deg	0.1/0.1	30	S	1
17.	Density Altitude	As Applicable	Ft	As Applicable	30	S	1
18.	OAT	As Applicable	Deg C	As Applicable	10	T	1
19.	Audio	50Hz-15KHz	As Applicable	As Applicable	As applicable (AA)	S	2
20.	Status of engines, stabilisers, ship's displacement, ship's trim (as text msg from a console on ship to be displayed in aircraft)						1

**QUESTIONNAIRE FOR DETAILS IN RESPECT OF
NAVAL AIRCRAFT SYSTEM INSTRUMENTATION AND TELEMETRY (NASI)**

Ser	Information Required	Data / information to be provided by Vendor
	<u>Vendor Qualification</u>	
1.	The vendor is to indicate details of Instrumentation and telemetry tasks undertaken so far. The vendor is to specify details of data captured and analysed for instrumentation tasks undertaken.	
2.	What kind of trials has the firm been involved with its instrumentation and telemetry facilities?	
3.	Has the firm been involved in preparation of instrumentation and telemetry scheme? Quote the requirements in generation of instrumentation scheme.	
4.	Has the firm been associated with CEMILAC for approval of instrumentation scheme? Quote the tasks involved.	
5.	Is the vendor an OEM of Data Acquisition Unit?	
6.	What Indigenization Content IC is considered implementable?	
7.	Foreign vendor to indicate the percentage of ToT willing to execute with his Indian partner over make portion of contract.	
8.	What is the experience of the firm on manufacture/supply/ integration of Data Acquisition System, displays with customised monitoring for parameters and event marking provision.	
	<u>Instrumentation and Telemetry.</u>	
9.	Elaborate activities envisaged on aircraft , ships and ground station for setting up of NASI to meet instrumentation and telemetry requirements.	
10.	What tools and test equipments would be required as part of instrumentation and telemetry.	
11.	Vendor to list down infrastructure augmentation at HL and TL for setting up of NASI.	
12.	Would the vendor be willing to provide compatible interfaces for installation of sensors and equipment for all ships and aircraft platforms.	

13.	Would the vendor ensure that all equipment used are military grade?	
	Parameters.	
14.	Vendor to assess adequacy of parameters listed at Appendices A to E and bring out additions if any.	
15.	The vendor is to submit technical specification of sensors and equipment to fulfill the testing requirements.	
16.	The vendor is to indicate the military specification compliance / air worthiness compliance standards of the equipment needed.	
17.	The vendor to provide a proposed instrumentation scheme / layout using all sensors and equipment.	
18.	MTBF and MTTR of each equipment and sensors to be indicated.	
	Mobile Telemetry Platform.	
19.	What all features would be provided on mobile telemetry to facilitate Pressure Error Correction ⁹ Trials.	
20.	Which all equipment would be integrated in Mobile telemetry to meet flight testing requirements as described at para 5 (b) (i) (ab).	
21.	What audio and video interface would be provided in mobile telemetry?	
22.	How many monitoring consoles would be provided in mobile telemetry?	
23.	List out specifications for environmental control and power supply requirements in mobile telemetry.	
24.	What would be the specifications of rugged vehicle (in terms of tonnage, speed, etc) which could facilitate mobile telemetry requirements?	
	Data Handling Module.	
25.	Which all feature would be provided in Data Handling Module to achieve prediction capability? What data analytics capability would be undertaken in data handling module?	
26.	What would be the data storage capacity to cater for 3 years of operation assuming 10 trials per month?	
27.	Real time processing capability needed for structural	

⁹ Pressure Error Correction (PEC) evaluation is undertaken to calibrate pressure instruments. This trial is needed to be performed when the airflow around the Pitot-Static probes are likely to get altered due to any change in external configuration.

	testing. What features can be provided in Data Handling Module for the same?	
28.	Which data simulation facility would be provided for such data handling? _	
	Aircraft Weighing Module.	
29.	Is there a provision for automatic calculation of vertical, lateral and longitudinal center of gravity?	
30.	What is the realistic life cycle for aircraft weighing module.	
31.	The vendor would be required to undertake leveling of the tarmac to install weighing provision. Would the vendor be willing to undertake the task?	
32.	Vendor is required to list down scope of work and components of aircraft weighing module.	
	Operation and Maintenance Module.	
33.	What are the tasks involved in meeting scope of work listed for operation and maintenance module as enumerated in Para 5 (e)?	
34.	What kind of specialization is desired to meet the above scope of work?	
35.	How many specialist with what experience and qualification would be suitable for the onsite operational support?	
36.	What timelines are envisaged for each of the listed scope of work?	
37.	Would the vendor be willing to provide door to door spare support?	
38.	What tools, test equipments are required for operational and maintenance support?	
39.	Would the vendor be willing to provide onsite support of minimum six crew for operational and maintenance support?	
40.	Would the vendor be able to ensure continuity in manpower?	
41.	What are the equipment/ tools and facilities needed towards op and maintenance support?	
	Financial Aspects.	
42.	The vendor is to provide indicative cost for setting up of NASI for each modules mentioned and any other setup required to fulfill the envisaged role.	
43.	Breakdown of cost (separate for Indian and imported components) is to be indicated.	

44.	The vendor should undertake installation and commissioning of all equipment including associated labs, setting up and facilities within three (03) months of signing of contract. The vendor(s) is required to indicate the feasibility of undertaking the same with cost.	
	<u>Documentation.</u>	
45.	The vendor is required to provide detailed documentation of all the equipment provided towards Project NASI in hard and soft copy. Would the vendor be willing to do the same?	
46.	The vendor is to indicate details of documentation that are required to be sought as part of setting up of NASI.	
	<u>On Job Training.</u>	
47.	During the course of setting up of NASI and rendering operational and maintenance support, the vendor would be required to impart on job training to naval technical crew on the entire NASI set up. Would the vendor be willing to undertake on job training?	
48.	What is the scope of training envisaged?	
	<u>Additional Details.</u>	
49.	The vendors may include any other additional details, as deemed appropriate, to elaborate the proposal.	
50.	Vendor should confirm if following conditions would be acceptable:- (a) The solicitation of offers will be as per 'Single Stage – Two Bid System'. It would imply that a 'Request for Proposal (RFP)' would be issued soliciting technical and commercial offers together, but in two separate sealed envelopes. The validity of commercial offers should be at least 18 months from the date of submission of offers. (b) The technical offers would be evaluated to check its compliance with RFP. (c) Vendors qualifying the technical requirements for the RFP would be shortlisted for evaluation of commercial offers. (d) Vendors once found suitable would be shortlisted. A Contract Negotiation Committee (CNC) would decide the lowest cost bidder (L1)	

	and conclude the appropriate contract.	
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INFORMATION PROFORMA**1. Name, Address and Unique ID (if any) of the Vendor /Company /Vendor.**

_____ (Company profile, in brief, to be attached. In the eventuality of the vendor emerging as L1, contract will be concluded in the name and address of the vendor, as indicated here). Vendors are to submit an undertaking that any subsequent proposal for change in name of vendor or address, will be intimated to IHQ MoD (Navy) at the first available opportunity and supporting documents be furnished within five working days of approval by relevant competent authority.

2. Type (Tick the relevant category).

Vendor manufacturing Telemetric and Instrumentation System (OEM) **Yes/No**
 Government sponsored Export Agency **Yes/No** (Details of registration to be provided)
 Authorised Vendor of Vendor manufacturing Telemetric and Instrumentation System **Yes/No** (attach details)
 Others (give specific details) _____

3. Contact Details.

Postal Address: _____
 City: _____ Province: _____
 Country: _____ Pin/Zip Code: _____
 Tele: _____ Fax: _____
 URL/Web Site: _____

4. Local Branch/Liaison Office/ Authorised Representative, in India (if any).

Name & Postal Address:

 City: _____ Province: _____
 Country: _____ Pin/Zip Code: _____
 Tele: _____ Fax: _____
 URL/Web Site: _____

5. Financial Details.

Annual Turnover: _____ USD
 Number of Employees in vendor _____
 Details of manufacturing infrastructure available _____
 Earlier contracts with Indian Ministry of Defence/ Government agencies:
 (Agency Contract Number Equipment Quantity Cost)

6. **Certification Quality Assurance Organisation (If Applicable).**

Name of Agency _____

7. **Equipment/Product Profile (to be submitted for each product separately):-**

(a) Name of Product: _____
(Should be given category wise for e.g. all products under night vision devices to be mentioned together)

(b) Description (attach technical literature): _____

(c) Whether OEM or Integrator: _____

(d) Status (in service /design & development stage): _____

(e) Production capacity per annum: _____

(f) Countries where equipment is in service: _____

(g) Whether export clearance is required from respective Government: ____

(h) Any collaboration/joint venture/ co production/ authorized dealer with foreign Industry (give details):

Name & Address: _____

Tel: _____ Fax: _____

(j) Any other relevant information. _____

8. **Declaration.** It is certified that: -

(a) The above information is true and any changes will be intimated within five (05) working days of occurrence.

(b) The _____ (name of vendor) has never been banned/de-barred for doing business with MoD/Gol/any other government organisation and that there is no inquiry going on by CBI/ED/ any other government agency against the vendor.

(Authorised Signatory)