भारतीय विमानपत्तन प्राधिकरण

राजीव गाँधी भवन , सफदरजंग हवाई अड्डा,

नई दिल्ली -110 003

AIRPORTS AUTHORITY OF INDIA

RAJIV GANDHI BHAWAN, SAFDARJUNG AIRPORT,

NEW DELHI-110 003

DIRECTORATE OF CNS-PLANNING-II

Expression of Interest (Domestic)

EoI (Domestic) for "Implementation of New NOCAS (No Objection Certificate Application System) along with associated accessories to provide nationwide solution"
EOI No.: AAI/CNSP-01/2026-27

Date of Publication: 08.04.2026

Last Date for submission of EOI: 14.05.2026 15:00Hrs

Executive Director (CNS-P)-II
AAI CHQ, RGB, New Delhi –110003

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Disclaimer

This Expression of Interest (EoI) is neither an agreement nor an offer by the Airports Authority of India (AAI) but an invitation to submit Expression of Interest by the prospective Firms or any other person. The purpose of this EoI is to get budgetary quotations & information about Prospective firms ("Firm"). This EoI would help the AAI to identify and understand manufactures / suppliers available, their potentials, current market, its sentiments, Estimate value of the product and eventually come up with a comprehensive NIT/tenders.

The AAI, its employees and advisors make no representation or warranty and shall have no liability to any person, including any Firm, under any law, statute, rules or regulations or tort, principles of restitution or unjust enrichment or otherwise for any loss, damages, cost or expense which may arise from or be incurred or suffered on account of anything contained in this EoI or otherwise, including the accuracy, adequacy, correctness, completeness or reliability of the EoI and any assessment, assumption, statement or information contained therein or deemed to form part of this EoI.

The AAI, may, in its absolute discretion but without being under any obligation to do so, update, amend or supplement the information, assessment or assumptions contained in this EoI. Information provided in this document is indicative and not exhaustive.

The issue of this EoI does not confer any right interest/obligation on part of AAI to accept and/or consider the submitted information and/or claim any right for consideration in the EoIs which shall be considered strictly in accordance with the terms and conditions of the EoI to be invited subsequently, as the case may be, for the Project.

The bidder/Firm shall bear all its costs associated with or relating to the preparation and submission of its EoI including but not limited to preparation, copying, postage, delivery fees, expenses associated with any demonstrations or presentations which may be required by the AAI or any other costs incurred in connection with or relating to its EoI. All such costs and expenses will remain with the bidder/Firm and the Authority shall not be liable in any manner whatsoever for the same or for any other costs or other expenses incurred by the bidder/Firm in preparation or submission of the EoI.

The bidder/Firm shall be wholly responsible for any statements/documents/ records, etc. submitted pursuant to this EoI and ensure accuracy thereof. The AAI or its employees or its advisors shall accept no responsibility or liability for any deficiency that may be made by the Firm. The bidder/Firm shall also indemnify the AAI, its employees and its advisors from actions arising out of this EoI.

The EoI is not a pre-requisite requirement to participate in Request for Proposal (RFP)/Tender. Bidders may note that Eligibility Criteria and QR (Technical and operational requirements) in the RFP/Tender may be different than those mentioned in this EoI.

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SECTION – I : NOTICE INVITING EXPRESSION OF INTEREST (EoI)

1. Executive Director (CNS-P)-II, Airports Authority of India, New Delhi on behalf of Chairman, AAI, invites Expression of Interest (EoI) from prospective Original Equipment Manufacturers (OEM)/Authorized Representative of OEM interested for **Techno-commercial Proposal for "Implementation of New NOCAS (No Objection Certificate Application System) along with associated accessories to provide nationwide solution".**

2. This **Expression of Interest (EoI)** is called through the electronic tendering process and can be downloaded from the NIC CPP Portal **https://etenders.gov.in/eprocure/app**. A copy of the EoI is also available on AAI website **www.aai.aero**. Please note that the submission of the EoI is only through the NIC CPP Portal **https://etenders.gov.in/eprocure/app** . The EoI will not be accepted in any other form. Further, it may be noted that EoI which is duly submitted on NIC CPP portal shall only be final and EoI just saved without submission will not be available for evaluation.

Vendors are requested to go through "Guidelines to firms", "Self-help files" & "FAQ's & system setting" links available on the login page of the e-EoI portal for guidelines, procedures & system requirements. In case of any technical difficulty, firms may contact on the help desk numbers & email ids shown at Para 3.6.2 of this Section.

3. INSTRUCTIONS TO THE CONTRACTORS/FIRMS FOR THE e-SUBMISSION OF THE EOI ONLINE THROUGH NIC CPP Portal https://etenders.gov.in/eprocure/app**.**

3.1. The EoI document has been published on the Central Public procurement Portal (URL NIC CPP Portal https://etenders.gov.in/eprocure/app). The firms are required to submit soft copies of their EoI electronically on the CPP Portal, using **valid Digital Signature Certificates**. The instructions given below are meant to assist the firms in registration on the CPP Portal, prepare their EoI in accordance with the requirements and submitting their EoI online on the CPP Portal. More information useful for submitting online EoI on the CPP Portal may be obtained at https://etenders.gov.in/eprocure/app.

3.2. **REGISTRATION**

a. Firms are required to enroll on the e-Procurement Module of the Central Public procurement Portal (URL NIC CPP Portal https://etenders.gov.in/eprocure/app) by clicking on the "Click here to Enroll" on the CPP Portal Enrolment which is free of charge.

b. As part of the enrolment process, the firms will be required to choose a unique user name and assign a password for their accounts.

c. Firms are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the CPP Portal.

d. Upon enrolment, the firms will be required to register their valid Digital Signature Certificate (Class II or Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g.Sify/TCS/nCode/eMudra etc.) with their profile.

e. Only one valid DSC should be registered by a firm. Please note that the firms are responsible to ensure that they do not lend their DSC's to others which may lead to misuse.

f. Firms then logs in to the site through the secured log-in by entering their user ID/ password and the password of the DSC/e- Token.

3.3. SEARCHING FOR EoI DOCUMENT

a. There are various search options built in the CPP Portal, to facilitate firms to search active EoI by several parameters. These parameters could include organization name, location, date, etc. There is also an option of advanced search for EoI, wherein the firms may combine a number of search parameters such as organization name, form of contract, location, date, other keywords etc. to search for a EoI published on the CPP Portal.

b. Once the firms have selected the EoI they are interested in, they may download the required documents/EoI schedules. These EoI can be moved to the respective 'My Tenders folder. This would enable the CPP Portal to intimate the firms through SMS/e-mail in case there is any corrigendum issued to the EoI document.

c. The firms should make a note of the unique EoI ID assigned to each tender, in case they want to obtain any clarification/help from the Helpdesk.

3.4. PREPARATION OF EoIs

a. Firm should take into account any corrigendum published on the EoI document before submitting their EoI. Please go through the EoI document carefully to understand the documents required to be submitted as part of the EoI.

b. Firm, in advance, should get ready the EoI documents signed by authorised person to be submitted as indicated in the EoI document/schedule and generally, they can be in PDF/SLS/RAR/DWF formats. EoI documents may be preferably scanned with 100 dpi with black and white option.

c. To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every EoI, a provision of uploading such standard documents (e.g. PAN card copy, annual reports, auditor certificates etc.) has been provided to the firms. Firms can use "My Space" area available to them to upload such documents. Those documents may be directly submitted from the "My Space" area while submitting a EoI, and need not to be uploaded again and again. This will lead to a reduction in the time required for EoI submission process.

3.5. SUBMISSION OF EOIs

a. Firms should log into the site well in advance for EoI submission so that he/she upload the EoI in time i.e. on or before the EoI submission time. Firm will be responsible for any delay due to other issues.

b. The Firm has to digitally sign and upload the required EoI documents one by one as indicated in the EoI document.

c. The EoI Inviting Authority (EIA) will not be held responsible for any sort of delay or the difficulties faced during the submission of EoIs online by the firms. The Firm should see that

the EoI documents submitted should be free from virus and if the documents could not be opened, due to virus, during EoI opening, the EoI is liable to be rejected.

d. The CPP portal server time will be considered as the standard time for referencing the deadlines for submission of the EoIs by the firms, opening of EoIs etc. The firms should follow this time during EoI submission. The firms are requested to submit the EoIs through online e-tendering system to the TIA well before the EoI submission end date & time (as per Server System Clock).

e. All the documents being submitted by the firms would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons until the time of EoI opening. The confidentiality of the EoIs is maintained using the secured Socket Layer 128 bit encryption technology. Data storage encryption of sensitive fields is done.

f. The uploaded EoI documents become readable only after the EoI opening by the authorized EoI openers.

g. Upon the successful and timely submission of EoIs, the portal will give a successful EoI submission message & a EoI summary will be displayed with the EoI no. and the date & time of submission of the EoI with all other relevant details.

h. The EoI summary has to be printed and kept as an acknowledgement of the submission of the EoI. This acknowledgement may be used as an entry pass for any EoI opening meetings.

3.6. **ASSISTANCE TO FIRMS**

3.6.1. Any queries relating to the EoI document and the terms and conditions contained therein should be addressed to the EoI Inviting Authority or the relevant contact person indicated in the EoI.

3.6.2. For any technical related queries please call the Helpdesk. The 24 x 7 Help Desk Number 0120-4711508, 0120- 4001002, 0120-4001005, 0120-6277787. International Bidders are requested to prefix 91 as country code.

Note- Bidders are requested to kindly mention the URL of the Portal and Tender Id in the subject while emailing any issue along with the Contact details. For any issues/ clarifications relating the tender(s) published kindly contact the respective Tender Inviting Authority.

Tel: 0120-4711 508, 0120-4001 002, 0120-4001 005, 0120-6277 787

E-Mail: support-eproc@nic.in

3.6.3. For any Policy related matter / Clarifications Please contact Dept of Expenditure, Ministry of Finance. E-Mail: cppp-doe@nic.in

3.6.4. For any queries related to bid submission date extension, EMD, eligibility criteria, technical specifications etc. The bidder may please contact the concerned Bid Manger as mentioned in the tender document. (Email Id: ajaygupta@aai.aero)

3.6.5. For any technical Issues / Clarifications relating to the publishing and submission of AAI tender(s)

a. In order to facilitate the Vendors / Bidders as well as internal users from AAI, Help desk services have been launched between 0800-2000 hours for the CPPP under GePNIC https://etenders.gov.in. The help desk services shall be available on all working days (Except Sunday and Gazetted Holiday) between 0800-2000 hours and shall assist users on issues related to the use of Central Public Procurement Portal(CPPP).

b. Before submitting queries, bidders are requested to follow the instructions given in "Guidelines to Bidders" and get their computer system configured according to the recommended settings as specified in the portal at "System Settings for CPPP".

3.6.6. In case of any technical issues faced, the escalation matrix is as mentioned below:

Sl. No.	Support Person	Escalation Matrix	E-Mail Address	Contact Numbers	Timings
1.	Technical Help Desk Team	Instant Support	eprochelp@aai.aero	011-24632950 Ext. 3512	0800-2000 Hrs. (MON - SAT)
2.	Mr. Gamit Vaibhav Manekjibhai JE(IT)	After 4 Hrs. of Issue	etendersupport@aai.aero or vaibhav_g@aai.aero	011-24632950 Ext. 3523	0930-1800Hrs. (MON-FRI)
3.	Sh. Amit Mishra, Sr. Manager. (IT)	After 12 Hrs.	amitmishra@aai.aero	011-24632950 Ext. 3520	0930-1800Hrs. (MON-FRI)
4.	Sh. Sunil Kumar Jt. GM (IT)	After 24 Hrs.	sunil.km@aai.aero	011-24632950 Ext. 3506	0930-1800Hrs. (MON-FRI)
5.	General Manager(IT)	After 03 Days	gmit@aai.aero	011-24657900	0930-1800Hrs. (MON-FRI)

***The Helpdesk services shall remain closed on all Govt. Gazetted Holidays.**

3.6.7. The above mentioned help desk numbers are intended only for queries related to the issues on e-procurement portal and help needed on the operation of the portal.

3.6.8. **For Bid submission queries only, related to the EoI published on the portal, Firms are advised to contact JGM (CNS-P), email- ajaygupta@aai.aero ; GM(CNS-P), email- gmcnspauto@aai.aero, contact no. 011-24632950 Extn -2593**.

3.6.9. AAI may at its discretion, extend/change the schedule of any activity by issuing an addendum / corrigendum on the e-procurement portal http://etenders.gov.in/eprocure/app. In such cases, all rights and obligations of AAI and the Firms previously subject to the original schedule will thereafter be subject to the schedule as extended/changed.

(i) In order to provide reasonable time for Firms to account for any amendments in preparing their EoI, AAI may, at its sole discretion, extend the deadline for the submission of EoI suitably. AAI will notify all registered Firms of any extension via the Central Public Procurement Portal (CPP portal).

NOTE: Firms are advised to upload their EoI submission well in advance of the Closing date to avoid any last minute issues. Uploaded EoI may be modified at a later date and time, until

the Closing date and time.

(ii) EoI once uploaded and at the Closing date and time shall be final, and no amendment thereto shall be permitted after the submission date.

(iii) Each Firm shall submit only one EoI. Central Public Procurement Portal shall not allow Firms to submit their EoI after the scheduled Closing date and time. The AAI will not entertain any post-Closing date confirmation of compliance.

4. Schedule of Important Activities:

Sl. No	Activity	Date and Time (IST)
1	Date & Time of Publication EoI	08.04.2026, 18:00Hrs
2	Start date & Time for Download EOI Documents from NIC CPP Portal	08.04.2026, 18:00Hrs
3	Closing Date & time of raising clarification by Vendors	21.04.2026, 18:00Hrs
4	Closing Date & time of clarification by AAI to vendor queries	01.05.2026, 18:00Hrs
5	Bid submission Start Date	02.05.2026, 11:00Hrs
6	Bid submission End Date	14.05.2026, 15:00Hrs
7	Date & Time for Opening EoI	15.05.2026, 16:00Hrs

5. Amendment to EoI document: At any time, prior to scheduled date of submission of EoIs, AAI, if it deems appropriate to revise any part of this EoI or to issue additional data to clarify and interpretation of provisions of this tender, it may issue addendum / corrigendum to this tender. Any such addendum / corrigendum shall be deemed to be incorporated in this EoI and binding on the firms. Addendum / corrigendum will be notified through e-Procurement Portal at https://etenders.gov.in/eprocure/app

6. Clarifications of EoI Documents: Firm, requiring any clarification of the EoI Document, may submit their queries, if any, through provision of e-Procurement Portal at https://etenders.gov.in/eprocure/app

7. Clarification needed if any shall be submitted through e-tendering portal only.

The Executive Director (CNS-Planning)-II
Airports Authority of India
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Email: edcnsp2@aai.aero
Tel: +91-11-20818215

SECTION – II

1. Introduction

Airports Authority of India (AAI), a Mini-Ratna Category-1 Public Sector Enterprise was constituted by an Act of Parliament and came into force on 1st April 1995 by merging erstwhile National Airport Authority and International Airport Authority of India. The merger brought into existence a single Organization entrusted with the responsibility of creating, upgrading, maintaining and managing civil aviation infrastructure both on the ground and air space in the country. As an Air Navigation Service (ANS) Provider, It provides services over Indian airspace and adjoining oceanic areas.

AAI manages 137 airports, which include 23 International Airports, 10 Customs Airports, 81 Domestic Airports and 23 Civil Enclaves at Defense airfields. AAI provides air navigation services over 2.8 million square nautical miles of air space.

2. Purpose of EoI

AAI intends to implement "new **No Objection Certificate Application System (NOCAS)** along with associated hardware infrastructure, software platforms, licenses, networking components, and support services etc. to provide nationwide solution."

Main purpose of this EoI is to obtain **Techno-commercial Proposal** from prospective bidders for '**Implementation of new "No Objection Certificate Application System (NOCAS) along with associated hardware infrastructure, software platforms, licenses, networking components, and support services, etc. to provide nationwide solution"** as per Scope of Work/Qualitative Requirements detailed in **Annexure-I**.

2.1. In response to the EOI, the prospective OEM/Authorized Representative of OEM are requested to submit signed copy of following:

(a) Bidder/Manufacturer/Supplier details & Work Experience details along with supporting document, as per Annexure- II
(b) Undertaking as per Annexure – III
(c) Budgetary estimate as per proforma provided in Annexure – IV

3. Scope of Work:

3.1. To invite a **"Techno-commercial Proposal for the implementation of a new No Objection Certificate Application System (NOCAS), along with associated hardware infrastructure, software platforms, licenses, networking components, and support services, etc., to provide nationwide solution**" from prospective OEMs/Authorized Representatives of OEMs having technical collaboration or a technical transfer agreement with the OEM/Indian subsidiary of the OEM, who have supplied such systems for the design, development, implementation, and maintenance of large-scale "GIS-based" digital platforms/web-based systems/e-governance systems, which are in use or have been used for Government department(s)/Corporates in the past 7 years.

3.2. Budgetary quotes of only those bidders will be considered who are evaluated as qualified as per eligibility criteria given in Para 4 of this Section-II.

3.3. If the supplier/manufacture firm or its OEM is undergoing CORPORATE INSOLVENCY RESOLUTION PROCESS (CIRP) under insolvency and bankruptcy code, such quotes shall be summarily rejected.

3.4. Tentative requirement (Scope of Work) for "Implementation of new No Objection Certificate Application System (NOCAS) along with associated hardware infrastructure, software platforms, licenses, networking components, and support services, etc. to provide nationwide solution" is given in **Annexure-I**.

4. Eligibility Criteria

4.1. General Eligibility Criteria

4.1.1. The OEM/bidder who have experience in design, development, implementation, and maintenance of large-scale "GIS-based" digital platforms / web-based systems / e-governance systems, in use or used for Government department(s)/Corporates.

4.1.2. **Preference to Make-In-India products (For bids < 200 Crore):** Preference shall be given to Class 1 local supplier as defined in public procurement (Preference to Make in India), Order 2017 as amended from time to time and its subsequent Orders/Notifications issued by concerned Nodal Ministry for specific Goods/Products. The minimum local content to qualify as a Class 1 local supplier is denoted in the bid document. If the bidder wants to avail the Purchase preference, the bidder must upload a certificate from the OEM regarding the percentage of the local content and the details of locations at which the local value addition is made along with their bid, failing which no purchase preference shall be granted. In case the bid value is more than Rs 10 Crore, the declaration relating to percentage of local content shall be certified by the statutory auditor or cost auditor, if the OEM is a company and by a practicing cost accountant or a chartered accountant for OEMs other than companies as per the Public Procurement (preference to Make-in -India) order 2017 dated 04.06.2020. Only Class-I and Class-II Local suppliers as per MII order dated 4.6.2020 will be eligible to bid. Non - Local suppliers as per MII order dated 04.06.2020 are not eligible to participate. However, eligible micro and small enterprises will be allowed to participate.

4.1.3. AAI reserves the right to visit the bidder's referenced sites and witness the performance of system in operation meeting the above requirements in Para 4.1.1.

4.2. Technical Eligibility

The bidder shall have experience in **design, development, implementation, and maintenance of large-scale** "**GIS-based" digital platforms / web-based systems / e-governance systems**.

Minimum Experience Requirement: The bidder should have successfully executed **atleast one project** during the **last seven years**.

4.3. Relevant Domain Experience

Preference shall be given to bidders having experience in development or implementation of:

i. Aviation-related IT systems
ii. GIS-based applications
iii. 3D visualization platforms
iv. Urban planning / building clearance systems
v. e-Governance/Decision support system/ citizen portals with public interface
vi. Workflow-based approval systems
vii. Mobile applications integrated with web portals

Experience in **height clearance / obstacle limitation surface (OLS) / aeronautical data systems** will be considered an added advantage.

4.4. Capability Requirements

The bidder shall have the capability to deliver the following components:

i. End-to-end NOCAS platform development
ii. GIS & 3D mapping integration
iii. Online application processing workflow
iv. Automated height clearance computation
v. Integration with external systems
vi. Mobile application development
vii. Cybersecurity compliance
viii. Cloud / Data Centre deployment
ix. AI-based analytics and automation features
x. 24×7 support and maintenance

4.5. Key Personnel Capability

The bidder shall have in-house professionals with expertise in:

i. GIS and geospatial systems
ii. Software architecture
iii. Cloud infrastructure
iv. AI / data analytics
v. Cybersecurity
vi. Large scale government digital platforms

4.6. Quality Certification

Mandatory certification: The bidder shall possess following certifications:

i. ISO 9001 – Quality Management System
ii. ISO 27001 – Information Security Management System
iii. CMMI Level 5

Optional Certification:

i. Any compatible certification by reputed agency/govern agencies
ii. Any other certificate bidder wants to submit.

5. EoI Evaluation Principle

Bids submitted in this EoI will be technically evaluated as per below table :

Technical Evaluation Parameters

Criteria	**Marks**
Experience in similar IT/GIS projects	20
Experience in e-Governance platforms/ Decision support system/ citizen portal	15
Technical approach & methodology	20
Proposed system architecture	10
Key personnel & team capability	10
Innovation (AI, 3D, mobile integration)	5
Total	**80**

Minimum **technical qualifying score: 70%**.

This EOI Bid Response(s) will be evaluated based on above given Technical Evaluation Parameters. Financial bids of the technical qualified bidders will be considered under this EOI, only for preparation of the estimated cost of the tender/RFP to be published.

Note:- ***The EoI is not a pre-requisite requirement to participate in Request for Proposal (RFP)/Tender. Bidders may note that Eligibility Criteria and QR (Technical and operational requirements) in the RFP/Tender may be different than those mentioned in this EoI, and will depend upon but not limited to, the estimate derived, guidelines of AAI Procurement Manual, MII Policies, and other applicable regulatory guidelines. No queries on this Note shall be entertained.***

However, it may be noted that evaluation during RFP/Tender shall be based on Quality and Cost Based Selection (QCBS) as per below mentioned criteria :

Weightage

Component	**Weightage**
Technical Proposal	80%
Financial Proposal	20%

6. Documents to be Submitted

i. Certificate of incorporation
ii. PAN, GST registration
iii. Audited financial statements of recent three financial years
iv. Work orders / completion certificates
v. Client certificates for executed projects
vi. Self-declaration regarding non-blacklisting (as per Annexure-III)

vii. ISO/CMMI certificates/other equivalent certificates (as per para 4.6 above)
viii. Details of key personnel

7. Payment Terms: Payment to the Contractor shall be made as per the prevailing payment terms mentioned in AAI Manual for procurement of goods and services.

8. Other terms & conditions

8.1. Guarantee/Warranty: The equipment's supplied (including hardware & software with accessories) under the contract shall have 3 years warranty and afterwards software shall have 7 years Annual Maintenance Contract. For supplied UPS & Batteries, warranty shall be for 05 years followed by CAMC for 03 more years for both UPS & Batteries.

8.2. Bidders shall provide detailed "Tentative Timeline" for "Implementation of New NOCAS (No Objection Certificate Application System) along with associated accessories to provide nationwide solution". **AAI intend to fully operationalize the new NOCAS along with all necessary hardware infrastructure, software platforms, licenses, networking components, and support services, etc. to provide nationwide solution by mid of year 2027**.

8.3. Standard terms & conditions relating to Performance Bank Guarantee; Liquidated Damages; Force Majeure; Dispute Resolution, Arbitration & Jurisdiction; FAT/SAT etc. are standard as per AAI guidelines and will be defined in detail during the RFP/Tender.

The Executive Director (CNS-Planning)-II
Airports Authority of India
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Annexure-I

Scope of Work (SOW)/Qualitative Requirements (QRs)

Abstract of SOW/Qualitative Requirements (QRs)

1.	**Objective of the Scope of Work**
	The objective of this Scope of Work (SoW) is to design, develop, implement, and maintain a next generation **No Objection Certificate Application System (NOCAS)** for Airports Authority of India (AAI). The proposed system shall enable a **secure, fully digital,** paperless **automated, and regulation-compliant platform** for processing aeronautical height clearance and obstruction-related NOCs in alignment with **ICAO, DGCA, MoCA, SACFA, and AAI guidelines**.
2.	**Assessment of Existing NOC Application System -**
	The scope includes a comprehensive review of the existing NOC application system to identify functional, technical, and operational limitations, including but not limited to: ● Manual and semi-manual verification processes ● Fragmented workflows and email-based communication ● Limited GIS and 3D visualization capabilities ● Inadequate audit trail and traceability ● Restricted scalability and rule configurability
3.	**Solution Framework and Architecture -**
	The proposed solution shall be based on a **modular, service-oriented, and API-driven architecture**, ensuring scalability, resilience, and future readiness. Key architectural principles include: ● Automated digital verification framework ● Secure, paperless, end-to-end workflows ● Configurable rule engine ● Centralized geospatial and aeronautical data repositories ● Seamless interoperability with internal and external systems
4.	**NOC Application and User Management -**
	The system shall provide a unified, role-based NOC application and management framework with the following capabilities: ● Online application for SACFA, Building, Windmill, PTL, Mast, CNS, Continuous and Multipoint structures ● User categorization, role definition, and access control ● Unified validation of applicant identity details ● Handling of overlapping NOC applications and reapplications ● Amalgamation and retention of historical NOCs ● Revalidation of previously issued NOCs

5.	**Automated Technical Evaluation and Processing** Automated and standardized technical evaluation shall form the core of the system, including: ● Height sheet generation with standardized terminology ● Automatic recalculation of height sheets upon database updates ● PANS-OPS calculations and continuous structure assessment ● Multipath and multi-radar obstruction analysis ● Shielding analysis using DEM information ● Improved accuracy through automated validation and simulation
6.	**AI-Enabled Features**
	The proposed solution shall incorporate AI-based capabilities to enhance efficiency and accuracy, including: ● AI-enabled document verification ● AI-assisted NOC evaluation and decision support ● Change detection and anomaly identification ● AI-assisted chatbot for applicants and internal users
7.	**Geospatial and Visualization Capabilities**
	The system shall provide advanced high resolution GIS-based visualization tools, including: ● 2D and 3D map views and 3D scene viewer ● Color-coded CNS and obstacle limitation surfaces ● Display of nearby airports and structures during evaluation ● Distance measurement, draw, and download tools ● Preview of NOC proposals with map-based visualization ● Shall be compatible with closed source and open source GIS maps ,3D models and all raw data,3D models, Maps generated by such open source and closed source models.
8.	**Data Integration and Interoperability**
	The solution shall support seamless integration with internal and external systems through secure APIs, including: ● AIS / AIM systems ● AeroDB and aeronautical databases ● NOTAM databases ● ULB CAF portals ● Third-party FPD/FPDAM and simulation tools ● Provision for future IoT sensor-based data integration
9.	**Workflow Automation and Governance**
	End-to-end workflow automation shall replace email and e-Office-based processes, covering: ● NOC Processing Level 1: Auto-settlement based on configurable criteria ● NOC Processing Level 2: Detailed technical analysis and simulation ● NOC Processing Level 3: Appeal and Aeronautical Study workflows ● Configurable rule engine for policy and regulatory updates
10.	**CCZM Full Automation and Implementation**

	The scope includes fully automated handling of Colour Coded Zoning Maps (CCZM), including: ● Automated CCZM creation and grid correction ● Interpretation and implementation of CCZM ● Verification workflows by CNS users ● Alignment with regulatory amendments and guidelines ● CCZM full compatibility with ULBs
11.	**Dashboards, Monitoring, and Reporting** The system shall provide comprehensive dashboards and reporting features, including: ● Executive Director-level and KPI dashboards ● National parameter dashboards ● Revenue management dashboards ● Application status tracker and SLA monitoring ● Public notification and VFR/IFR publication modules ● National GUI based Airport Parameter changelog viewer with date selection.
12.	**Audit Trail, Compliance, and Security**
	The solution shall implement robust governance and compliance mechanisms, including: ● End-to-end audit trail management ● Metadata versioning and update history ● Secure authentication and role-based authorization ● Compliance with applicable IT and aviation security standards
13.	**Mobile Enablement and Field Operations**
	The scope includes mobile and field enablement features, such as: ● Mobile application for field verification. ● Offline maps and data access ● Survey and cartographic onboarding workflows.
14.	**Revenue Management and Future Enhancements**
	The system shall support configurable revenue management with: ● Fee configuration and policy-driven updates ● Future-ready monetization framework ● Support for regulatory and commercial changes. ● Fully safe and fail proof payment gateway integration.
15.	**Deployment, Training, and Acceptance -**
	The scope shall include: ● Deployment guidelines for staging,testing and production environments ● Testing, validation, and acceptance criteria ● Training and capacity building for AAI stakeholders ● Defined implementation milestones and deliverables

16.	**Expected Outcomes -** The proposed NOCAS solution is expected to deliver: ● Highly reduced NOC processing timelines Improved accuracy, consistency,ease of application and transparency. ● Enhanced regulatory compliance and auditability ● A scalable, future-ready national aviation safety platform
17.	The proposed Scope of Work for the Next Generation NOCAS envisages a secure, automated, and future-ready digital platform for efficient processing of aeronautical NOCs in compliance with applicable regulatory frameworks. By leveraging automation, geospatial intelligence, AI-assisted evaluation, and integrated workflows, the solution aims to improve accuracy, transparency, turnaround time, and governance. All functional, technical, and operational aspects are covered in detail in subsequent sections, and the implemented system shall serve as a scalable national platform supporting AAI's long-term aviation safety and development objectives.

Scope of Work (SOW)/Qualitative Requirements (QRs): Part-I

Introduction

COMPLIANCE MATRIX

Note:

1. For stating Compliance: Write "C" in the third column below.
2. For stating Non-Compliance: Write "NC" in the third column below.
3. For stating Partial or Conditional Compliance: Write "PC" in the third column below.
4. Against each compliance statement, write specific para and page of supporting technical documentation (from where the stated compliance could be verified) in fourth column below.

Scope SN.	Title	Description	Compliance	Reference
1	Statutory Background & Mandate	Airports Authority of India (AAI), under the Ministry of Civil Aviation (MoCA), Government of India, is statutorily responsible for development, regulation, and safeguarding of aerodromes and navigable airspace in accordance with the Aircraft Act, Aircraft Rules, DGCA Civil Aviation Requirements (CAR), ICAO Annex-14, Annex-10, PANS-OPS, and relevant Gazette Notifications. Regulation of height of structures and obstacles around aerodromes is a safety-critical national function.		
2	Purpose of NOCAS	The No Objection Certificate Application System (NOCAS) is envisaged as a centralized, authoritative, and mission-critical digital platform for managing the complete lifecycle of aeronautical No Objection Certificates (NOCs) for structures, developments, and obstacles in the vicinity of aerodromes across India, ensuring protection of navigable airspace and aviation safety.		
3	Strategic Importance	NOCAS plays a strategic role in safeguarding civil aviation operations, national airspace integrity by preventing hazardous penetrations of Obstacle Limitation Surfaces (OLS). It acts as the single source of truth for aerodrome safeguarding data for civil aviation stakeholders.		

4	Need for System Enhancement	Rapid urbanization, vertical infrastructure growth, expansion of civil and defense aviation, and increased inter-agency dependencies have significantly increased the volume, complexity, and criticality of NOC cases. The existing system requires enhancement to ensure transparency, scalability, regulatory consistency, legacy traceability, and future-ready planning capabilities.		
5	Vision of the Enhanced Platform	The enhanced NOCAS platform shall evolve from a transactional clearance system into an paperless,intelligent, GIS-centric, AI-assisted decision support ecosystem capable of supporting planning, simulation, optimization, regulatory evaluation, and permanent safeguarding of aerodrome and airspace data.		
6	End-to-End Digital Lifecycle	The scope covers complete digitization of the NOC lifecycle starting from Airport AGA,CNS,PANS-OPS Parameter configuration to AI-assisted recommendation, approval or rejection, issuance of digitally generated NOC letters, and long-term archival with full audit trails.		
7	Greenfield & Brownfield Coverage	The system shall support both Greenfield aerodrome planning and Brownfield aerodrome expansion/modification scenarios. For Greenfield sites, OLS safeguarding shall be extended from pre-feasibility stage. For Brownfield sites, legacy data and historical NOCs shall be preserved and correlated without regulatory discontinuity.		
8	Planning ,Carto,Survey Directorate Enablement	The system shall onboard Planning,Carto,Survey Directorate users through a dedicated Module enabling digital land suitability analysis, wind-based runway orientation, OLS generation, obstacle assessment, multi-agency evaluation, simulation, and optimization prior to locking permanent site coordinates.		
9	Regulatory Compliance Framework	The platform shall embed ICAO Annex-14, Annex-10, DGCA CARs, PANS-OPS criteria, national defense airspace restrictions,Gazette Notifications and any future regulations as configurable, rule-based engines. All evaluations and AI outputs shall be traceable, explainable, and aligned with officially notified standards and amendments.		
10	GIS & 3D Digital Twin Foundation	NOCAS shall be built on a robust GIS and 3D digital twin foundation capable of rendering aerodromes, runways, procedures,CNS facilities, OLS surfaces, terrain, and obstacles in both 2D and 3D, with airport-based, runway-based, procedure-based, and segment-based visualizations.		

11	AI-Assisted Decision Support for planning module.	The scope includes an AI Decision Engine to analyze wind data, terrain, obstacles, land availability, and regulatory constraints to assist planners and evaluators by suggesting optimal runway orientations, layout adjustments, mitigation measures, and feasibility outcomes, while retaining final authority with designated officials.		
12	Simulation & Optimization Environment	The Planning Module shall function as a simulation/game-engine-like environment enabling multidisciplinary committees to rotate runways, shift thresholds, modify lengths, and compare multiple alignments in real time to optimize wind coverage, minimize obstacle penetration, reduce land acquisition, and lower mitigation costs.		
13	Multi-Agency Technical Evaluation	The system shall support structured, parallel technical evaluation by AGA, CNS, OPS, PANS-OPS. Each directorate will evaluate proposals digitally within its domain and record observations, conditions, or objections in a standardized and auditable manner.		
14	Airspace & Defense Compatibility	NOCAS shall evaluate compatibility with controlled and restricted airspace and strategic constraints, identifying conflicts with IAF operations and restricted zones and supporting simulation-based mitigation or alternate proposals.		
15	Coordinate Locking & Data Integrity	Upon approval by competent authority, runway and site coordinates shall be permanently locked in WGS-84 format. Associated OLS surfaces shall be frozen and reused for all future NOC cases, ensuring regulatory consistency and elimination of manual manipulation.		
16	Transparency & Explainability	The system shall provide transparent and explainable outputs for all evaluations, including AI recommendations, height calculations, and differential outcomes between legacy and current cases through rule comparison, terrain differences, and regulatory parameter evolution.		
17	Centralized Repository & Traceability	NOCAS shall maintain a centralized digital repository of all issued NOCs, rejections, amendments, legal cases, appeals, and historical cases, spatially linked to terrain, surfaces, and obstacles, with complete audit trails for regulatory, vigilance, and legal scrutiny.		
18	Integration-Driven Ecosystem	The scope includes secure, standards-based integration with historical wind databases, AIS/AIM, AeroDB, NOTAM, ULB CAF portals, SACFA, ERP/SAP, payment gateways, e-Sign, and other government systems through REST/SOAP APIs and webhooks.		

19	Security, Resilience & Governance	The system shall comply with AAI IT Security Policy, Government of India cybersecurity guidelines, and national critical infrastructure protection norms, including RBAC, encryption, logging, disaster recovery, business continuity, and periodic security audits.All Document processing fully compliant with IT ACT 2000.		
20	Scalability & Future Readiness	The platform shall be dynamically scalable to support increasing application volumes, additional aerodromes, regulatory amendments, ETOD ingestion, advanced simulations, and expanded AI capabilities without major architectural changes.		
21	Intended Stakeholders & Users	The system shall cater to AAI Planning, Engineering, CNS, AGA, OPS directorates, regional and station safeguarding units, defense stakeholders, Urban Local Bodies, State agencies, and applicants such as developers, infrastructure agencies, and consultants.		

Scope of Work (SOW)/Qualitative Requirements (QRs): Part-II

COMPLIANCE MATRIX

Note:

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Scope of Work

Scope SN	Scope Title	Scope Description	Compliance	Reference
1	**About AAI**	AAI is responsible for issuance of NOC for height clearance under GSR-751(E), GSR-770 (E) or any other notification issued by the Government of India for the purpose under the Aircraft Act 1934 Section 9A		
2	About AAI	AAI manages 137 airports, which include 24 International Airports (including 3 International Civil Enclaves), 10 Customs Airports (including 4 Customs Civil Enclaves), 80 Domestic Airports and 23 Domestic Civil Enclaves at Defense airfields.		
3	About AAI	AAI also provides Air Traffic Management Services (ATMS) over the entire Indian Air Space and adjoining oceanic areas with ground installations at all Airports and other ATS units to ensure safety of Aircraft operations.		
4	**Scope Objective**	The objective of this document is to establish the scope of work of the AAI AERODROME SAFEGUARDING PORTAL / Next-Gen NOCAS System v3.0. This secure, scalable, paperless, 3D GIS-centric, and fully automated digital transformation platform shall adhere with standards stated in GSRs, AAI, MoCA, ICAO, DGCA CAR guidelines, ADSACs, or any other notification issued by GoI for the purpose under the Aircraft Act 1934 Section 9A, integrating multiple stakeholders, and supports end-to-end workflow automation without manual intervention using technology innovations like Automation, AI, IOT, Terrain profiling and 3D.		
4.1	Scope Objective	The system should be robust, efficient, and fast, with all functional aspects and performance considerations addressed as per AAI IT policies and guidelines.		

5	Scope Objective	The system shall adopt modular, configurable architecture using Rule Engine development. This will facilitate configuration of business rules of various modules developed in new applications. The solution shall operate in both modes: a) Automated Mode: end-to-end processing with rules-engine driven validations and computation, automated drafting, and automated decision support. The system shall support hybrid processing (automated default or automated with man in the middle with manual exception handling).		
6	Scope Objective	The proposed solution shall be a bespoke custom developed solution to meet AAI requirements listed in this document and its references.		
7	Existing solution block diagram	Please refer Figure 1 below for an indicative block diagram of the existing solution.		

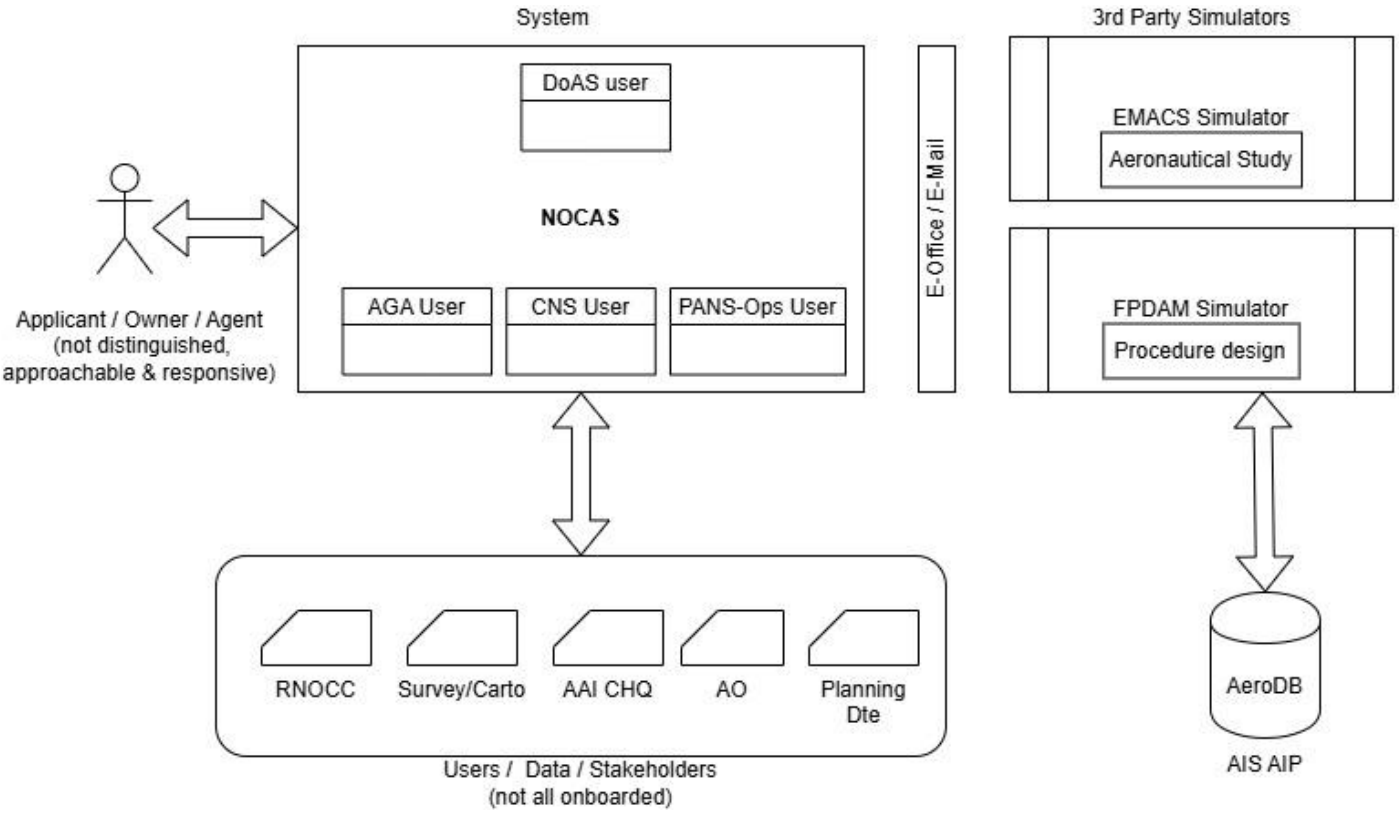


Figure 1: Existing system block diagram (indicative)

8	About existing NOC application system	This web-based application called NOCAS comprises of: a) a critical GIS component which is necessary to perform the permissible height calculation for buildings and other structures. b) a role-based login to different categories of staff within AAI for processing the NOC. c) anyone from the public can register as an applicant through online login. d) on getting the login credentials, the applicant can apply online application for obtaining NOC for a proposed structure submitting Requested Top Elevation (RTE). e) using this application, the NOC officer can easily plot the proposed site on a digital map, and using a tool can generate the height calculation sheet for the same. f) considering the height limitation criteria, the officer can clear or reject the NOC application with approved Permissible Top Elevation (PTE)		

9	About existing NOC application system	Key features of existing NOC application system include: a) Web-interface for the general public to register an application and monitor its status. b) GIS component for permissible height calculations for building and masts along with a Geodatabase and a virtual height limitation surface pertaining to aerodrome and communication, in and around the airport. NOCAS application uses ArcGIS Online Topographic / Street Map & Satellite Imagery Map. c) Role-based access to different categories of staff within AAI for servicing the applications. d) The system is based on Esri technology – ArcGIS Server 10.x, ArcGIS Desktop 10.x and ArcSDE 10.x with SQL Server 20XX Functionalities provided in the currently functional NOCAS software are as follows: Apply NOC Application, NOC Application Process, Review Application Process, Appeal Application Process, CCZM Generation Workflow, View NOC Archive Reports, Revalidate NOC, Role Management, Active Users, Case Info, Appeal Payment Info, View NOC Brief, View Settled Cases, Distance Measurement Tool, View Surface, Applicant Dashboard, Profile Update, Finance Dashboard, Check Approximate Top Elevation, View Issued NOC, View Rejected NOC, View Auto-settled NOC, Track NOC Status, Height Sheet Generation Tool, View CCZM pdf links, Home Page Links and pdf, View Interactive CCZM. Please refer to Figure 2 below for an indicative NOC process workflow.		

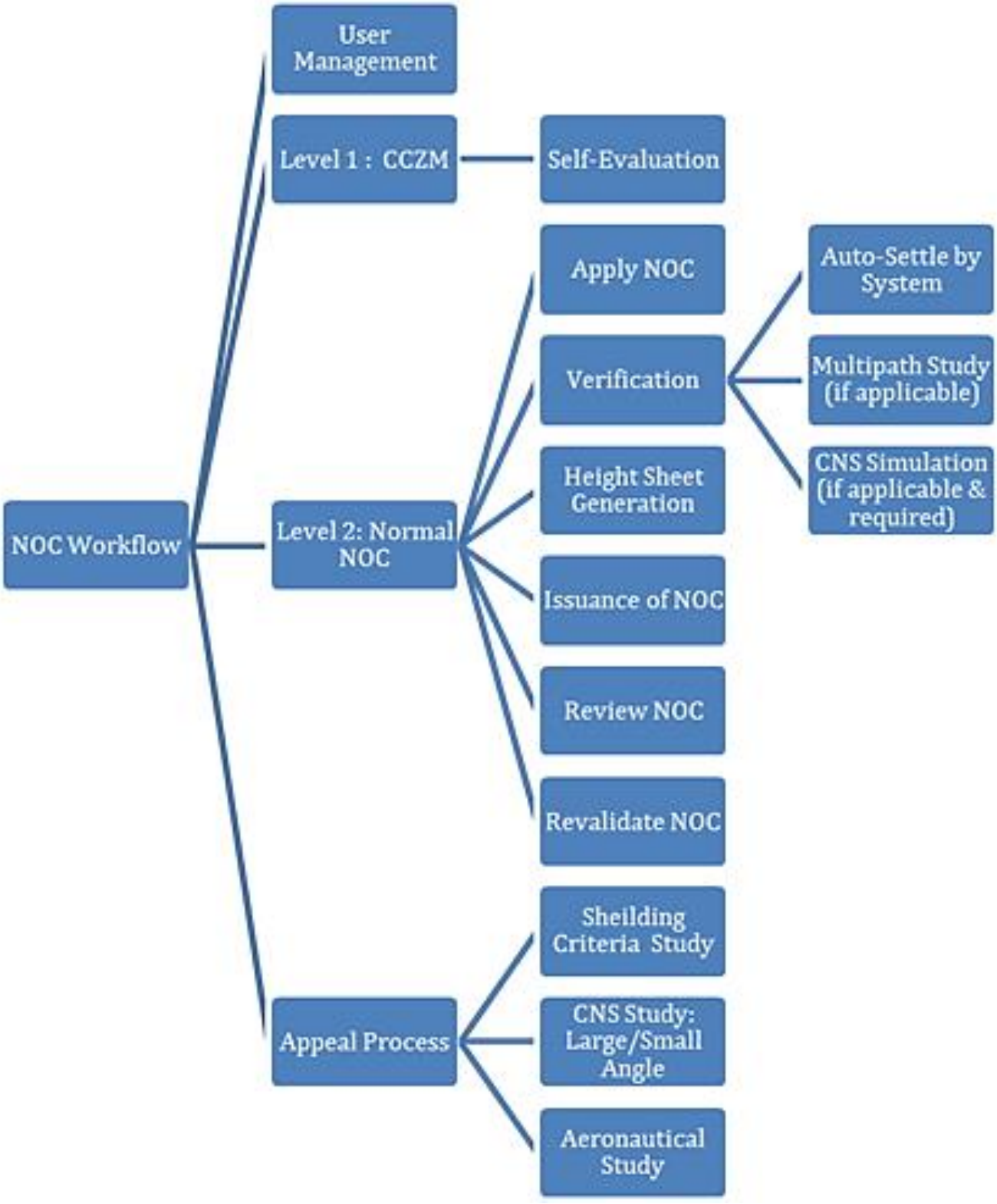


Figure 2: NOC workflow

10.1	Solution Framework	Please refer Figure 3 below for the proposed solution framework with key features & innovations (mandatory as well as optional/recommended).		
10.2	Proposed Solution Block Diagram	Please refer Figure 4 below for an indicative block diagram of the Proposed solution. The selected bidder is advised to confirm the flow depicted in this diagram before implementation with all stakeholders.		

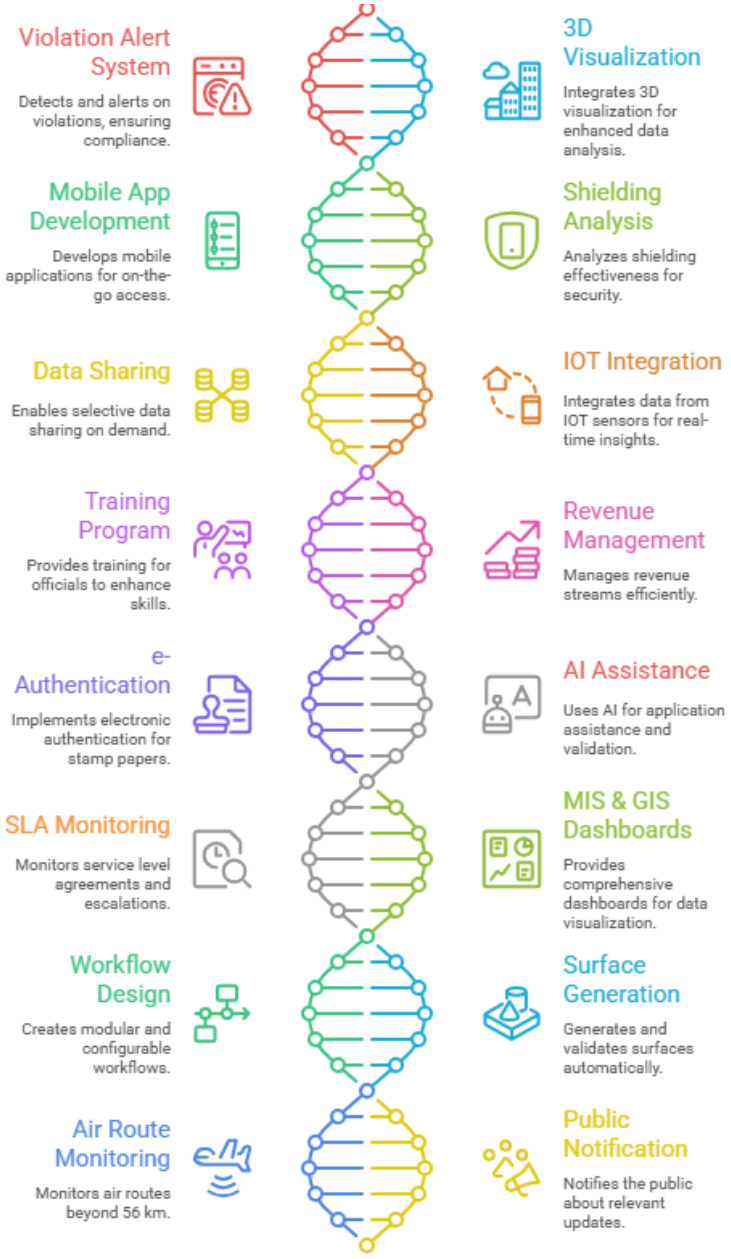


*Figure SEQ Figure * ARABIC 3: Proposed solution framework with requested innovation*

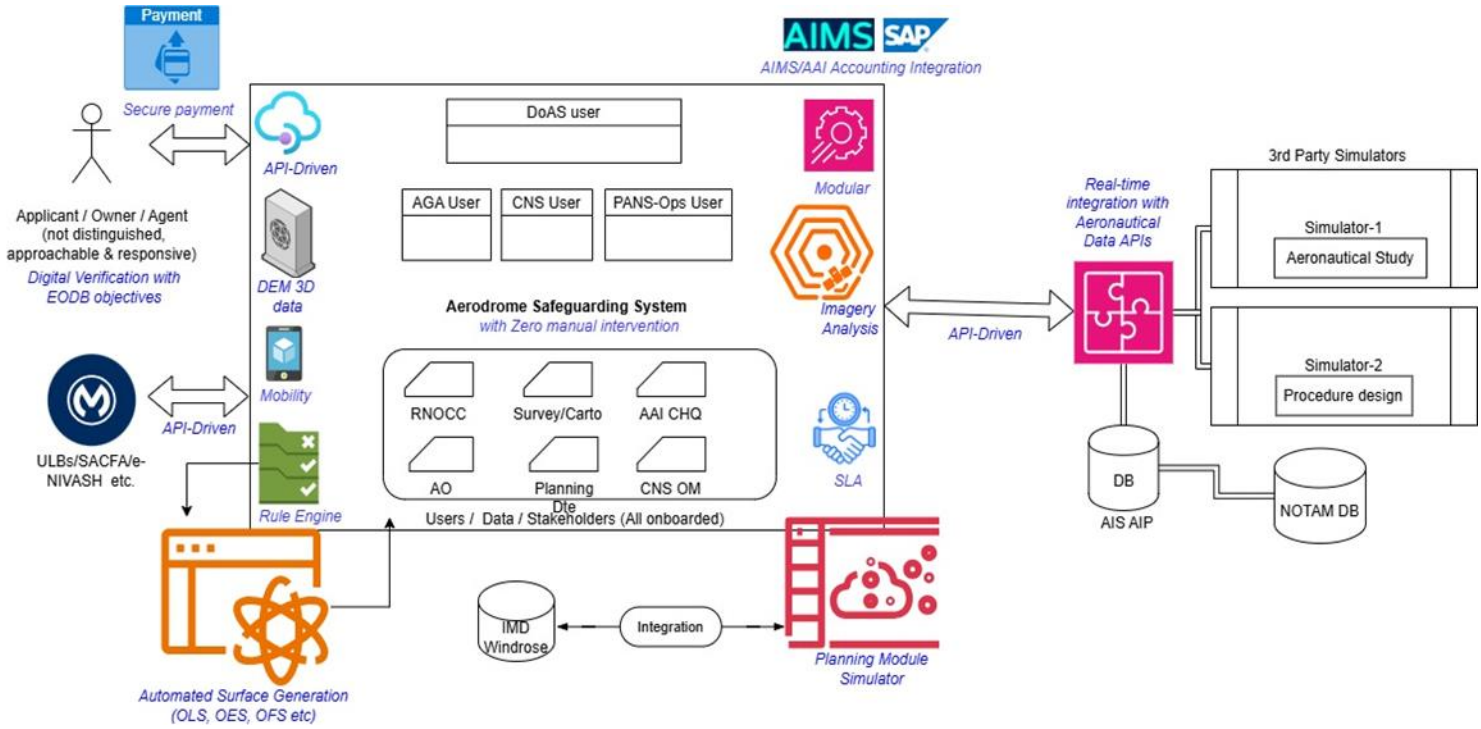


Figure 4: Proposed solution block diagram (indicative)

11	Automated Digital Verification Architecture	The system shall replace all existing undertakings (1A-1G) with a single unified digital undertaking, in alignment with the GSRs and ADSACs.		
12	Automated Digital Verification Architecture	The system shall facilitate Digital Verification of applicant documents using Integration with India Stack / API-Setu and/ or any such available government APIs / Aadhaar-based services (e-Sign, DigiLocker etc.), incorporate e-stamp paper-based undertaking and support paperless governance. All submissions, undertakings, declarations, approvals, and communications shall be digitally executed (digital signature / eSign where adopted) and stored electronically. Please refer Figure 5 for an overview of India stack components. The selected bidder is advised to confirm this integration touchpoints before implementation with the DoAS users. As per Ministry of Commerce and Industry, Govt. of India:		

		1. All government bodies must update their systems to ensure PAN is used as the common identifier to access their services where possible. 2. The ministries switch to using PAN as a user/login ID in place of existing setup. Further directives can be referred from official website of Ministry of Commerce and Industry, Govt. of India or from CBDT's PAN 2.0 Project (Information on PIB: https://www.pib.gov.in/PressReleasePage.aspx?PRID=2077608&reg=3&lang=2		
13	Automated Digital Verification Architecture	The system shall be able to assume that legal compliance for Aadhaar-based e-Sign/DigiLocker is maintained by the owner; the proposed system shall integrate only through approved & authenticated APIs and record e-Sign transaction details for audit.		

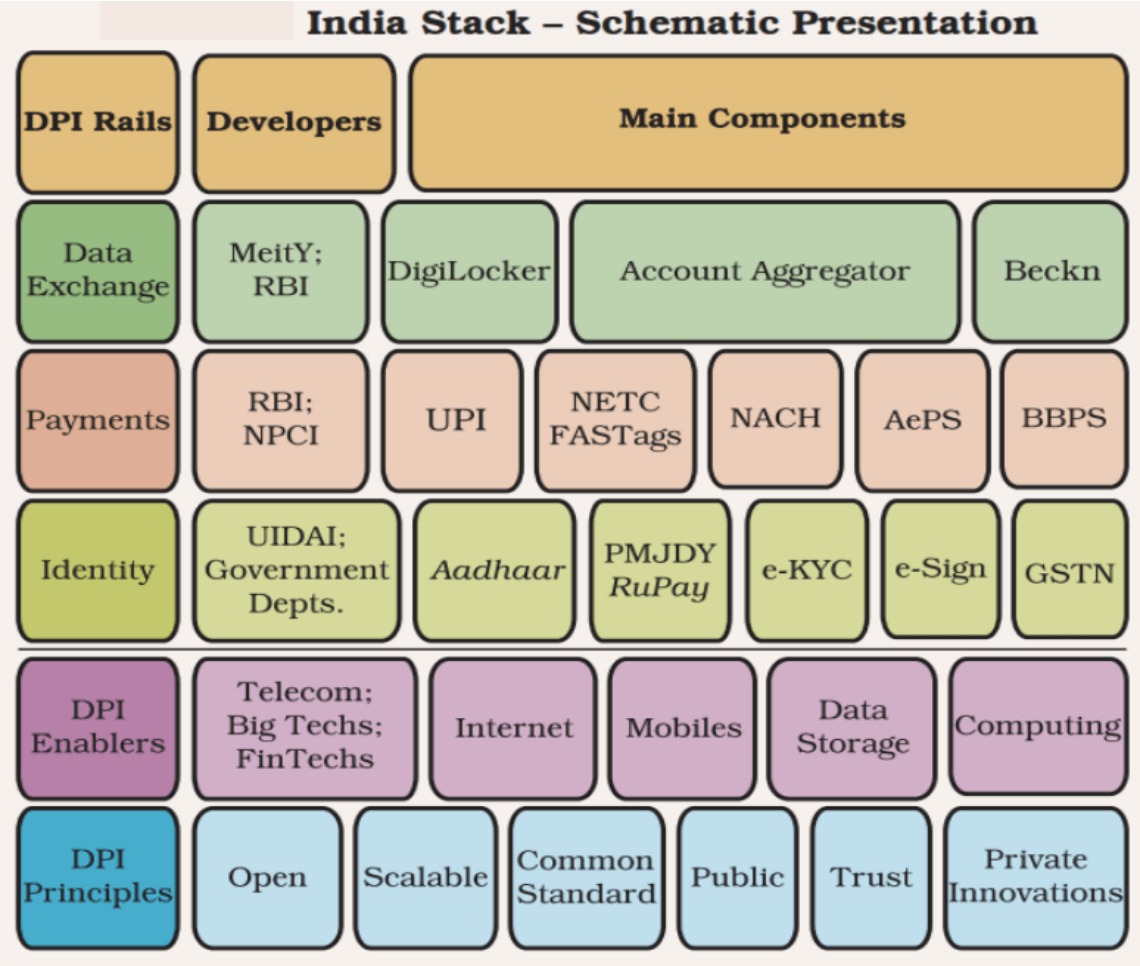


Figure 5: India stack components

14	Aeronautical Data Ingestion Pipeline	The system shall establish a data ingestion pipeline for inclusion of authoritative aeronautical datasets supplied by the owner and stakeholder departments (AIS -AeroDB, Survey Carto, CNS Planning/O&M, Planning Dte., FPD and others), with schemas, domains and coordinate reference systems agreed in advance Datum to be used WGS 84 and projection shall be UTM Zone 42N to 47N for horizontal coordinates and EGM-08 or AAI-specified geoid for vertical datum, and inputs shall include clear metadata for provenance and effective dates.		
15	Aeronautical Data Ingestion Pipeline	The system shall ensure submission of Data Input for update in the database from Data Providers e.g. CNS-P, CNS-O&M, FPD, Survey/Carto, AIS-AIP and/or Planning Dte. with multi-level Validation & Authentication Checkpoints involving due approvals from competent authority using mutually agreed		

		Data Sharing Formats with e-sign facility for protection & accountability.		
16	AI assisted NOC evaluation and processing	The system shall implement AI assisted validation and verification, patterns recognition, predictive analytics, historical data-driven automation for NOC application, verification, processing and reporting. E.g. Use cases for AI assistance are - Coordinates and applicant details shall be auto-fetched from submitted documents after verification, autogenerating undertakings, autogenerating surfaces, overlapping detection, change detection, recommendation w.r.t 2030 guidelines of ICAO Annex 14, etc. The selected bidder shall guarantee zero calculation errors and zero document/text errors originating from the system's computation and auto-generated outputs. Any defect that leads to incorrect calculation/output shall be treated as a Severity-1 defect, with mandatory RCA, patch, and regression test evidence.		
17	AI-assisted chatbot assistant	The system shall integrate an AI-assisted chatbot assistant to guide applicants through the application process, helping improve "first-time-correct" NOC applications. Primary features include: a) understand required formats and templates to check format compliance for uploaded documents, b) help applicant fill in application details correctly while prompting them on mistakes during filing, c) generate standard documents such as undertaking formats and/or justification letters etc. d) support real-time identity validation using India stack APIs & DigiLocker, Aadhaar, e-Sign etc. e) Enable format compliance checks for uploaded documents automatically using user-provided input.		
18	Enable & disable aerodrome	The system shall have the capability to activate and deactivate (enable & disable) an entire aerodrome/airport from the system, keeping all application data, system data, users & audit logs etc. intact persistently and reflect disablement on public VFR/IFR and CCZM listings as per governance directives.		

19	Publishing VFR / IFR List on public domain	The system shall implement a publishing pipeline on ingest of validated aerodrome data changes in the Aerodrome database. The system shall update the public homepage and VFR / IFR List on public domain /eAIP INDIA and stage the change into the next applicable AIRAC eAIP AMDT in line with AAI Aeronautical Information Management (AIM) procedures, ICAO Annex 15, DGCA CAR Section-9, and Standard AIRAC publication cycles. Each update must include version identifiers and timestamps to indicate the latest revision and ensure traceability.		
20	Publishing VFR / IFR List on public domain	The system shall include functionality for automated publishing of updated VFR (Visual Flight Rules) and IFR (Instrument Flight Rules) lists based on newly ingested and approved data in line with AAI Aeronautical Information Management (AIM) procedures.		
21	Publishing VFR / IFR List on public domain	The system shall ensure that only the data that has passed validation and received approval from the competent authority shall be eligible for public display.		
22	Publishing VFR / IFR List on public domain	The system must have a feature to notify subscribed users or stakeholders of changes to VFR/IFR lists via email or dashboard alerts.		
23	Audit trail management	The system shall maintain logs of all updates, including source data, approval details, and publishing actions for audit and compliance purposes.		
24	NOTAM DB Integration	In case of critical update in data of aerodrome survey facilities, based on authority's decision, NOTAMs (Notice to Airman) are published which are cycled for updates within 30 days instead of AIRAC cycle.		
25	NOTAM DB integration	The system shall ensure that Urgent operational changes for ex. Permanent Modification and/or withdrawal of NAV-AIDS, shall get reflected in the database via NOTAM DB integration for effectiveness in height calculation in near-real-time with clear effective timestamps.		

26	Integration with AIS AIM system	The proposed solution shall integrate to exchange relevant and mutually agreed datasets e.g. NOTAM info, eTOD, AMDB, Electronic Charts etc.) with AIS AIM database or any operational platform being used by the AIS department for Aeronautical Information Management.		
27	NOTAM DB integration	The system shall be able to store and display NOTAMs and AIRAC cycle deltas from AIS (where shared), highlight procedure changes that impact NOC evaluations, and trigger reassessments for impacted applications. NOTAM deltas impacting procedures shall be visualized and route impacted applications to reevaluation automatically.		
28	Integration with AeroDB / AIS AIM database	The system shall support integration with AIS for: 1. Creation of ICAO-compliant OLS surfaces 2. 3D modeling of obstacles (LOD1/2/3) 3. Import of drone/LiDAR survey data 4. Penetration analysis with alerts 5. Automated reporting for NOTAM support 6. Visualization in 3D web scenes 7. notifying data gaps via alerts 8. Providing data to proposed solutions as AIS dept is already providing data to FPD, CNS, ASM and OPS		
29	Overlapping NOC applications	The system shall provision clear mention of any known overlapping of polygon for the NOC site subjected for NOC in the Undertaking 1A. The system shall be able to detect and cross-validate such known polygon overlaps with previously issued NOCs and referring to Undertaking 1A by spatial querying feature layers. Upon detection, the applicant shall receive a non-blocking alert, and processing officers shall see overlapping cases on their dashboards with linkages to original NOC items. In case of unknown overlap, the system should immediately flag the same to the applicant as well as to the NOC processing officers and AO as a priority alert. Further workflow to be designed during SDD workshop.		
30	Overlapping NOC applications	The system shall facilitate NOC processing officers to be able to view overlaps and prior NOCs on maps and make decisions with full context		
31	Overlapping NOC applications	The system shall provide the applicant with a facility to retain the option to proceed with a fresh application despite the overlap, ensuring flexibility and independence in application submission		

32	Overlapping NOC applications	The system shall facilitate the Departmental users who are processing the NOC application with 3D depiction of all NOC issued/applied in nearby areas on the map based on their roles and permissions.		
33	User Management	The system shall provide a comprehensive centralized user management module with capabilities to support secure and scalable access control across various user groups		
34	User Management	The system shall facilitate the super-admin user to create and manage custom user roles (e.g., Admin, Reviewer, Approver, Data Provider, External Applicant) and user types (e.g., Internal, External, Departmental).		
35	User Management	The system shall ensure that changes or modifications in user details from any of the RHQ/CHQ admins to be effective immediately without any latency		
36	User Management	The system shall ensure that every user lifecycle events (create, modify roles, suspend, retire) shall be orchestrated through the workflow orchestration engine job types with approval steps and e-signature integration via external e-Sign APIs.		
37	User Management	The user management module should be designed to provide: a) secure creation of user accounts with associated metadata (e.g., department, designation, contact details) with email and /or OTP-based activation b) bulk user creation and import from external systems if required c) role based access control to ensure users can access only the modules, data, and actions permitted by their assigned roles d) granular permission settings for read, write, approve, and administrative actions e) support for user onboarding, deactivation, role reassignment, and archival. f) integration with authentication systems (e.g., LDAP, Aadhaar-based login, or other government-approved		

		identity providers). g) administrative dashboard for monitoring user activity, role distribution, and access control compliance. h) modification workflows to manage user transfers, role updates, and hierarchy changes. i) termination workflows shall be implemented for user retirement or separation j) enforce least-privilege permissions through the content portal groups and item sharing models, k) and maintain immutable security audit logs through the enterprise geospatial platform logs export combined with database audit trails.		
38	User Management	The system shall ensure that all onboarding and subsequent updates for a user shall be routed through an approval fully e-sign integrated channel comprising regional authority, DO, GM DoAS and other relevant officials as decided by AAI		
39	User Management	The system may offer optional provision to facilitate integration with AAI's Identity Access Management (IAM) (provided by NIC or any other Govt agency) using Single Sign On (SSO) with Multi Factor Authentication (MFA) API Integration, as and when made available via AAI.		
40	User Management	The system shall support a centralized user management framework with the following user categories and user roles:		
41	User Categories	External Users: a) Public users applying for NOC. b) SACFA users applying for tower clearances (Accept/Reject only). c) Departmental Applicants (internal AAI staff acting as applicants) applying for aerodrome facility development clearance. d) ULBs/Municipal Bodies users applying for height clearance through Common Application Form available on Local Authorities website i.e. Delhi (MCD and NDMC) and Mumbai (MCGM).		
42	user categories	Internal Users: a) View-Only/Monitoring Users b) Airport Operators (AO) o AAI o Non-AAI c) Designated Officers (DO) at AAI RHQ (for approvals and User data management at RHQ) d) Departmental users – NOC Processing		

		o AGA, CNS, and PANS-Ops officers at RHQ Level o AGA, CNS, and PANS-Ops officers at CHQ Level o CNS [O&M] for Multipath & Simulation Study e) Appellate Committee Members f) Survey Carto section (AAI) g) Aerodrome Planning (AAI CHQ) h) Member (ANS) i) Joint Secy. (MoCA) j) DGCA k) ED (ATM) / (CNS) / (Planning) l) GM (DoAS) (for approvals and User data management at CHQ) m) Planning directorate n) AIS integration o) FPD p) CNS [Planning] q) Finance r) AC-1 s) AC-2 t) AC-2 Section (3 users at the minimum) u) Super User DGCA departmental users will be active users of NOCAS with summary reporting & decision-making features as per SDD workshops. The system shall implement workflow as agreed between both AAI and DGCA.		
43	User roles	The user management module in the system shall be capable of defining distinct user roles such as: i. Applicant – for submitting applications and tracking status. ii. Inspector/Verifier – for conducting field inspections and uploading verification data. iii. Approver - for approving spatial & attribute data edits and updates iv. Administrator – for managing user accounts, permissions, and system configurations. v. Others - as directed by AAI users during SDD workshops.		
44	Audit trail management	The system shall be able to ensure all stakeholder actions—document edits, approvals, calculations, promotions—are e-signed where permissible and preserved in immutable audit records accessible to authorized reviewers.		
45	Audit trail management	The system shall maintain comprehensive audit trails for all update and editing workflows to ensure accountability and traceability. All user activities, role changes, and access events must be logged for audit and compliance.		
46	Audit trail management	The solution must provide role-based approvals, audit trails, and versioned references for Website updates, eAIP Amendments and NOTAM references		

47	Integration with ULB CAF	The system shall allow two-way Rest-API based integration with the Common Application Form to receive applications.		
47.A	Integration with ULB CAF	Integration with ULB/SACFA/e-NIVAS through CAF: Provisions shall be made for Appeal request from SACFA/ULB Server along with required document submission link through API via CAF. Provisions for Payment link shall be made.		
48	Apply NOC	The system shall be able to assume that urban local bodies' Common Application Forms and SACFA portals will accept/return payloads with consistent identifiers		
49	Apply NOC	The system shall use components of India stack APIs (https://indiastack.org/) for identity verification of applicants while registering them as user		
50	Apply NOC	The system shall provide user-friendly tools to input geographic coordinates, proposed structure height, and detailed site/location information		
51	Apply NOC	The system shall include an integrated GIS-enabled interface that allows applicants to draw polygons accurately for site marking		
52	Apply NOC	The system shall automatically validate submitted polygons for: a) Shape correctness b) Area accuracy c) other GIS integrity checks as directed by AAI during SDD workshops d) There shall be no limit of Plot Size and number of Coordinates supplied in the NOC application.		
53	Apply NOC	The system shall not allow creation of fresh applications for the same coordinates under a new Application ID. Such cases should be duly alerted to the system.		
54	Apply NOC	The system shall ensure that applicants resubmit application using the original Application ID if their application was returned for correction in previous attempt.		
55	Overlapping NOC applications/ Reapplication.	The system shall detect and report previously applied polygons by the same applicant(s) and identify overlaps (same location / plot/ polygon) if any.		

56	Overlapping NOC applications	The system shall detect overlapping polygons by geo-referencing unique application IDs and overlaying auto-fetched coordinates of previously issued NOCs. All the polygons of previously issued NOCs to be made visible on the map dashboard of the NOC processing officials of AAI.		
57	Overlapping NOC applications	The system shall notify applicants as well as concerned Designated Officers (DOs) of any previously issued NOC and seek confirmation that the declaration in Undertaking 1A is accurate		
58	Overlapping NOC applications	The system shall provide color coded visual indicators of overlapping applications to assist in review and decision-making in both GIS and MIS interfaces		
59	Apply NOC	The system shall extract and auto-populate common attributes from pre-filled information available in Undertaking 1A PDF and Site Certificate PDF		
60	Apply NOC	The system shall integrate with DigiLocker or equivalent India Stack digital APIs to enable secure document retrieval, verification, and e-signature functionality for Automated Digital Document Integration submitted during NOC application		
61	Predefined/configurable templates for NOC Letter	At present, the permitted height (AMSL) mentioned in the NOC letter represents the minimum height approved collectively by CNS, AGA, and PANS-OPS criteria, however, CNS Simulation Study cases are inherently different, as permissions are granted pointwise, with individual permitted/approved elevations for each location. The system shall generate NOC letter in two distinct formats: (a) One for cases where a single minimum permitted height is derived from CNS, AGA, and PANS-OPS criteria. (b) A separate format for CNS Simulation Study cases, explicitly indicating permitted/approved elevation for each point.		
62	Predefined/configurable templates for NOC Letter	Currently, the NOC letter displays only the name of the applicant. The system shall print on the first page of the NOC letter - User ID and registered contact number of the applicant, along with the applicant's name. This will assist applicants and examining authorities during review, revalidation, and reopening of old cases, where recalling the User ID after long intervals is a frequent practical difficulty faced at AAI stations Auto-generated documents shall be generated using template-controlled and rule-bound fields to prevent incorrect insertions.		

63	Centralized Repository of All Issued NOC Letters	The system shall be able to maintain a centralized repository of all issued NOC/authorization/rejection letters as content documents linked to applications; letters shall be generated from predefined/configurable templates and carry applicant name, User ID, contact, coordinates and permitted elevations (single minimum or point-wise for CNS simulation cases). The proposed system shall contain all legacy NOC letters that are uploaded or auto generated for New / Revised / Revalidated / Other types of NOC cases generated through existing systems and made retrievable on demand. This will help in traceability of issued permissions, Ease of reference for audits and future reviews and Elimination of dependency on local or manual records		
64	Applicant Classification	The system shall add a mandatory field to classify NOC applicants as 'AAI' or 'Non-AAI' applicant. Another Classification also required as Operational or non-Operational. This status shall be clearly visible on the user dashboard as well as to the examining internal authorities. This distinction is essential in cases involving AAI operationally critical structures, where exemptions or special consideration may be required due to restrictions imposed by RTE or other constraints. The system shall be able to standardize applicant classification (AAI/Non-AAI) and reflect this in dashboards and processing routes; AO cases shall have additional CNS simulation options and fee logic /exemptions where policy permits.		
65	Removal / Enhancement of Point Entry Limit	The system shall not restrict the number of points that can be entered into a single NOC application. The point entry restriction shall be removed, or the maximum permissible number of points shall be substantially increased from the existing limit of 15 points, as Complex structures often require detailed point-wise analysis. The system shall remove or substantially increase point entry limit (≥15) for complex structures, support bulk point ingestion with validation and asynchronous processing *Policy decision		
66	Aeronautical Data Ingestion Pipeline	The system shall be able to assume that large applicant submissions (multi-point polygons, 3D models) will be processed asynchronously; users shall receive progress indicators and completion notifications.There will be no limit to the number of coordinates supplied in the applications.The application will be able to process it efficiently and accurately.		

67	Display of Nearby Structures During NOC Examination	The system shall display nearby buildings/structures in 3D with full dimensions and coordinated while examining an NOC case, for accurate large-angle and small-angle calculations, Identification of cluster formations and better technical judgement and consistency during examination		
68	Inclusion of Pre-assessed Structures While Adding CNS Facilities	The system shall be able to record pre-assessed structures within NCZs of new CNS facilities; when facilities are added, existing permitted structures shall be tagged as "Permitted/Pre-assessed" to avoid incorrect zero-height flags, with lineage to commissioning studies. When adding a new CNS facility, the system shall fetch and include legacy structures within NCZ as 'Permitted / Pre-assessed Structures' to prevent incorrect zero-height flags.		
69	Standardized Drop-Down for Type of Structure	The system shall provide the 'Type of Structure' field as a standardized drop-down menu to ensure uniform terminology, improved data integrity and enhanced analytics and reporting capability for NOC applications		
70	Standardization of CNS Height Sheet Terminology	The system shall be able to standardize CNS height sheet terminology (e.g., Antenna Base Elevation, Counterpoise Elevation, Site Elevation instead of terms like "Reduced Facility Level" etc.) and reflect these consistently in UI, reports and analytics.		
71	Height Sheet Generation	The system shall be able to compute the minimum permitted height (PTE) for an application by evaluating AGA OLS, CNS criteria and PANS-OPS constraints in sequence, returning the most restrictive elevation and the provenance of each criterion; results shall be materialized in a "height sheet" feature table linked to the application feature and downloadable as PDF via Map/Report printing services.		
72	Current Height Sheet Generation workflow	The current height sheet will be replaced with a height sheet and calculation dossier , this HS shall display four sections: Summary, AGA , CNS, PAN-Ops. HS must be generated using Calculations by AGA/CNS/PAN-Ops as per GSR 751 E/ GSR-770 (E)-amendments. Users (AGA, CNS, PAN-Ops, A.O.) shall validate aerodrome data and calculations. System shall allow users to Generate New Height Sheet during verification if required. Users shall record their decision by clicking Agree or Disagree.The Height sheet dossier shall consist of the		

		detailed calculations,3D snapshot of the restrictions and formulas and reference to relevant GSR,CAR clauses . Please refer to the following Figure 6: Height Sheet Generation Workflow (indicative) for an overview of the existing process. The selected bidder is advised to improve this flow before implementation with the DoAS user.		

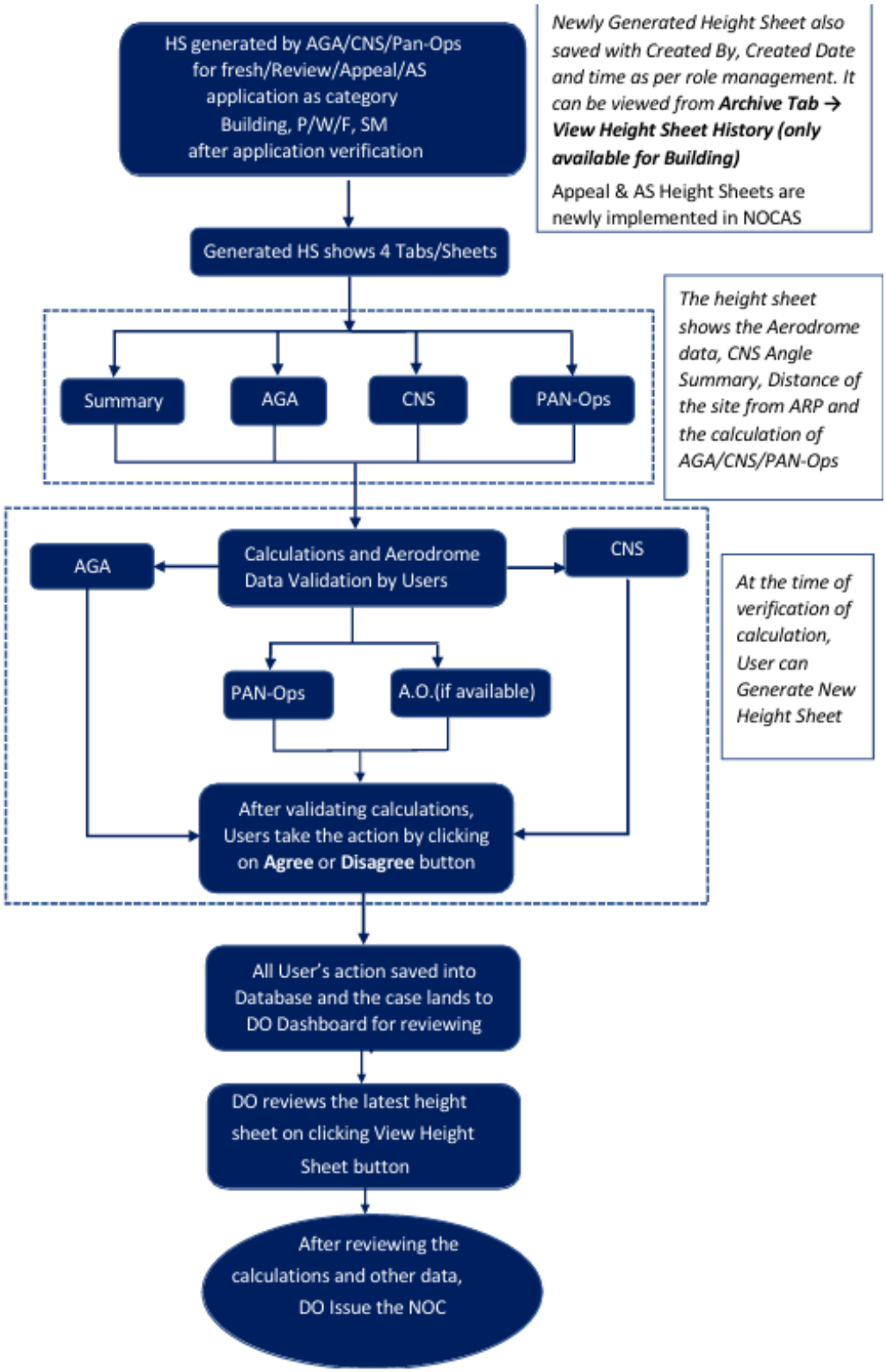


Figure 6: Height Sheet Generation Workflow (indicative)

73	Automatic Re-calculation of Height sheet on Database Updates	The system shall be able to automatically re-calculate permitted heights for previously filed cases whenever database or procedural updates occur, identify affected cases via spatial/attribute dependencies, and queue reissuance or notifications through automated workflows.		
74	Automatic Re-calculation of Height sheet on Database Updates	The system shall be able to constrain height sheet regeneration jobs triggered by data/procedure updates to batched, monitored processes; affected applicants shall receive notifications with clear explanations of changes		
75	Requested Building Height	The system shall use the term "Requested Building Height" or "Requested Height of the Structure" for the field where applicants input the proposed height, instead of "Building Height".		
76	Applicant details in NOC letter	The system shall explicitly specify the name, type and complete details of the structure in the NOC letter issued to the applicant.		
77	Predefined /configurable templates for NOC Letter	The system shall include page numbering on all pages of the NOC letter.		
78	Filter, Search and View NOC Details	The system shall provide a feature for the authorized user to view the list of NOCs issued and rejected, along with their respective application IDs, for a specific selectable period. In the NOC issued search window, system should have provision to search the database for a surveyor, location, etc.		
79	Predefined /configurable templates for NOC Letter	The system shall provide complete visibility of the entered latitude and longitude values with no restriction on view/scroll coordinate input field and limited length of text/viewing area in the NOC Application form while retaining configurability of this format/structure in future.		

80	Predefined /configurable templates for NOC Letter	The system shall provide sufficient space in the NOC letter format for signatures and official seal.		
81	Application ID in the map view	The system shall provide the complete Application ID when the cursor is hovered over the corresponding area on the map should be displayed		
82	SACFA Mast NOC	The system shall not clear/issue the SACFA NOC s without DO clearance. Any Issued SACFA NOC record should be traceable. It should not go away from the inbox even after all the four members have processed it.		
83	SACFA Mast applications for essential aids which need to be cleared for RTE in offline mode	The system shall: a) provision conduction of Multipath study for selected SACFA clearances b) ensure that SACFA mast disapproved by any one of the NOC members shall be moved to Saral Sanchar Portal only after processing by DO. c) No offline processing shall be permitted after rollout of proposed solution and appropriate amendments in policies are approved by AAI.		
84	SACFA Mast application details	A) The system shall ensure that applicant Contact details including mobile no. & communication address shall be clearly provided and verified with the SACFA application, as it is required in case of multipath study & site verification. B) The system shall ensure SACFA details for exemption as per ADSAC 04 of 2022 are available to RNOCC. Handshake parameters to be redefined during integration with WPC/Saral Sanchar portal.	C)	D)
85	SACFA Mast auto clearance	The system shall be configurable by super-admin user to extend document submission timeline for NOC processing* for SACFA Mast cases falling under multipath study. This is required because when SACFA mast applications come under multipath study, it takes time to get the drawing from the owner/applicant and then it has to be sent for multipath study to CHQ.		

		After multipath study only application can be processed. Sometimes it takes more than 30 days. But presently policy states that if the application is not processed within 30 days , The SACFA application deemed cleared by WPC without receiving any response from NOCAS Server. *This is subject to policy decision.		
86	SACFA Mast Check Module	The system shall provide a dedicated SACFA verification module for requirements a to f below.		
87	SACFA Mast Check Module	a) Display SACFA mast locations on interactive maps for spatial analysis and regulatory visibility		
88	SACFA Mast Check Module	b) Trigger alerts for masts located near critical zones or exceeding permissible proximity thresholds		
89	SACFA Mast Check Module	c) Integrate with SACFA databases / WPC / Saral Sanchar portal database to verify mast ownership, licensing status, and compliance records for data sharing w.r.t NOC processing.		
90	SACFA Mast Check Module	d) Visualize mast concentration across regions to identify high-density zones and potential interference risks		
91	SACFA Mast Check Module	e) Use AI/ML to detect patterns indicating unauthorized or unregistered mast installations.		
92	SACFA Mast Check Module	f) Identify masts with abnormal attributes or placement using statistical and spatial anomaly detection techniques.		
93	Metadata update informatio n	The system shall provide a periodic feature to flag relevant stakeholders (identified during SDD workshops) to verify date of incorporation of CNS Equipment/FPD data/Master data in system master database. Like all CNS facilities, RADAR is to be integrated for regular data update workflows. This will help to verify the database updates and keep data updated. This information is required to keep a record of parameters which were considered while issuing any NOC letter.		

94	NOC Applicant details	A) The system shall auto detect any mismatch w.r.t address, name, coordinates etc. between registration, elevation certificate, and undertaking. B) The system shall provide mandatory features for both owner and applicant contact details (Mobile No. as well as email ID) to be entered into NOC application along with an option to declare whether the applicant is the direct owner or an agent submitting details on behalf of the owner. System shall distinctly accept inputs related to correspondence details for applicants, owner and agent users. C) The system shall provide options for owner and applicant details in application (provision for authorized agents to fill the application on behalf of owner) D) The system shall discourage that the applicant/agent is non-responsive adding to delay in processing of aeronautical study cases due to lack of coordination / cooperation between owner and applicant / agent. E) The system shall include Applicant User ID and registered contact number on the first page of the NOC letter for traceability. F) The system shall permit change of owner details in issued NOC under special circumstantial workflow defined with AAI approval during SDD workshop	G)	H)
95	Color coding of CNS Surfaces	The system shall provide a feature In the GIS Map for communication surfaces of different CNS Equipment to be differentiated by giving different color coding		
96	CNS Surfaces Assessment by selection of equipment	The system shall provide a feature In the GIS Map for selecting specific CNS equipment for easy analysis of particular surface and processing the application. Along with one popup window having information of that particular CNS Equipments (Like coordinate, Site elevation etc.)		
97	Windmill & PTL NOC application	The system shall provide feature for auto-import of site coordinates from/ with site elevation & coordinate certificate for NOC applications pertaining to structures of type – windmill, Power Transmission Lines etc. Current process of attaching Excel file with NOC applications pertaining to windmill & PTL etc. shall be removed in the new system to reduce workload of coordinate verification.		

98	Distance measuring tool	The system shall provide feature of Multipoint Distance Measurement tool on the GIS map to calculate distances between site and multiple (at least 03) set of points at a time, for easy analysis of location of site w.r.t multiple nearby airports with pictorial representation and obstacle recommendation.		
99	Draw and Download tool	The system shall be able to support drawing tools like perpendiculars, parallels, arcs, bearings and measuring tools in web application, and persist drawn graphics as analysis geometry items attached to the application record. It shall be able to incorporate standard measurement, drawing and analysis tools in web apps, including distance, bearing, perpendiculars and arcs drawn over surface layers.		
100	Draw and Download tool	The system shall ensure advanced CAD-like operations shall be approximated in web tools and documented.		
101	Draw and Download tool	The system shall ensure applicants and officers shall be able to draw lines, measure horizontal and vertical distances, check bearings, and inspect elevation profiles using measurement widgets in the web application.		
102	Nearby airports consideration	The system shall provide features to assess the NOC applications which fall in the overlapping area of the adjacent regions' airports. OLS maps of adjacent region's airport shall be visible while applying AGA surfaces to assess closeness with adjacent airports of site lying in boundary region.		
103	Status of evaluation process	The system shall provide detail NOC application status like 'pending for multipath study', 'pending with AO for physical verification', 'pending with applicant for multipath study Data Ingestion Pipeline' etc.		
104	Auto settle intimation to AO	The system shall ensure that intimation of the Auto-settled cleared cases should be marked to the AO for record, verification, controlling and monitoring.		
105	Metadata update information	The system shall provide alerts for regular mandatory checks for master database of an airport is required to be popped up to the AO.		
106	Metadata update information	The system shall ensure data integrity from AGA, CNS and PANS-Ops data stakeholders using procedures to prompt the processing officials regarding the data changes		

107	Metadata update information	The system shall ensure periodic data update/review (configurable) & due date notification/alerts system with approval workflow for individual data stakeholders (AO/Survey section/CNS Planning etc.)		
108	DO Dashboard	The system shall provide a Statistical report of pending NOC cases and issued NOC status in DO dashboard. It shall have the applicants received, in process, pending since, monthly / yearly statistics, Airport wise & RNOCC statistics etc.		
109	Test Height Sheet	System shall provide option for Test height sheet generation to DO (Designated Officer) for planning and assessment of height of structure at an airport.		
110	Height calculation Accuracy improvement	The system shall ensure that height sheet generated for changed PANS-OPS procedures and CNS devices should precisely match for calculations from updated datasets		
111	Preview NOC with map	The system shall provide features to preview NOC letters with the Map images of subject application ID.		
112	Configuration of Map view	The system shall provide a feature to configure user-based default desired setting for the application GIS map, so that for a particular user the map is always open in the predefined set format.		
113	Review NOC	The system shall implement a review process based on ADSAC 02 of 2024 Key Rules for Review: a) Review Limit: An applicant can file a review application only once with the designated officer. Criteria for Review: b) If the requested height was not granted. c) If the applicant wants to apply for more height than previously cleared. Note: The limit shall be designed as configurable in the system to accommodate upcoming policy revisions.		
114	Review NOC	The system shall provide below details in the Review NOC letter for the review cases: a) Date of issue of Review NOC. b) Date of Issue of Initial NOC. c) Validity of the NOC		

115	Retain Initial NOC in DB	The system shall provide features to view, download and print initial NOC letter even after the Review NOC is uploaded.		
116	View NOC brief	The system shall provide feature to "View NOC Brief" to fetch the exact current status of a NOC ID with information whether the concerned evaluating officers have agreed or disagreed.		
117	Overlapping NOC applications	The system shall be giving alert when applicant/owner applies multiple times for NOC for same plot.		
118	Amalgamation	The system shall be capable of identifying whether it is the case of amalgamation or Multiple NOC in the initial stage.		
119	Unified Validation of Applicant Identity Details	The system should promote Unified Single Digital Undertaking, prefilled using Digital KYC APIs, e-signed and verified digitally to eliminate formatting, wording and stamping errors. Address of the owner, site etc. in Undertaking, site elevation certificate and application should be auto synced and validated in the system.		
120	AI enabled document verification	The system shall facilitate automated comparison of site description, survey numbers, site coordinates and elevation from the uploaded documents with NOC application also the validity of site elevation certificate.		
121	Revalidate NOC	The system shall implement a Revalidation flow for NOC applications as per Rules for Revalidation given in ADSAC 02 of 2023 and current 2026 guidelines One-time revalidation is generally allowed if construction work has commenced within the initial validity period.		
122	Revalidate NOC	The system shall give indication when a case of Revalidate NOC is cleared by AGA user and Airport Operator.		
123	Invisibility of the initial NOC in Undertaking 1A and Authorization letter	The system shall ensure that an applicant selects the para stating that old NOC ID will become null and void after the issuance of present NOC, and hence the old NOC in Undertaking 1A and Authorization letter should not be visible in the public domain to avoid confusion.		
124	Apply NOC	The system shall perform sanity check on Airport Operator's Comments and accuracy of site coordinates and elevation in an NOC application before taking such cases in RNOCC. In case of discrepance, the system shall recommend Rejection of such applications so that the applicant can apply again without waiting for RNOCC response.		

125	View NOC letter with comments and calculations	The system shall provide facility to view the issued NOC letter along with the other details like NOC Application height sheet with comments and calculations, etc. for the particular Application ID in later date. This NOC letter shall always be stored with digital signature.		
126	Revalidate NOC	The system shall provide features to Revalidate and issue of NOC based on clearance received from CHQ post appeal process.		
127	PANS-Ops calculations	The system shall make available Calculations with respect to PANS-Ops also in the height sheet for PANS-OPS users, like AGA calculations.		
128	NOC for continuous structure	The system shall ensure exclusive provisions for processing NOC applications for continuous structures like Metro rail, road over bridges, transmission lines, airport boundary wall, perimeter lightings etc. Here it should be noted that the metro rail corridor consists of different structure types such as rail corridor and metro rail stations. In this regard, Rule 10 Schedule 1 of GSR 770E should be referred to. It should be noted that NOC for these structures should contain clauses covering the marking and shielding aspects. Metro line corridors may be provided shielding data support of Power transmission lines. (PTL) as per approval in AAI policies. * *Policy decision		
129	Multipoint structure/ poles	The system shall provision to edit the NOC for cases of individual / multiple poles against which there is comment on disagreement, in case of NOC applications like powerlines.		
130	Multipoint structure/ poles	The system shall provision to record comments on disagreement for each of poles / multi-point structures and those comments should appear in height sheet summary too.		
131	Process of verification at AO level	As now the process of aerodrome safeguarding has evolved, and every station is set up to do AO Processing comprehensively. Considering this, the system shall have the process of verification of documents by AO in line with the site verification process. NOC applications should be subjected to AGA CNS PANS-Ops processing only after AO processing is complete. *This is subject to policy decision.		

132	Apply NOC	The system shall ensure that Do's & Don'ts related to the document preparation such as site elevation certificate, undertakings etc. should be in the NOC application format itself. This may be achieved using a trained AI chatbot.		
133	Apply NOC	The system shall mandate attaching permission letter from AO if the site is located within the airport premises.		
134	Planning Dte user requirements	Three main use cases for planning department user in proposed solution: a) Preparing master plan for a Greenfield airport b) Preparing pre-feasibility study report for a proposed Runway Extension within operational aerodrome c) Preparing pre-feasibility study report for a proposed new building within operational aerodrome		
135	Planning Dte user requirements	The proposed system shall onboard the Planning dte users providing Role based user access		
136	Planning Dte user requirements	The proposed system shall onboard the Planning dte users providing Role based user access The system shall ensure to capture via integration / form-based data of following documents for the selected probable site as per checklist of inputs before site visit & pre-feasibility study for carrying out Prefeasibility Study / desk study: i. Co-ordinates of the proposed site in WGS-84 system ii. Revenue map of the site indicating the Khasra nos. iii. Line diagram sketch of the site indicating the overall geometric shape as well as the dimensions of the proposed site iv. Survey of India map in the scale of 1:50000 v. Meteorological data of the last ten years from the Indian Meteorological Department (IMD) vi. Windrose diagram of the proposed site from IMD vii. Contour map of site showing extent of land viii. Type of critical aircraft for which the site for an airport is planned ix. Type of operation desired – VFR or IFR x. Name, Phone/Mobile no. and e-mail of the coordinating / Nodal officer of State government is required for coordination. xi. Minimum and maximum to be specified, if possible do not limit.		

137	Planning Dte user requirements	The system shall capture Lat Long and AMSL data input from site surveys using DEM/DTM automatically and precisely with option to correct individual building corner while doing height evaluation. All should be in WGS84.		
138	Planning Dte user requirements	The system shall be able to enforce datum consistency (e.g., EGM-08) across elevation inputs; where site elevation is captured from DEM, the system shall allow correction of individual building corners during evaluation and record the correction delta		
139	Planning Dte user requirements	The system shall provide a Form based rule engine-based simulator /game engine-based simulation environment with features like rotate, tilt, shift, pan, zoom, 360-degree virtual view etc. with AGA surfaces, for prefeasibility analysis of identified aerodrome site for assessing and analyzing configurational changes in aerodrome planning parameters. Parameters like locking/unlocking/shifting/copying the imaginary etc. to be provided.		
140	Planning Dte user requirements	The system should enable access: a) to all NOCs applied/approved/rejected with suitable color coding in 3D with height sheet b) to view reasons and summary of restriction calculations preferably on first page of height sheet c) to accurate height calculation information with constraints and explanation to Planning dte users for aerodrome planning and estimation.		
141	Planning Dte user requirements	All India DEM data required for site suitability study and pre-feasibility study of proposed aerodrome facilities which is a continuous and recurring exercise. Currently the department is using Google Earth & other 3rd party COTS software where distortion in accuracy is evident.		
142	Planning Dte user requirements	The system shall provision a Mobile application for supporting Planning dte users with site survey activities with Esri Basemap. Said application to work with Mobile or/and Tab.		
143	Planning Dte user requirements	The proposed system shall map existing terrain and obstacles / buildings data (eToD) in 3D basemap for planning activities. 3D terrain and obstacle information will be required.		

144	Planning Dte user requirements	The system shall provision downloadable configurable sized grid with interactive PTE information for planning dte users for pre-feasibility study. This is something like interactive CCZM with enlarged grids for planning use.		
145	Planning Dte user requirements	The system shall provide planning dte users to have access to proposed NAV-Aids & allied facilities with their planned implementation and /or decommissioning dates. This will establish correlation between operational planning and pre-feasibility study.		
146	Planning Dte user requirements	The system shall provide 3D simulation with form-based rule engine for planning dte users to ascertain details in 3D while performing penetration, orientation and shielding studies		
147	Planning Dte user requirements	The system shall implement an AI Decision Engine to prioritize "Least land acquisition" and "Lowest mitigation cost" as early as the conceptual stage to avoid costly redesigns later.		
148	Planning Dte user requirements	System shall implement requirement checkpoints to ensure that the "strategic clearance" for Defense airspace as an active data layer to prevent conflicts with military restricted areas.		
149	Planning Dte user requirements	To improve accuracy and precision analysis, the proposed solution shall integrate High-Resolution Digital Elevation/Terrain Models (DEM/DTM) to ensure that the "penetration height" and "severity classification" are based on precise ground elevations rather than generic topographic maps. Also, Existing man-made infrastructure (like Roadways, Railways, Power Grids, etc.) shall be integrated in forms of layers which can be further analyzed (using Geospatial operations) for identification of conflicts and feasible options for resolution in terms of required land parcel.		
150	Planning Dte user requirements	The system shall integrate a Temporal GIS layer to track the growth of vegetation (trees), water bodies or temporary obstacles (cranes) over time, which can impact OLS integrity between periodic surveys. Please refer ADSAC 03 of 2019 and / or ADSAC 04 of 2021for further details.		

151	Planning Dte user requirements	The selected bidder should explore the possibility of Integration with PM GatiShakti platforms of the proposed solution for access to & sharing data for planning and pre-feasibility study. The GatiShakti NMP is already used for pre-feasibility assessments across various infrastructure ministries. Few selected use cases are mentioned below:		
152	Planning Dte user requirements	The system shall ensure incorporation of physical infrastructure layers: existing and proposed networks of Roads (Bharatmala), Railways, and Ports (Sagarmala), which in turn allows AAI planning department stakeholders to ensure seamless multi-modal and last-mile connectivity for passengers and cargo.		
153	Planning Dte user requirements	The system shall ensure incorporation of Environmental & Utility Layers for Access to data on forests, wildlife sanctuaries, water bodies, and mines helps identify environmental constraints early, reducing the risk of mid-course revisions.		
154	Planning Dte user requirements	The system shall ensure incorporation of Land Revenue Maps for mapping of land use and land ownership records facilitating faster identification of sites with "least land acquisition" requirements.		
155	Planning Dte user requirements	The system shall ensure incorporation of AI Decision Support portal with analytical tools that can support the AI engine in comparing multiple runway alignments based on real-world constraints like existing utility networks (power transmission lines, telecom towers) and terrain data.		
156	Planning Dte user requirements	The system shall assist Planners to use the portal to identify critical infrastructure gaps (e.g., missing rail links to cargo terminals) to ensure the new airport is functionally integrated into the national logistics network. Also, the transport layers integration shall be utilized for planning Transit-oriented Development zones for upcoming airports for seamless passenger travel with reducing carbon footprint.		
157	Planning Dte user requirements	The proposed solution shall be synchronized with the National Single Window System (NSWS). This will allow private developers to apply for height clearances and other ministry approvals (e.g., Environment, Defense) through a single interface for realizing EODB.		

158	Planning Dte user requirements	The system shall implement Automatic Enforcement: Once runway coordinates are "locked" in the Aerodrome Safeguarding Portal, these may be pushed as an "AAI-NOC-ready dataset" to the GatiShakti NMP. Local bodies and other ministries shall be able to then see these height-restricted zones in real-time to prevent unauthorized construction. This two-way handshake is subject to policy decision.		
159	Planning Dte user requirements	The system shall implement regulatory measures w.r.t situational NOC challenges like Crane height clearance, SACFA mast cases and Table-top runway AMSL reg. as per GSR 751 (E). Z-index information using 3D basemap DEM information may be used for height calculation in such cases.		
160	Planning Dte user requirements	The proposed solution shall ensure to realize following benefits of Integration with GatiShakti NMP: a) Cost & Time Efficiency: Reduces delays in land acquisition and allotment by providing transparent, data-backed evidence. b) Data Integrity: Replaces offline processes with a single "source of truth," minimizing human error in record-keeping and coordinate management.		
161	Planning Dte user requirements	The system shall ensure that Site suitability study & pre-feasibility study report and allied data are maintained persistently in Planning dte user login with audit trail.		
162	Planning Dte user requirements	The system shall enable Planning Department users with a web application with 3D eTOD map with AGA surfaces in 3D to check pre-feasibility of aerodrome		
163	Planning Dte user requirements	The system shall enable auto-generation/updating of AGA OLS Surfaces to be auto generated from Masterplan drawing submitted by Planning Dte to GM DOAS.		
164	Planning Dte user requirements	The system shall implement a data sharing pipeline between Planning dte user and Survey /Carto user so that : a) Survey user can perform site survey to prepare/validate/update OLS charts w.r.t AGA surfaces and land profile b) Planning Dte user can receive back a report from Survey Carto user and then submit it to the State Govt with the suitable remark (as "Feasible / Not Feasible) with obstruction details"		

165	Planning Dte user requirements	The system shall allow planning dte user to view provisional temporary height sheets during simulation		
166	Planning Dte user requirements	The system shall provide configurable templated pre-feasibility report auto generation,		
167	Planning module	The system shall incorporate a specialized module for aerodrome planning to accommodate Planning Dte User requirements as listed above. This system will facilitate the end-to-end digitization of project lifecycles, ensuring that OLS surfaces are automatically generated from official online parameters, starting from pre-feasibility through to the final locking of runway coordinates. The objective is to transform the proposed solution with an integrated Greenfield-Aerodrome Safeguarding Portal -a digital ecosystem that extends OLS safeguarding to new sites with help of standardized digital path from initial proposal through AI-assisted review to final approval.		
168	Planning module	Key Capabilities of this module are: Automated Simulation: Real-time analysis of wind patterns and obstacles to find the most cost-effective runway alignment. Design Optimization: Digital "tweaking" of layouts to reduce earthwork and maximize airspace efficiency (e.g., parallel procedures when IAF restricted airspaces in proximity). Expert Finalization: A multidisciplinary committee will use these simulations to select and lock the permanent site coordinates in WGS 84 format		
169	Planning module	The system shall be able to incorporate 3D sun-shadow path analysis for aerodrome planning using 3D map viewer and analysis widgets, present impact visualization on procedures or surfaces and store the outputs for recommendation purposes.		
170	Planning module	The system shall be able to compute cross-section terrain profiles along user-drawn lines and paths using elevation services and generate PDF/CSV outputs attached to cases, aiding shielding and approach/take-off evaluations		
171	Planning module	The system shall perform cross section and profile evaluation along critical approach and departure paths.		

172	Planning module	The system shall provision a module for aerodrome planning as an integrated Greenfield digital ecosystem that extends OLS safeguarding to new sites.		
173	Planning module	The system shall be able to render airport-based, runway-based, procedure-based and segment-based depictions that users can toggle in 2D/3D clients, with contextual pop-ups showing parameters, effective dates, and last update source.		
174	Planning module	The system shall ensure that this module will onboard Planning directorate users facilitating them with end-to-end digitization of project lifecycles.		
175	Planning module	The system shall ensure automatically generated OLS surfaces from official online parameters, starting from pre-feasibility through to the final locking of runway coordinates		
176	Planning module	The system shall ensure that this module has Real-time analysis of wind patterns and obstacles to find the most cost-effective runway alignment		
177	Planning module	The system shall facilitate Digital "tweaking" of layouts to reduce earthwork and maximize airspace efficiency using this module(e.g., parallel procedures when IAF restricted airspaces in proximity).		
178	Planning module	The system shall consider above requirement as a Game-Engine/simulation environment in this module for the planning directorate user. A multidisciplinary committee will use these simulations to select and lock the permanent site coordinates in WGS 84 format.		
179	Planning module	The module shall support Runway orientation finalization, Land suitability analysis, OLS & obstacle assessment, AI based optimization, Multi agency evaluation (AGA, CNS, OPS, PANS-OPS, IAF)		
180	Planning module	The system shall integrate various components including but not limited to GIS Engine, IMD Windrose Database, DEM / Terrain Model, ICAO Annex 14 / DGCA CAR Engine, AI Optimization Engine, Existing Obstacle Database		

181	Planning module	The system shall provision for this module: i. Project Creation Tool Inputs: • Project Name • Location (Lat/Long) • Elevation • Airport Type (Greenfield / Brownfield) • Aircraft Code (3C / 4C / 4E) Output: • Unique Project ID • Editable workspace		
182	Planning module	The system shall provide for this module: ii. Land Parcel & Terrain Tool Input: • SHP / KML / GeoJSON • 3D DEM • Land availability report System Processes: • Upload SHP / KML / GeoJSON • Area & shape validation • Terrain slope analysis • Land availability check Output: • Suitable • Conditionally Suitable • Not Suitable		
183	Planning module	The system shall provide for this module: iii. Wind & Runway Orientation Tool Inputs: • IMD wind data (10–30 years) • ICAO crosswind limits System Processes: • Windrose generation • Crosswind calculation • AI suggested runway headings • Effect of obstruction and can it get resolved by tweaking Outputs: • Primary runway orientation • Alternate orientation (±5° / ±10°)		

184	Planning module	The system shall provide for this module: iv. OLS & Obstacle Analysis Tool Auto Generated Surfaces: • Approach • Take off Climb • Transitional • Inner Horizontal • Conical • Balked Landing Obstacle Detectable: • Terrain • Buildings • Trees • Towers Visualization: • 3D color coded obstacle view • Penetration height • Severity classification		
185	Planning module	The system shall provide for this module: v. Simulation & Optimization Engine User can: • Rotate runway • Shift threshold • Change runway length • Compare multiple alignments AI suggests: • Minimum obstacle penetration • Best wind coverage • Least land acquisition • Lowest mitigation cost		
186	Planning module	The system shall provide for this module: vi. Technical Evaluation Layer AGA • Runway length • Strip / RESA • Taxiway geometry CNS • ILS feasibility • DVOR / DME location • Radar visibility		

		OPS • Aircraft performance • Declared distances • Missed approach PANS-OPS • Obstacle clearance • Procedure design IAF • Defense airspace conflict • Radar interference • Strategic clearance		
187	Planning module	The system shall provide for this module: 4.7 AI Decision Engine System Output: • Feasible • Feasible with mitigation • Not recommended AI Suggestions: • Alternate runway orientation • Shift in location • Obstacle removal priority • Design optimization		
188	Planning module	The system shall provide for this module: 4.8 Coordinate Locking Tool Once approved: • Runway coordinates locked • OLS frozen • Used for all future NOC cases • No manual modification allowed		
189	Planning module	Please refer Figure 7 below for End-to-End Process Flow (indicative) of the planning module. The selected bidder is advised to confirm this flow before implementation with the Planning Dte users.		

190	End to End Process Flow	Description of the process flow depicted in Figure 7 is as follows: Step 1: User Login (Role-Based) - The user logs into the system with permissions based on their role. Step 2: Create a New Pre-Feasibility Project - A new project is initiated to evaluate the feasibility of a proposed airport runway or related infrastructure. Step 3: Land Parcel Upload & Validation - Land-related data and maps are uploaded and validated for accuracy. Step 4: Windrose Analysis (Using IMD Data) - Wind pattern data from the meteorological department is analyzed to understand prevailing wind directions. Step 5: AI-Based Runway Orientation Suggestion - The system uses AI to propose the best runway orientation based on wind and land data. Step 6: Obstacle Detection (Using GIS + AI) - Potential obstacles in and around the land parcel are identified using a combination of GIS data and AI. Step 7: Simulation & Runway Optimization - Simulations are run to optimize runway layout and performance. Step 8: Technical Evaluation (AGA / CNS / OPS / PANS-OPS) - The project is evaluated against aviation technical standards and operational requirements. Step 9: IAF & Airspace Compatibility Check - The system checks whether the proposed runway is compatible with airspace constraints and military aviation requirements. Step 10: AI Decision Engine - AI processes all inputs and provides a calculated decision or recommendation. Step 11: Lock Coordinates - Final coordinates for the proposed runway/site are confirmed and locked. Step 12: Report Generation - A comprehensive report is generated based on all analyses and decisions.		

Figure 7: Pre-feasibility study workflow

191	Planning module	The system shall ensure to provide below outputs from this module at the end of processing: a) Pre-Feasibility Report (PDF) b) Wind Analysis Charts c) OLS Drawings d) Obstacle Maps e) Compliance Matrix (ICAO/DGCA) f) Final ready dataset		
192	Dashboards	The system shall make available as default GIS dashboards to the users based on the requirements posed by Application review officers, Regional HQ, Central HQ, and DGCA users etc, for real-time insights regarding but not limited to: i. Application status, progress & outliers ii. SLA compliance and escalation metrics iii. Revenue tracking and fee collection iv. Inspection schedules and outcomes v. User activity and system performance vi. aeronautical studies vii. obstacle management viii. jurisdictional oversight The final count, nature, indicators and layout of the dashboard will be formalized by the selected bidder at the time of SDD workshops.		
193	Dashboards	The system shall implement a Dashboard Generation Wizard, with a flexible web application interface, configurable by a naive user without GIS expertise, having drag-and-drop-able widgets, filtering options, data binding and configurable dashboard / report generation which can be used by end-users to create their dashboards.		
194	Dashboards	This Dashboard Generation Wizard should be integrated with map viewer and external data sources (e.g., satellite imagery, drone data, government APIs)		

195	Dashboards	The system shall ensure that GIS dashboards shall support visualization of the AAI data layers including but not limited to: i. Obstacle Locations (e.g., buildings, towers, chimneys, windmills, statues) ii. Natural Terrain Elevation (using DEM/SRTM data) iii. Airport Reference Points and Runway Layouts iv. Obstacle Limitation Surfaces (OLS) and ICAO Annex 14 Surfaces v. Air Route Corridors (including extended routes beyond 56 km) vi. Jurisdictional Boundaries (e.g., ULBs, state borders, airport zones) vii. NOC Application Sites (with status indicators) viii. Inspection Routes and Field Survey Tracks ix. Buffer Zones and Safety Margins x. Satellite and Drone Imagery Overlays xi. Change Detection Layers (2D/3D built-up area changes)		
196	Dashboards	The system shall enable export of GIS data from the dashboards in commonly used and interoperable formats, including but not limited to: i. Shapefile (.shp) ii. GeoJSON (.geojson) iii. KML (.kml) iv. CSV with geospatial coordinates v. TIFF/GeoTIFF for raster data etc. including projection metadata, for vetted stakeholders and internal analysis.		
197	API Development and data sharing	The system shall be able to constrain external data sharing to vetted formats (Shapefile/GeoJSON/KML/KMZ/CSV/GeoTIFF), with metadata and projection information; public/applicants' downloads shall omit sensitive fields, and internal exports shall follow least privilege sharing. The solution shall provide a comprehensive, versioned REST API layer covering all core modules (airport/runway master, applications, scrutiny, processing, approvals, payments, document generation, communications, audit logs, GIS/3D services, reporting, integrations). API shall support multi-tenant onboarding for multiple airport operators and stakeholders. API shall include OpenAPI/Swagger documentation, authentication/authorization, throttling, and auditability.		

198	API Development and data sharing	The system shall be able to constrain export/download of data and letters to watermarked PDFs and vetted data packages; bulk downloads shall be rate-limited and logged.		
199	3D Scene Viewer	The system shall be able to present a 3D terrain basemap and existing obstacle blocks using elevation services and multi-patch generation from 2D footprints; volume/area computations shall be available for large structures in support of planning, fee assessment, and shielding checks. The solution shall include an integrated 3D measurement tool for aerodrome safeguarding use cases, including 3D distance, height, clearance, and profile measurements (point-to-point, line, polygon, and volume as applicable) measurement outputs in required units with metadata (coordinate reference, geoid model, timestamp, user) , ability to export measurement results into application records and reports		
200	3D Scene Viewer	The system shall enable 3D Scene Viewer for applicants and NOC Reviewing Officer for zoning/safety violations		
201	3D Scene Viewer	The system shall enable virtual simulation of a structure against AGA, OLS, PANS-Ops and CNS surfaces with visual overlays for OLS/PANS-OPS/CNS surfaces as required, with clear depiction of infringements and margins.		
202	Change Detection	The system shall be able to run built up area change detection for unauthorized construction in AAI define AOIs using AI/ML and raster/vector analytics on satellite/drone imagery layers; workflows shall compute multi-temporal change (e.g., image differencing, object detection), generate 2D/3D built-up deltas, and alert designated officers for suspected violations.		
203	Change Detection	The system shall utilize AI/ML-driven change detection algorithms to analyze 2D and 3D built-up area changes using satellite and drone imagery, GPS beacons/sensors, DEM based terrain modelling or any other suitable type of data		
204	Change Detection	The system shall ensure the system can identify deviations from approved plans or unauthorized developments by comparing historical and current imagery data in near real time		
205	Change Detection	The system shall ensure to flag unapproved obstacle growth, and route detections to departmental dashboards for review prior to enforcement.		

206	Change Detection	The selected bidder shall evaluate and implement appropriate data creation and survey mechanisms to support the change detection process, in agreement with the concerned department/stakeholders		
207	Change Detection	The selected bidder shall generate 3D building blocks from 2D satellite imagery to enhance obstacle analysis and improve the accuracy of built-up area change detection		
208	Change Detection	The system shall implement features to automated 3D extrusion of buildings from architectural drawings/ models/ other types of input data submitted by applicant.		
209	Change Detection	The selected bidder shall ensure integration of drone-based imagery and satellite data into the system for comprehensive spatial analysis and alert generation		
210	Aeronautical Data Ingestion Pipeline	The system shall establish Data ingestion pipelines for VHR satellite imagery with validation of Number of bands, Image depth, Spatial resolution, Image compression, Orthorectification, Color correction, Pixel shift, Adjacent image shift, building edges visibility, mosaicking, color balancing, seamline removal, georeferencing, co-registration with Base imagery and time-stamping.		
211	Mobile Application	The system shall provision a Mobile Application for the applicant user for location-based NOC submissions, featuring geotagging, geofencing, DIGIPIN integration, and multilingual support. Said application shall work in Mobile and/or Tab devices used by AAI staff.		
212	Mobile Application	The system shall be able to implement a mobile application experience for applicants to submit geotagged NOC requests with geofencing, coordinate capture from device GPS, photo attachments, and offline synchronization capability; submissions shall sync to the central application layer and support digital signatures where permissible. Said application shall work in Mobile and/or Tab devices used by AAI staff.		
213	Mobile Application	The system shall be able to integrate site visit geofencing (e.g., 50 m tolerance) in mobile field app, restrict form submissions to geofenced areas, and enforce precise coordinate capture with device accuracy thresholds; submissions outside defined geofences shall be flagged for review. Said application shall work in Mobile and/or Tab devices used by AAI staff.		

214	Mobile Application	The system shall be able to assume field devices used for inspections support smart survey forms, accuracy thresholds, secure device management, offline sync and geofencing. Said application shall work in Mobile and/or Tab devices used by AAI staff.		
215	mobile application for applicants	The system shall be able to support applicant mobile submissions in multiple languages, provide guided assistance, auto-generate undertakings/justification letters from structured forms, and pre-validate completeness using rule engine before formal submission.		
216	mobile application for applicants	The system shall provide a mobile application for applicants to facilitate location-based submission of NOC applications		
217	mobile application for applicants	The mobile app shall integrate features such as geofencing, geotagging, and DIGIPIN to accurately capture and validate locational information during the application process.		
218	mobile application for applicants	The selected bidder shall ensure the app is user-friendly, secure, and compatible with major mobile platforms (Android/iOS), with real-time synchronization to the centralized database of the system		
219	mobile application for applicants	The selected bidder shall ensure the app provides localization through multilingual support and user guidance to enhance accessibility and ease of use for diverse applicant groups from all over India		
220	Mobile App for Departmen t Users	The system shall implement a mobile solution for departmental users to support field inspections and on-site verification, wherever applicable. This solution shall support feed from automated Lidar based survey to replace manual site verification, as per AAI policies.		
221	Mobile App for Departmen t Users	The mobile app shall include functionality to: i. Record inspection details and observations. ii. Capture geo-tagged photographs. iii. Access application data and location maps. iv. Synchronize inspection data with the backend system v. Integrate street view feature to assist field users during field verification, enabling visual validation of site conditions.		
222	Mobile App for Departmen t Users	The selected bidder shall ensure to explore, suggest to AAI and / or implement data acquisition mechanisms—such as camera-mounted vehicles—to generate street-level imagery required for enabling the street view functionality		

223	Mobile App for Department Users	The system shall ensure offline capability for use in low-connectivity areas and secure data handling during synchronization		
224	Mobile App for Department Users	The system shall be able to assume that applicant geotagged photos/videos using mobile devices will be stored with location and time metadata; manipulations and re-uploads shall be tracked, and tamper-evident hashes shall protect integrity where feasible		
225	Shielding Analysis using DEM Information	The system shall facilitate Automated Shielding Analysis Module using 3D terrain data and configurable parameters to streamline NOC issuance decision making and reduce manual intervention in this process		
226	Shielding Analysis using DEM Information	The system shall implement an automated Shielding Analysis Module to assess the feasibility of issuing No Objection Certificates (NOCs) for candidate obstacles shielded by natural terrain features leveraging Digital Elevation Models (DEMs) for terrain analysis. The system shall be able to conduct shielding analysis using 3D terrain basemap and Digital Elevation Models (DEM) by calculating terrain profiles and line-of-sight between airport/facilities and proposed obstacles; to determine whether natural terrain provides shielding under standard/configurable tolerances		
227	Shielding Analysis using DEM Information	The system shall integrate configurable parameters, including the standard (but configurable) 16-meter shielding tolerance, small angle – large angle etc. to allow flexibility based on regulatory or operational requirements		
228	Shielding Analysis using DEM Information	The system shall be able to conduct shielding analysis by sampling DEM profiles along facility–obstacle rays; classify "shielded" when max(terrain) ≥ obstacle top − tolerance (e.g., 16 m); attach the profile chart to the case.		
229	Shielding Analysis using DEM Information	The selected bidder shall explore and suggest to AAI on advanced data acquisition methods, such as camera-mounted vehicles, to collect, update and enhance the data accuracy and reliability of terrain modeling, shielding validation and site verification etc. The proposed system require regularly updated 2D and 3D data to be provided by the Authority for decision making purposes.		

230	Shielding Analysis using DEM Information	The selected bidder shall collaborate with relevant departments at AAI to finalize technical specifications of data sources, and validation protocols to ensure compliance and operational effectiveness of shielding analysis module.		
231	API Development and data sharing	The system shall provision to offer selective sharing of NOC data with private airport operators, Urban Local Bodies (ULBs), Government bodies (BIS, Gati Shakti etc.) , and internal sources using industry-standard APIs		
232	API Development and data sharing	The system shall implement API clients and consumers to facilitate automated, bidirectional communication with external applications, eliminating the need for manual intervention		
233	IOT sensor-based data integration	The system shall facilitate APIs bound communication conforming to industry standards for seamless ingestion and integration of IoT sensor-based data, enabling real-time data exchange with external applications to establish IoT data exchange, enhancing automated airport operations and decisions		
234	Configurable future updates in Revenue management	The Revenue management module shall ensure configurability of: a) fee calculation logic to accommodate alternate methods such as volume-wise, floor-wise, or area-wise calculations, in addition to the currently adopted building-wise approach. b) to manage policy changes, such as the current exemption of the first NOC fee, allowing future updates without system redevelopment		
235	Configurable future updates in Revenue management	The system shall be able to implement a configurable revenue management logic that computes fees (building-wise, floor-wise, area-wise, volume-wise); receipts/invoices shall be integrated with SAP/AIMS via API, and exemptions (e.g., first NOC fee) shall be toggled in configuration		
236	Connectedness Validation	The system shall incorporate AI-assisted functionality to logically group buildings for fee assessment and validate claims of 50% connectedness between towers/buildings using 2D and 3D drawings/models submitted by applicants. The system shall be able to validate "50% connectedness" claims for grouped buildings using 3D models submitted by applicants (e.g., glTF/OBJ converted to multi-patch) and spatial analytics to compute connected volumes or shared footprint ratios, reducing manual review complexity.		

237	Secure, paperless workflows	The system shall implement a digital alternative to physical stamp paper submission by integrating Aadhaar-based electronic verification mechanisms such as Protean e-Sign and DigiLocker. It shall be able to integrate digital verification alternatives to physical stamp paper through Aadhaar based e-Sign/DigiLocker where permissible, attach verified documents to application records, and reflect signatures in the approval lineage. The solution shall be fully paperless and digitally processed end-to-end, and fully compliant with the Information Technology Act, 2000 and associated rules/guidelines.		
238	secure, paperless workflows	The system shall ensure the solution enables secure, legally compliant authentication and document validation, thereby streamlining workflows and reducing dependency on manual, paper-based processes.		
239	secure, paperless workflows	The system shall facilitate seamless integration of these digital services into the existing application ecosystem to enhance user experience, improve turnaround time, and support government initiatives for paperless governance.		
240	secure, paperless workflows	The selected bidder shall coordinate with relevant authorities and service providers to ensure the solution adheres to applicable legal and regulatory standards		
241	Configurable Rule Engine	The system shall provision a configurable Rule Engine module in production environment with feature to validate changes prior to release of a new configuration with options to Proceed or Roll back – w.r.t new surfaces and planning feasibility etc. All computational modules shall include deterministic formula control, unit handling, rounding rules, versioning, and automated test suites.		
242	Configurable Rule Engine	To ensure long-term adaptability and compliance with evolving national and international aeronautical policies, the system shall ensure designing all workflows as modular/configurable components, enabling independent updates, replacements, or extensions without affecting the overall system architecture		

243	Configurable Rule Engine	The system shall be able to ensure all height sheets, diagrams and outputs are automatically watermarked, carry item IDs and version stamps, and are traceable to the configuration set used at compute-time.		
244	Configurable Rule Engine	The system shall implement a configurable rule engine to govern application logic, allowing dynamic updates to: i. Approval hierarchies ii. Document requirements iii. Fee structures iv. Validation checks v. Policy-based routing		
245	Configurable Rule Engine	The system shall ensure workflows are adaptable to future changes in: i. GSRs of AAI ii. ICAO guidelines iii. DGCA regulations iv. Ministry of Civil Aviation directives v. Local/state-level aviation policies		
246	Configurable Rule Engine	The system shall be able to implement a rule engine that encapsulate AGA, CNS, PANS-OPS formulas; configuration changes shall be versioned in a repository and testable in a sandbox with rollback to prior versions. The system shall also provide a workflow simulation environment (sandbox) to test new configurations, rules, or process changes before deployment in production to validate new rules before deciding for go-live. It should work like a simulator environment in production that validates new rule/parameter changes on representative test cases without impacting live results, support proceed/rollback options, and record simulation outcomes for governance.		
247	Configurable Rule Engine	The system shall be able to assume departmental agreement on regulatory templates and rule parameters (GSR 751E/770E slopes, angles, distances; DOC 8168/9905 criteria) before go-live; rule engine configuration changes shall undergo sandbox simulation and approval with rollback capability.		

248	Configurable Rule Engine	The system shall develop a comprehensive administrative interface to manage: i. Workflow configurations ii. Rule engine parameters iii. User roles and permissions iv. SLA thresholds and escalation rules v. Document templates and formats		
249	Configurable Rule Engine	The system shall be able to constrain rule changes to administrative interfaces with version control, and every change shall record parameters, author, timestamp, environment, simulation tests run, and deployment status.		
250	Configurable Rule Engine	System shall provide a dashboard for monitoring active configurations and system health within the above-mentioned administrative interface.		
251	Configurable Rule Engine	The system shall enable 'Proceed' and 'Rollback' options within the sandbox to: i. Validate changes without impacting live operations ii. Revert to previous configurations in case of errors or policy reversals iii. Maintain system stability during updates iv. Rollback to previous versions when required.		
252	Configurable Rule Engine	The system shall be able to support continuous updates to formulas/parameters as Annex 14 and national rules evolve, with sandbox simulation of representative cases and rollback protection, and document each deployment with height-sheet sanity checks and sign-offs.		
253	Configurable Rule Engine	The system shall implement a version control mechanism for all workflow configurations and rule sets, enabling tracking of historical changes and ensuring that all configuration changes are: i. Logged with timestamps and user details ii. Auditable through the administrative interface iii. Exportable for backup and compliance review		

254	Configurable Rule Engine	The system shall be able to store configuration/adaptation files (surface parameters, slopes, facility rules, auto-settle thresholds, fee policies) with metadata, apply them at runtime, and track changes with timestamps, user IDs, and change descriptions for auditability in a dedicated file server to store configurational metadata viz.: i. Workflow definitions ii. Rule engine parameters iii. SLA thresholds iv. Document templates v. Routing logic		
255	Automated CCZM creation	The system shall have the capability of auto generation/ auto-update of Color-Coded Zoning Map (CCZM) in real time considering all the surfaces of AGA, CNS, PANS-OPS and studies including Aeronautical & Shielding study for high terrain areas based on Aerodrome Safeguarding Circular (ADSAC) 04 of 2020 and other policy documents (present as well as upcoming). Any CCZM not generated as per laid down criteria / specifications shall be treated as a high severity BUG.		
256	Automated CCZM creation	The system shall be able to automate CCZM grid generation and update using Geoprocessing models in desktop geospatial authoring tool authored and shared to the geospatial application server as web tools; departmental users shall review CCZM edits in and on approval, promote them to Go live via Data Store/replica workflows and controlled deployment pipelines.		
257	CCZM Implementation	At Level 1, the applicant shall have access to a publicly available section of the web application where the Color-Coded Zoning Map (CCZM) is published/updated		
258	CCZM Implementation	The system shall be able to provide an applicant self-evaluation experience that publishes interactive Color-Coded Zoning Maps (CCZM) as tiled layers and feature layers in content portal, allow users to query permissible top elevation (PTE) per grid, and indicate whether a NOC is required when RTE<PTE using client-side expression/validation engine in Web Map/3D web scene viewer pop-ups.		
259	CCZM Implementation	The CCZM shall display permissible height limits for the selected location Above Mean Sea Level (AMSL). It should enable zoning visualization that dynamically adapts to terrain elevation using integrated 3D geospatial data.		

260	CCZM Implementation	If the applicant's required height is equal to or below the CCZM permissible height, the system shall indicate that no NOC is required		
261	CCZM Implementation	If the applicant's proposed height exceeds CCZM limits, the system shall guide them to proceed to Level 2, where they must register and formally apply for NOC.		
262	Automated CCZM creation	System should calculate CCZM map grids based on AGA, CNS and PANS-Ops criteria with permissible height		
263	CCZM automation tool	Provision to be made in proposed system to fully automate the CCZM preparation and updating allowing AGA, CNS and PANS-OPS users to make necessary adjustments directly within the system including generation of CCZM PANS-OPS templates		
264	CCZM automation tool	The system shall ensure the grid size selected for CCZM creation (Default 1' x 1' Grid) may be configurable to 30" x 30" Grids in areas closure to the airport max. up to 4 kms to reduce the RED Zone in the CCZM or to accommodate special requirements from Urban Local Bodies (ULBs)/Development Authorities. Red Color grid indicates that no predetermine top elevation is given. For sites in red area, compulsory NOC applications are to be filed.		
265	CCZM Implementation	The CCZM thus created is to be verified by AGA, CNS and PANS-OPS point of view and therefore distributed to the respective AGA/CNS/PANS-Ops users for verification of the permitted top elevation through		
266	CCZM Implementation	After obtaining all the comments, the Nodal Officer-CCZM shall compile all the comments and update the CCZM to incorporate the feedback to maximum extent possible and present the CCZM along with feedback to the GM (ATM-DoAS) for approval		
267	CCZM Implementation	The Nodal Officer-CCZM (DO-CCZM) shall ensure publication of CCZM in grid format as well as CCZM with geographical features. Nodal Officer-CCZM shall also ensure that the CCZM is incorporated into proposed solution and a copy of the approved CCZM is provided to the respective airport for further distribution to the ULBs.		

268	CCZM Implementation	Shape file / other GIS format data may also be provided to the Local Bodies so that the CCZM grids are superimposed by the Local Bodies on the city maps for better appreciation and utilization		
269	Automated grid correction in CCZM	The system shall ensure grid correction in CCZM for Accurate Height Calculations by applying geospatial grid alignment techniques to correct distortions and improve vertical height precision. The system shall be able to implement automated grid correction for CCZM using geospatial alignment to basemap features, ensure color ramp consistency across airports, and allow departmental edits through secured edit templates.		
270	CCZM Implementation	This module shall enable temporal navigation to review zoning map revisions and policy changes over time for the authorized user		
271	CCZM Implementation	The system shall facilitate integrated end-to-end CCZM Approval workflow within proposed system including all stakeholders like Survey carto, planning, AGA, CNS, DOAS, PANS-Ops etc. with 360-degree alert/notification and no manual intervention.		
272	Interpretation and implementation of the CCZM	In case the desired height is more than the CCZM permitted top elevation, then the applicant shall apply online for NOC for height clearance to AAI through proposed system		
273	CCZM Implementation	The selected bidder shall refer to the guidelines of Aerodrome Safeguarding Circular (ADSAC) 04 of 2020 CCZM for implementation details on CCZM in the proposed solution		
273.1	CCZM Implementation - VERIFICATION PROCESS BY CNS USER	As per indicative flowchart depicted below in Figure 8. The selected bidder is advised to confirm this flow before implementation with the DoAS users.		

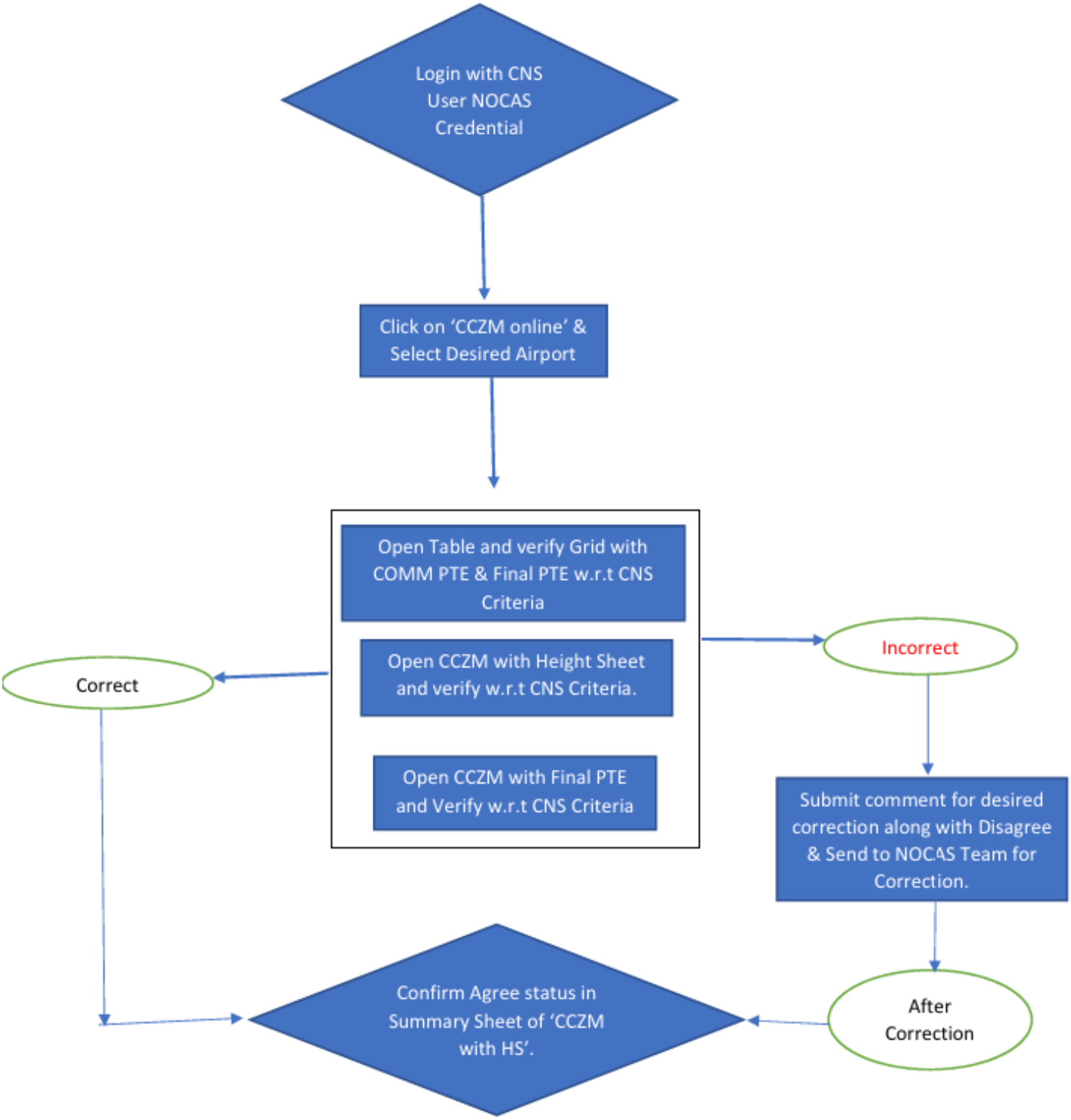


Figure 8: CCZM Implementation - VERIFICATION PROCESS BY CNS USER

274	Technical Evaluation by AGA, CNS, PANS-OPS	Within Level 2, the system shall evaluate the proposal through two possible cases: a) AUTO-SETTLEMENT b) TECHNICAL ANALYSIS		
275	NOC Processing Level 1: Auto Settlement	A) The system shall be able to trigger auto-settlement when RTE ≤ CCZM or other auto-settle thresholds (e.g., IFR/VFR distance bands) and autogenerate a system authorization letter after due approval workflow. B) The system shall process auto settlement in cases where the Requested Top Elevation (RTE) is less than the Permissible Top Elevation (PTE) defined by aviation safety parameters/CCZM. C) In such cases, the application shall first undergo document verification. Post-verification, it shall be routed to the Auto-Settlement Module for system-generated approval without manual intervention.	D)	E)
276	Auto settle criteria:	The NOC application filed through online system is auto-settled if the Requested Top Elevation (RTE) is below the CCZM permitted to elevation. A system generated assessment letter is issued to the applicant.		
277	Auto Settle criteria for all calculation types (SACFA + building)	IFR CRITERIA: IFR Criteria is applicable to both building and SACFA Mast, when the site lies beyond 56 km from IFR Airport and Requested Height (Building Height + Mast Height) is less than 150 mts. AGL. VFR CRITERIA: VFR Criteria is applicable to both building and SACFA Mast, when the site lies beyond 20 km from VFR Airport and Requested Height (Building Height + Mast Height) is less than 150 mts. AGL. CCZM CRITERIA: NOC Application is Auto Settled through CCZM criteria when the Requested Top Elevation (RTE) is below the Permissible Top Elevation (PTE) of CCZM grid in which the site lies. CCZM criteria are applicable to both building and SACFA Mast. 7-40 CRITERIA: 7-40 Criteria is applicable for SACFA Mast cases only, when the site lies beyond 7 km from nearest airport and Requested Top Elevation is less than 40 + Runway End Elevation /ARP Elevation. 56-150 CRITERIA (IFR): 56-150 Criteria is applicable for SACFA		

		Mast cases only, when the site lies beyond 56 km from nearest airport and Requested Top Elevation is less than 150m + Runway End Elevation /ARP Elevation. 20-100 CRITERIA (VFR): 20-100 Criteria is applicable for SACFA Mast cases only, when the site lies beyond 20 km from nearest airport and Requested Top Elevation is less than 100m + Aerodrome Elevation /ARP Elevation.		
278	Integration with ULB CAF	In case, the color of the home grid is RED, the applicant shall apply online for NOC for height clearance to AAI through the proposed solution for issuance of NOC or through the Common Application Form (CAF) with the Urban Local Bodies (ULB) where the web service of ULBs have been integrated with NOC website for single window clearance in accordance with Ministry of Urban development initiative for 'Ease of Doing Business'.		
279	NOC Processing Level 2: Technical Analysis	If the RTE exceeds permissible limits: Step 1: The system shall automatically forward the application for document verification. Step 2: If any modification is needed in the submitted documents, The system should prompt review officer to send application back to the applicant for document modification. Step 3: In case documents are verified successfully the system should send a payment link and notify applicant for document approval and payment deposit. Step 4: Once payment is verified, the system shall auto-forward the application to relevant expert departments: Step 5: AGA user generates the Height sheet as per OLS Step 6: CNS user will verify the Height sheet generated by AGA w.r.t. CNS criteria and if found any discrepancy then CNS user may regenerate the Same Height sheet or may sent to technical team for correction. In case Multipath is detected then system shall auto-forward the case to CNS(O&M) department who will perform multipath study as per ADSAC 02 OF 2021 or any updated policy SOP for accommodating four coordinates for Multipath study.		

		Step 7: PANS-OPS user generates the Height sheet Step 8: AO completes Site verification Step 9: The system shall onboard each of the stakeholders involved in NOC processing. All these departments shall conduct their corresponding detailed technical assessments, such as height sheet generation, obstacle limitation checks, etc. Step 10: Once all three departments approve the technical evaluation and after multi path analysis report reception, the system shall forward the file to the Designated Officer (DO) of the respective region for final administrative approval. Step 11: After DO approval, the system shall issue the NOC to the applicant.		
280	NOC Processing Level 2: Technical Analysis	The system shall calculate using AI assisted methodology a) risk score and b) severity score while evaluating an obstacle while performing penetration analysis.		
281	NOC Processing Level 2: Technical Analysis	The system shall suggest mitigation options in case of obstacles for height reduction, profile adjustment, shielding solutions, 2030 Guidelines as per AMDT 18 of ICAO Annex 14 and other such technically feasible recommendations.		
282	NOC Processing Level 2: Technical Analysis	The system shall give feedback to the architects and developers to avoid repeated iterations based on submitted artifacts at the time of NOC application.		
283	NOC Processing Level 2: Multipath Study	Multipath Study Analysis is done for ILS/LLZ CAT-II & CAT-III as per guidelines provided in GSR 751/E.		

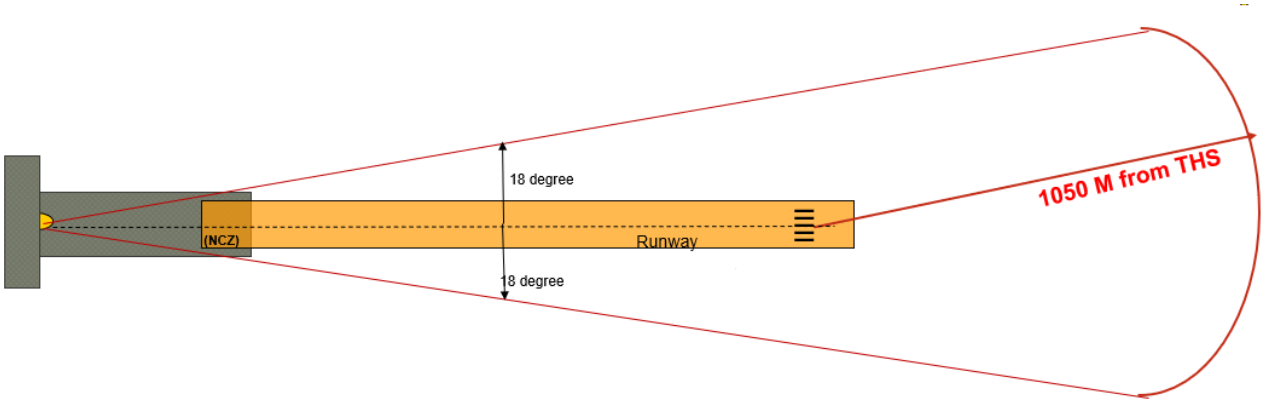


Figure 9: Criteria of Multipath Study for LLZ Antenna

283.1	NOC Processing Level 2: Multipath Study	Para 2.3.3 of GSR-751 (E): Notwithstanding anything in para 2.3.1 and 2.3.2, in all airports having/intended to have cat II and cat III ILS, all object in sector of + 18 degree for medium aperture antenna localizer and + 15 degree for wide aperture LLZ antenna, up to the distance of 1050M beyond threshold, to be analyzed for their potential multipath effects on the performance of ILS . Reference: Aerodrome Safeguarding Circular (ADSAC) 02 of 2021-Corrected Version Please refer to Figure 9 above for depiction of multipath study criteria.		
284	NOC Processing Level 2: Protection of Localizer Service volume	Schedule II, Para 2.3 of GSR 751(E) details the service volume of localizer signal propagation which is to be protected: 2.3.1 Within 10 degrees' azimuth in front of LLZ antenna, an object (located beyond the area specified in Annexure 1) should not subtend an angle of elevation more than 0.75 degrees at the center of antenna array. 2.3.2 Within +10 degrees to +35 degrees LLZ azimuth in front of antenna an object (located beyond the area specified in Annexure I) should not subtend an angle of elevation more than 1.1 degree.		

285	NOC Processing Level 2: Protection of Localizer Service volume & Multipath Study	The system shall be able to evaluate CNS localizer criteria using angular formulas and DEM-based line-of-sight, including: within ±10° azimuth, vertical angle ≤0.75°; within ±10° to ±35°, vertical angle ≤1.1°; and mandatory multipath analysis for CAT II/III sectors of ±18° (medium aperture) or ±15° (wide aperture) up to 1,050 m beyond threshold, triggering simulation workflow steps when applicable		
286	NOC Processing Level 2: Multipath Study	Multipath study done at CNS-OM Directorate at AAI CHQ before the issue of NOC only for the height permitted through proposed solution.		
287	NOC Processing Level 2: Multipath Study	Multipath study is part of Normal NOCC (Level 2). Multipath study is required to analyze impact of signal detected / deflected / affected by any structure and takes multipath.		
288	NOC Processing Level 2: Multipath Study	All NOC/SACFA cases except essential facility as mentioned in para 8 of ADSAC 04 of 2022 shall be processed for Multipath Study.		
289	NOC Processing Level 2: Multipath Study	CNS O&M dept does this study and provides yes/no but no height clearance is provided in this report. Presently the CNS O&M team is not onboarded in existing system. The proposed system shall onboard this user and provide facility to establish all Multipath study and other study related communication within the proposed solution.		
290	NOC Processing Level 2: Multipath Study	Please refer ADSAC 2 of 2021, GSR-751(E) and GSR-770(E) for implementation details of Multipath Study		
291	NOC Processing Level 2: Multipath Study	The system shall be able to support multipath study triggers in normal NOC flow for ILS CAT-II/III localizer sectors (±15°/±18° up to 1050 m); when flagged, the case shall be routed to CNS simulation team, and the system shall attach the facility geometry, obstacle data and terrain context for export		

292	NOC Processing Level 2: Multipath Study	Currently the sharing of information for this study is manually initiated using an e-file in e-office.aai.aero mentioning the input data, circumstances and need for the study along with required documents. The proposed solution shall ensure end-to-end integration with the system used by CNS O&M users for performing multipath study. The scope of this integration is Rest-API based two-way integration to share requirement data for simulation as input to the simulator and receiving output of simulation study from the simulator to be used for NOC decision making purpose.		
293	Replacing E-Mail E-Office communication by automated workflows in proposed solution	The system shall be able to maintain transaction integrity by disabling multi-channel manual loops (emails/e-office) in favor of in-app document routing and approvals; where emails/e-office are used, the system shall auto-archive correspondence against the case. Note: E-office automation shall cover the workflow with respect to NOC only, as there may be workflow outside NOC subject, which will remain intact on E-office as-is.		
294	NOC Processing Level 3: Appeal Workflow	Applicants aggrieved by the decision of DO (Designated Officer) of any RNOCC at Level 2 – such as disapproval or sanction of a lower height – may file an appeal with the Appellate Committee constituted by MoCA, in accordance with GSR 751E and ADSAC guidelines		
295	NOC Processing Level 3: Appeal Workflow	The appeal workflow shall support a multi-stage evaluation process including: a) Site verification b) Technical re-assessment c) Shielding checks d) Escalation to Appellate Committee for final decision .There will be dedicated module for appellate committee also.		

296	NOC Processing Level 3: Appeal Workflow	Appeal studies comprise of below possibilities: a. Shielding study b. CNS Small angle study + cluster analysis (a and b are default studies within appeal process) c. aeronautical (if case approved by Appellate Committee for this study, fees as applicable) i. AGA study (main) ii. CNS Small angle study + cluster analysis iii. PANS-OPS study d. All of the above		
297	NOC Processing Level 3: Appeal Workflow	During appeal process, like all other actions in the application, the system shall ensure complete traceability with AAI agreed SLAs, Push notifications in case of delays, e-sign / timestamping of user interactions and Audit Trails should be maintained.		
298	NOC Processing Level 3: Appeal Workflow	The system shall sanity-check the eligibility for appeal.		
299	NOC Processing Level 3: Appeal Workflow	A) The system shall ensure that the appeal must be submitted online through the new web-based aerodrome safeguarding portal. Offline appeals will not be permitted in any case. The system shall implement necessary features to ascertain this part of the scope, especially with reference to appeal for cases prior to 01.01.2016 NOCAS1, power lines, windmills etc. B) The selected bidder shall ensure sync of data of historical offline appeal cases into the proposed system before UAT.		

300	Documentation requirements	The system shall check availability, sufficiency & correctness of documents for that appeal request, including but not limited to: i. Copy of the NOC issued by designated officer ii. Architect's justification letter as per State/local regulations iii. Layout plan with scale, north direction, and surveyed coordinates iv. Undertaking on Rs 10 non-judicial stamp paper format available in existing system v. Authorization letter of Undertaking 1D signatory (optional) vi. Certified site elevation and WGS-84 coordinates vii. Site Survey certificate (PDF) viii. Basic layout plan (PDF) ix. Detailed layout plan of plot (in case plot size>5000sqmtrs) x. Elevation plan of buildings (in case plot size>5000sqmtrs) - mandatory xi. Elevation plan of buildings (in case plot size<5000sqmtrs) - optional x To check Connectedness between buildings (on demand)		
301	NOC Processing Level 3: Appeal Workflow	The system shall allow the applicant for choosing from below options: a) Shielding Analysis b) Aeronautical Study and / or CNS Study (Small angle, large angle analysis w.r.t radar) c) All of the above		
302	NOC Processing Level 3: Appeal Workflow	The system shall forward appeal applications with correct documents to the Directorate of Aerodrome Safeguarding (DoAS), AAI CHQ, who examines the appeal for completeness and eligibility before forwarding it for further review. The system will perform Aeronautical study in fully automated man in the middle and integration with CNS ,PANS OPS, FPD systems		
303	NOC Processing Level 3: Appeal Workflow	The system shall notify for Re-evaluation of PTE (Permitted Top Elevation) in the appeal case and detailed re-evaluation is done at Directorate of Aerodrome Safeguarding (DoAS), AAI CHQ as per GSR & ADSACs		
303.1	NOC Processing Level 3: Appeal Workflow -	Please refer Figure 10 for an indicative appeal workflow. The selected bidder is advised to confirm this flow before implementation with the CNS - CHQ users.		

	APPEAL CASE PROCESSING BY CNS USER AT CHQ			

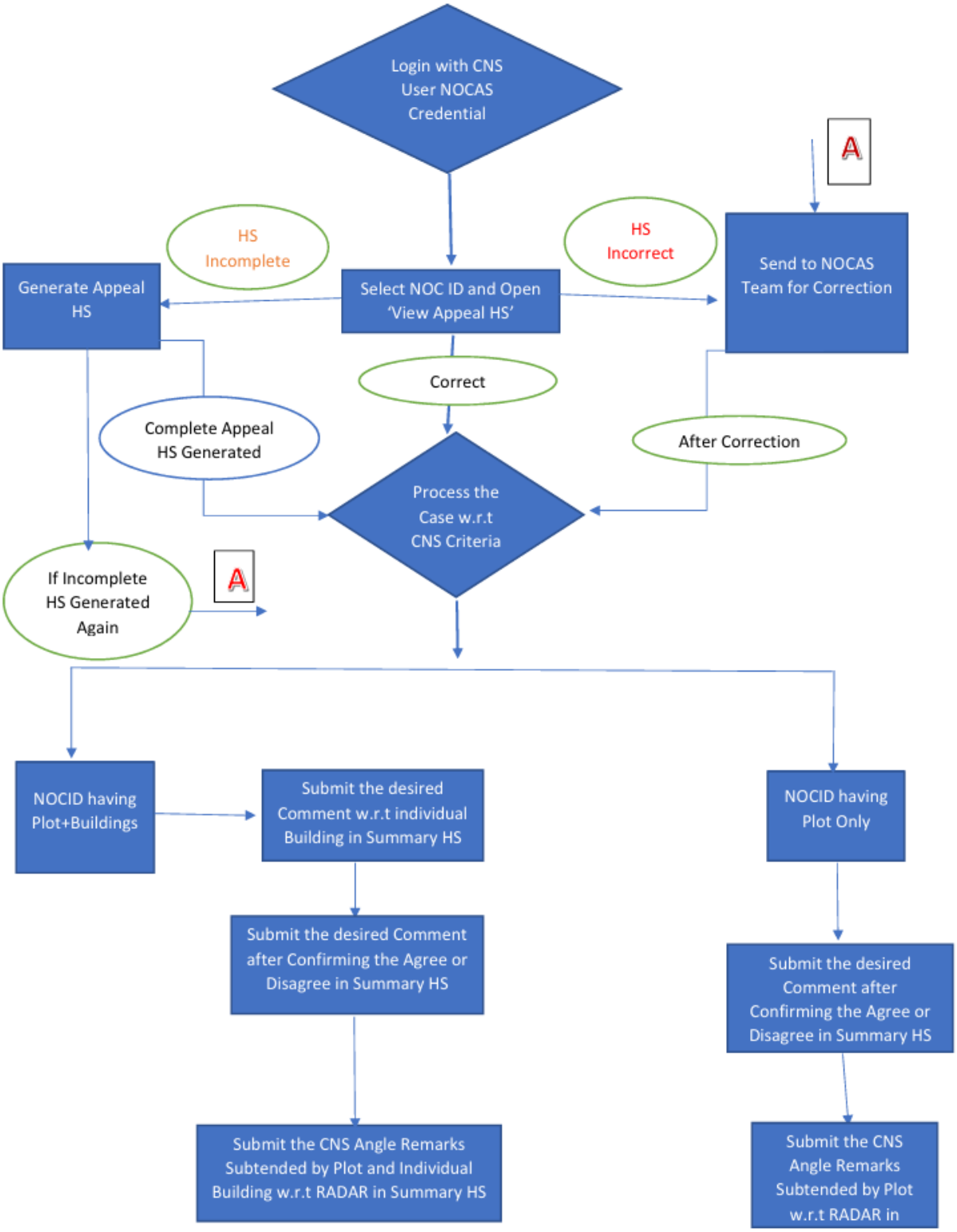


Figure 10: Appeal Workflow for NOC processing

304	Aeronautical Study Guidelines	If required, the system shall facilitate routing of appeal for an aeronautical study/simulation study, conducted to assess the impact of the proposed elevation. This study may include: i. Assessment of OLS (Obstacle Limitation Surfaces) penetration using 3D DEM data. ii. Evaluation of potential interference with CNS facilities (e.g., radar) iii. Information of angle subtended by structure at RADAR for PTE calculation iii. Analysis of impact on PANS-Ops surfaces linked to published or proposed Instrument flight procedures iv. Use of simulations or modeling to determine operational implications		
305	Aeronautical Study Guidelines	Indicative workflow for aeronautical study is as follows. Caution: The selected bidder shall refer to the ICAO, AAI and GSR guidelines before implementation. Appeal → AC-1 scrutiny (send-back cycles) → AO site verification → AC-2 compilation → Shielding (DEM LOS) + CNS small-angle/cluster → Aeronautical Study for AGA lifting (1.27% / 4.11%) if applicable → Committee brief & MoM → DO authorization → Issuance of letter (Normal/Shielding/CNS/AS)		
306	Aeronautical Study Guidelines	The system shall be able to apply special handling for wind farms, high-tension lines and electromagnetic sources, flag them for CNS team review, and apply facility-specific rules (e.g., DVOR 600 m NCZ, radar >11kV lines).		
307	Aeronautical Study Guidelines	The system shall be able to implement CNS power-line, wind-farm, and electromagnetic-source rules (e.g., DVOR 600 m NCZ; ASR/ARSR power-line restrictions up to 1–2 km by voltage class; wind-turbine clearance distances) with configuration facility, flagging cases for CNS review with facility-specific rule application.		

308	Aeronautical Study Guidelines	The system shall be able to compute CNS DVOR/DME clearance using tilt-angle and base-offset criteria (e.g., 1.5° for DVOR, 3 m below base within 150 m for DME; beyond 150 m, tan(3°)) in accordance with GSR 751E and ADSAC guidelines and render service-volume extents up to 20 km in 3D.		
309	Aeronautical Study Guidelines	The system shall have a joint dashboard to display the technical review and study outcomes, assisting the committee to decide whether to uphold, revise or reject the appeal. These options should be available on the dashboard. Recommendations are documented and approved accordingly in the system.		
310	Aeronautical Study Guidelines	The system shall send a detailed report through a push notification converting the official final decision to the applicant through the portal, with the appropriate remarks and any conditions, if applicable		
311	Aeronautical Study Guidelines	The system shall not allow any post-submission changes (e.g., parameters like height, coordinates etc.) in the same appeal. System shall notify the applicant while attempting any change the policy that any post-submission change requires a new appeal submission with revised documents and fee.		
312	Aeronautical Study Guidelines	Once the appeal evaluation and decision process concludes, the outcome shall be updated back in the system. Compliance with revised conditions is monitored, and the case is formally closed		
313	Revenue Management Module	The system shall ensure that all payment invoices must be generated through the proposed solution fully two way integrated with Existing AAI SAP invoicing system		
314	secure, paperless workflows	The system shall be able to realize the Appeal workflow with AC-1 preliminary document scrutiny, send-back cycles (limited and time-bound), AO site verification, and AC-2 technical consolidation, each implemented as discrete but automated workflow sharing a common application ID.		

315	Preliminary Verification (AC-1)	AC-1 Member dashboard in the system should have the capability for auto-management/distribution system of cases to concerned AC-1 team members based on distribution criteria defined by AAI (ex: equal 5000sq.ft and 2000sq.ft cases).		
316	Preliminary Verification (AC-1)	The system shall route the case to allotted Appeal Coordinator-1 (AC1) for initial document scrutiny		
317	Preliminary Verification (AC-1)	The system shall have an option to Send back the application with correction advise if documents are incomplete or incorrect. This notification shall be broadcasted to the applicant and AC1 user.		
318	Preliminary Verification (AC-1)	The system shall be enforcing the limit (03 currently but configurable in the proposed system) for allowing correction & re-submission cycles.		
319	Preliminary Verification (AC-1)	The system shall enforce SLA of 30 days (current but configurable) is applicable for this re-submission		
320	Preliminary Verification (AC-1)	The system shall implement reminders as In-App notification to the internal users (weekly but configurable)		
321	Preliminary Verification (AC-1)	The system shall implement Auto generated Email/SMS triggered to the applicant for periodic reminders (as per stipulated duration- configurable)		
322	Preliminary Verification (AC-1)	The system shall ensure on 30th day(configurable), a notice should be auto-generated to the applicant that non-submission of desired document(s) in another 30 days will lead to case closure without any further communication or reasons.		
323	Preliminary Verification (AC-1)	The system shall auto-close the case after completion of 60th day(configurable) from last send back by AC1		

324	Preliminary Verification (AC-1)	The system shall trigger a system-generated email and/or in-app notification for every correction request during above process		
325	Preliminary Verification (AC-1)	If documents are verified correctly and found satisfied, the system shall notify concerned AO & RHQ to initiate site verification		
326	Preliminary Verification (AC-1)	Simultaneously, AGA, CNS and PANS-OPS experts shall be notified for initiating evaluation by the system		
327	Preliminary Verification (AC-1)	Once AO submits satisfactory report to AC-1 and the three departments complete their evaluation, the system shall generate a summary report before the case can proceed to AC-2 for further assessment		
328	Preliminary Verification (AC-1)	The system shall ensure that this summary report to be incrementally updated at every stage of appeal process with updated previous remarks & approval e-sign and timestamps		
329	Preliminary Verification (AC-1)	The process mentioned above is subject to amendments w.r.t workflow, guidelines and stakeholders. The proposed system shall provide modularity configurability and rule engine to accommodate this amendment without subjecting to redevelopment.		
330	Detailed Verification (AC-2)	The system shall ensure after AC-1 clearance, to notify AC-2 to initiate evaluation / checks of the most restrictive height is from which criteria i.e. AGA, CNS or PANS-Ops.		
331	Detailed Verification (AC-2)	If site is most restricted by PANS-Ops criteria and RTE is not clear, but PTE is found lesser than that from AGA and CNS criteria, then the system shall dispose-off the case with PTE qual to height calculated from PANS-Ops criteria with system generated authorization letter with OK/comments from AC-2 section dashboard. The system shall be able to ensure that PANS-OPS surfaces are non-permissive for penetration and that aeronautical study lifting is applied only to AGA OLS where criteria permit; rule engine shall enforce prohibition consistently.		

332	Detailed Verification (AC-2)	The system shall have the feature for Generating authorization letters only with AC-2 user. The system shall be able to support standardized authorization letter templates for Normal, Shielding, CNS Simulation and Aeronautical Study outcomes, auto-populate case details, allow selective edits, and apply digital signatures before distribution. The system shall be able to support configurable drop-down templates for letter generation (Normal, Shielding, CNS, Aeronautical Study), enforce multi-signatory routes (GM DoAS, GM CNS, GM FPD, DO), and publish final letters with e-signs to applicants and stakeholders.		
333	Predefined/configurable templates for NOC Letter	A) The system shall introduce two NOC letter formats: (a) consolidated single minimum permitted height; (b) CNS Simulation Study with point-wise permitted/approved elevations. B) NOC format for Aeronautical Study to be standardized. C) Specific mention of defense airfield clearance necessary to avoid disputes	D)	E)
334	Detailed Verification (AC-2)	If applicant has requested for "Shielding criteria study only" or If PTE restricted from AGA criteria, AC-2 user shall have a provision in the system to forward the case to CNS(O&M) user for shielding analysis for advising PTE w.r.t. CNS criteria.		
335	Detailed Verification (AC-2)	After shielding analysis, CNS(O&M) forwards the case to AC2 for preparing shielding report		
336	Detailed Verification (AC-2)	The Summary report should be augmented with results accordingly.		
337	Detailed Verification (AC-2)	System shall have provision for Auto Generation of the Shielding Report based on GSRs guideline and DEM elevation, in AC2 user login		
338	Detailed Verification (AC-2)	When processed and cleared through shielding after approval from all three GM (DOAS, CNS and FPD), the system shall provision Auto Generation of Final shielding report.		

339	Detailed Verification (AC-2)	The system shall ensure that the Auto Generated Shielding Report is downloadable in PDF, MS-Word, printable formats.		
340	Detailed Verification (AC-2)	System Generated Shielding report shall include the snapshot/image of the site w.r.t airport with contours/DEM detail of site location used for AGA & CNS study in above step.		
341	Detailed Verification (AC-2)	Once the shielding report is complete, AC2 user to Forward the report to GM DOAS for Approval		
342	Detailed Verification (AC-2)	GM DOAS to forward the same to GM CNS and GM FPD for respective signatures.		
343	Detailed Verification (AC-2)	Both GM CNS and GM FPD will verify, sign and then forward the report to GM DOAS		
344	Detailed Verification (AC-2)	GM DOAS will send the case back to AC-2, from here AC-2 may forward to AC-2 section users for putting up in upcoming Appellate committee meeting (ACM), if required.		
344.A	ACM Presentation Module	A complete automated suite for Aerodrome Committee Meetings (ACM) that generates: a) Case Briefs. b) Minutes of Meetings (MoM). c) Authorization Letters (supporting existing or improved/modernized formats). d) Public Transparency: Automated display of MoM on the NOCAS website. e) Legal Safeguards: Implement a "Legal Case Flag" to exclude sensitive or sub-judice cases from public MoM displays.		
345	Detailed Verification (AC-2)	For the ACM, the system shall provide a feature for auto generating brief, as per the template for brief decided by AAI. The system shall ensure configurability of this template to accommodate changes in the format.		

346	Detailed Verification (AC-2)	The system shall provide feature for the Brief to be downloaded in MS-Word format		
347	Detailed Verification (AC-2)	The system shall ensure the workflow of Submission of the Shielding report with brief to Appellate Committee (ACM) for further decision (approved/deferred)		
348	Detailed Verification (AC-2)	The system shall ensure fulfilment of below checklist for ACM Inputs: 3D simulation of the case, Brief, calculation parameters & results, key params (RTE, PTE etc.), report (if required). In case any item is missing from this list, the system shall provide in-app push notification to the stakeholder concerned with due date. The system shall ensure configurability of this checklist.		
349	Detailed Verification (AC-2)	The system shall ensure that, in case of a deferred decision in the ACM, remarks from committee members must be a mandatory input. This feature to input remarks should be available in each of the member's login.		
350	Detailed Verification (AC-2)	The system shall be able to assume committee workflows require mandatory remarks on deferrals, digital signing where permissible, and publishing of approved minutes on internal/public portals with version and timestamp.		
351	Detailed Verification (AC-2)	The system shall be able to record committee deferrals with mandatory remarks, auto-carry over cases to next agenda, and re-generate updated briefs and minutes automatically from the latest state.		
352	Detailed Verification (AC-2)	The system shall be able to generate AC-2 briefs and Appellate Committee Minutes of Meeting from auto-fetched application content and member remarks, allow committee review and edits, publish approved MoM as documents, and route outcomes for authorization letter issuance to DO. The system shall have minutes of meeting generation feature for an ACM within AC-2 login, as per agreed but configurable template.		

353	Detailed Verification (AC-2)	The system shall establish workflow for the Minutes to be submitted for review & approval to members of Appellate committee meeting (only who were present in the meeting). Committee members will have editing option to add/modify comments.		
354	Detailed Verification (AC-2)	The system shall ensure Minutes of meeting to be downloadable in editable PDF, MS-Word, printable format.		
355	Detailed Verification (AC-2)	In case of modified comment, the system should allow AC-2 users to prepare final Minutes and have a feature to resubmit the same to committee members.		
356	Detailed Verification (AC-2)	After approval from committee members, upon notification to the AC-2 user, the system should have a feature for Minutes to be auto-published on proposed solution's public interface view.		
357	Detailed Verification (AC-2)	The system should establish the workflow so that the final Authorization letter as per template (configurable) can be sent for approval by GM-DoAS and then issued by AC-2 and further sent to the DO with a copy to internal users, AO and Applicant along with email/SMS/in-App notifications.		
358	Detailed Verification (AC-2)	In case, Applicant RTE rejected through shielding, and wants to appeal further and need aeronautical study, then system shall establish below workflow:		
359	Detailed Verification (AC-2)	System shall allow AC-2 users to perform height sheet generation. The system shall be able to calculate and display permitted heights with transparent formula boxes (for authorized users) showing angles, distances, datum elevations, and intermediate steps; these shall be rendered as pop-ups in web apps and embedded in downloadable reports.		
360	Detailed Verification (AC-2)	The system shall be able to maintain "Most Restrictive From" attribution (AGA/CNS/PANS-OPS) for each computed PTE, and drive the subsequent appeal or study workflow based on that attribute		

361	Detailed Verification (AC-2)	System shall allow AC-2 user / Applicant to Upload all necessary document, compiled with sheets.		
362	Detailed Verification (AC-2)	System shall route the case to nominated members of sub-committee, once they approved send case for payment links.		
363	Detailed Verification (AC-2)	a) System shall maintain audit trail of this workflow with timestamp and user ID of concerned person taking the action and provide authorized users with an option to view new & previously generated height sheets. b) Old height sheets shall be preserved in the central database as tamper proof, digitally signed artifacts with metadata and explanation of calculations and constraints. c) Generated outputs (NOC letters, annexures, deficiency letters, orders) shall be electronically verifiable and tamper proof.	d)	e)
364	Detailed Verification (AC-2)	The system shall enable AC2 to raise fee payment requirement (Aeronautical Study or Shielding).		
365	Detailed Verification (AC-2)	System shall auto-generate payment links and send them to the applicant.		
366	Detailed Verification (AC-2)	System shall allow the applicant to upload required documents (e.g., Undertaking 1E) for further study.		
366.A	Undertaking 1E Integration	The system shall a) Mandatory link Undertaking 1E with the unique NOCAS ID. b) impose a requirement for Construction Status Elevation Photographs to be uploaded as part of the 1E compliance.		
367	Detailed Verification (AC-2)	Once payment and documents are uploaded, the system shall send the case to AC-2 for verification of documents and fee receipt.		

368	Detailed Verification (AC-2)	After AC2 verification, the system shall route the case simultaneously to CNS, AGA and PANS-Ops user dashboards / login		
369	Detailed Verification (AC-2)	The system shall facilitate each departmental user to review document, Provide Technical analysis, Upload supporting files, Validate RTE and PTE		
370	Detailed Verification (AC-2)	The system shall allow CNS and PANS-Ops department user to nominate officers for site visit. The system shall Auto-generate a Site Visit Performa to be notified to nominated officers The system shall allow upload of: • Coordinates verification report • TE[Total elevation] measurement readings • Field inspection notes		
371	Detailed Verification (AC-2)	On due date, site visit by all AS / CNS study team members will take place. 1. Site visit report as per site visit Performa will be filled by team members for each case in commercial grade rugged tablet & stylus provided by AAI. 2. A geofenced mobile application dedicated to this use case to be developed as per specifications of the users to be gathered during SDD workshops (e.g. Geotagged photo and video evidence captured, location precision below 5m etc., Geofencing limit of 50m or less etc.) 3. After site visit report is filled and signed by team members, AO and site owner / owner representative, the report can be saved as: a. Save as Editable Draft to be submitted later b. Final Submission of site visit report by all AS/CNS team members. 4. After final submission, this site visit report will also be shown in AO and Applicant dashboards of proposed solution (along with the AC-2 dashboard. 5. Now in the cases where 150mtrs data is asked to AO will be checked by AC-2 for requirement of 150mtrs data by using as per OLS penetration calculation sheet. 6. If OLS penetration is less than CNS Permissible Top Elevation, then 150mtrs data is not required from AO a. Then AC-2 will forward the case to AS/CNS team members for report preparation w.r.t. AGA, CNS & PANS-Ops b. Once report is prepared by concerned AGA, CNS & PANS-		

		Ops members, the case will be forwarded to the AC-2 c. Now AC-2/AC2-User will prepare a brief of the case(s) to present at Appellate Committee Meeting (ACM). d. This brief will be forwarded to GM DoAS for review/approval e. GM DoAS to send the case(s) to ACMs dashboard f. After this meeting to be held (Shielding workflow to be added here up to authorization letter). 7. If OLS penetration is greater than CNS Permissible Top Elevation, then 150mtrs data is required from AO a. AO will provide the details of all adjacent building(s)/structures around 150mtrs of the proposed site (plot)/building(s) within timeline as prescribed by Competent Authority (AAI or MOCA) b. Then this data will be sent by AO to AC-2 and AC-2 will send data to GM DoAS for further forward to GM CNS O&M to check small object in cluster also as per their SOP. c. GM CNS O&M will provide PTE with remark and send back to GM DoAS and subsequently GM DoAS will send to AC-2		
372	AC-2 Compilation	The system shall establish a workflow to: a) Route site visit data to AC-2. b) Allow AC-2 users to compile all field reports. c) Auto-generate the Draft Aeronautical Study (AS) Report		
373	AC-2 Compilation	The system shall be able to track site visit planning for aeronautical/CNS studies by forming teams (min/max members per directorate), batch-forwarding cases, generating site-visit proformas as smart survey forms forms/PDF, and synchronizing outcomes to the AC-2 compilation dashboard		
374	AC-2 Compilation	The system shall be able to support batch case forwarding to directorate heads for team formation and review, with templated email/in-app notifications to AO, applicants and RNOCC/stations; notification templates shall be editable and versioned		
375	AC-2 Compilation	The draft Aeronautical Study Report shall appear on the logins of the three departments - CNS, AGA, PANS-Ops Each department should have option to add remarks, Approve or send back.		
376	Appellate Committee Review	After all, three approvals, the system shall move the case to Appellate Committee Review.		

377	Appellate Committee Review	The system shall provide a dedicated Appellate Committee Dashboard with Map view with coordinates in 3D view, Case briefs, details, add remarks MOM and feature to Upload any additional authorization notes		
378	Finalization & Document Issuance	Once, it is verified by committee, Outcomes sent to AC-2 further sent for Authorization letter.		
379	Authorization & Rejection Letters	The system shall auto-generate the applicable document: a) Authorization Letter (Shielding format or AS format) b) Rejection Letter c) Revised NOC (if applicable)		
380	DO Approval	Final documents shall be routed to the Designated Officer (DO) for digital approval.		
381	Applicant Communication	The system shall send email notification to applicant & concerned region Display final outcome in the applicant dashboard		
382	Automated Surface Generation, Simulation, and Validation	The system shall ensure Automated Surface Generation of aerodrome surfaces like obstacle limitation surfaces, upcoming surfaces as per Amendment 18 of ICAO Annex 14, coordinate envelope generation, enabling precise elevation-aware analysis and improved decision-making. The amendment introduces a new performance-based approach to obstacle limitation surfaces that: • Provides holistic safeguarding of airspace against obstacles • Introduces two main categories: Obstacle Free Surfaces (OFS) and Obstacle Evaluation Surfaces (OES) • Ensures surfaces are adaptable to the type of operations at the aerodrome • Aligns with the new Aero plane Design Group (ADG) categorization Please refer QUICK REFERENCE GUIDE: OBSTACLE LIMITATION SURFACES PARAMETERS & DIMENSIONS (OLS_QU-1.pdf) on ICAO website. This guide serves as a quick reference only and must be used in conjunction with ICAO Annex 14, Volume I - International Standards and Recommended Practices (SARPs). The specifications in this guide are only extracts of the complete SARPs found in Annex 14, Volume I.		

383	Automated Surface Generation, Simulation, and Validation	With the emergence of new aeronautical surface types such as Obstacle Evaluation Surface (OES) and Obstacle Free Surface (OFS), in addition to the existing Obstacle Limiting Surface (OLS), the system must support configurable and automated surface generation, along with validation and version control, to ensure compliance with evolving international aviation standards. The bidder shall develop a modular surface generation engine capable of creating and managing multiple surface types including: i. Obstacle Limiting Surface (OLS) ii. Obstacle Evaluation Surface (OES) iii. Obstacle Free Surface (OFS) iv. Any future surface types as per ICAO Annex 14, its amendments, GSRs or DGCA guidelines v. The solution shall support multiple geoid models and shall be designed to add future geoid models without redesign. vi. The system shall allow selection/configuration of geoid model(s) (e.g., national/regional/global) at project / airport / application level as required. vii. Geoid model updates/additions shall be possible via configuration or modular plug-in approach, not hard-coded. viii. The system shall clearly record which geoid model and version was used in every computation and output.		
384	Automated Surface Generation, Simulation, and Validation	The system shall be able to align OLS implementations with ongoing Annex 14 revisions (OFS/OES under Amendment 18/2025), structuring rules to support legacy OLS and future OFS/OES, ensuring forward compatibility to the applicability date.		
385	Automated Surface Generation, Simulation, and Validation	The system shall ensure surface parameters such as dimensions, slopes, elevation limits, and buffer zones are fully configurable via an administrative interface		
386	Automated Surface Generation, Simulation, and Validation	The system shall provide visualization of generated surfaces within the GIS dashboard, with overlays for obstacle data and compliance indicators		

387	Source of data for surface generation on Production Environment	For AGA/OLS/CNS/PANS-OPS as per user dept entered through their input dashboard.		
388	Source of data for surface generation on Production Environment	For AGA/OLS Data from Licensed Private/ State Government, JVC Airports the sources are: Validated Survey and Master Plan data to be provided by Airport Operators through their input dashboard.		
389	Automated Surface Generation, Simulation, and Validation	The system shall be able to generate runway-based AGA surfaces in 3D from surveyed endpoints, thresholds, and ARP, publishing them as layers for height evaluation, with formulas and constraints applied per runway type/code as specified by current Annex 14 tables as mentioned below		
390	Automated Surface Generation, Simulation, and Validation	The system shall be able to compute AGA obstacle-limitation surface elevations using parameterized formulas as per ICAO Annex 14, AAI GSRs, ADSACs etc. for all surfaces including but not limited to Inner Horizontal Surface, Conical Surface, Transitional Surface, Approach Surface, and Take-off Climb, render these as 3D surfaces over a 3D terrain basemap, and persist all slope/length/divergence parameters in a configurable rule engine; for example, Inner Horizontal height = Aerodrome Elevation + 45 m; Conical slope = 5% rising from the IHS periphery; Transitional slopes = 1:7 (14.3%) for code 3/4 instrument/non-instrument runways and 1:5 (20%) for code 1/2 non-instrument runways.		
391	Source of data for surface generation on Production Environment	For CNS Data the sources are: 1. Survey and carto section 2. CNSP (Planning) dept for planned facility data 3. CNS O&M dept for commissioned facility data 4. Airport Operator, after approval from CNSP/Survey Carto. Through their respective NOCAS-3 input dashboard. No physical maps or Document will be shared.		
392	Source of data for surface generation on Production Environment	For PANS-OPS Data the sources are Procedure Designer who has developed/reviewed the procedure will provide the procedure via Simulator integration for Procedure design or via KML files through file server for updating in proposed solution.or through their NOCAS-3 data input dashboard .No physical maps or Document will be shared.		

393	Automated Surface Generation, Simulation, and Validation	The system shall be able to generate AGA Obstacle Limitation Surfaces (OLS)—Basic Strip, Transitional, Approach, take-Off Climb, Inner Horizontal, Conical, Outer Horizontal, Outer Transitional—through parameterized geoprocessing models; surface geometries shall be computed from runway parameters, design codes and slopes, and published as 2D/3D multi-patch or mesh layers in 3D		
394	Automated Surface Generation, Simulation, and Validation	The selected bidder shall be capable of creating and maintaining 3D OLS ,PANS-OPS and CNS Surfaces as per GSR 751E & GSR 770E.		
395	Automated Surface Generation, Simulation, and Validation	The OLS surfaces mentioned below are expected by AAI to be protected in the proposed system till ICAO Annex 14 amendment 18 guidelines are implemented. System shall ensure automated and configurable rule-based auto generation of all new surfaces OLS, OES, OFS and other as per AMDT 18 and by taking changes and amendments approved / in future to be approved in ICAO assembly and further by DGCA into account.		
396	Automated Surface Generation, Simulation, and Validation	A. BASIC STRIP B. TRANSITIONAL/APPROACH TRANSITION SURFACE C. APPROACH SURFACE (including displaced THR & extended Approach) D. TAKE-OFF CLIMB SURFACE (including displaced THR & extended Approach) E. INNER HORIZONTAL SURFACE F. CONICAL SURFACE G. OUTER HORIZONTAL SURFACE H. OUTER TRANSITIONAL SURFACE		

397	Automated Surface Generation, Simulation, and Validation	The system shall mandate availability of below information/data for creating OLS Surfaces: a. Runway designation b. Dimension of runway (Length and width) c. Co-ordinates in WGS 84 and elevation in meters of physical extremity of runway(s). d. Co-ordinates in WGS 84 and elevation in meters of threshold. e. Co-ordinates in WGS 84 and elevation in meters of ARP. f. Aerodrome elevation in meters. g. Co-ordinates in WGS 84 and elevation in meters of proposed extension of runway, if any. h. Longitudinal profile of runway in meters. i. IFR & VFR Information of Airport for which surfaces to be created. j. Each runway capacity information as per Aerodrome Design Group. Note: All elevation data shall be in EGM-08 format.		
398	Automated Surface Generation, Simulation, and Validation	It is recommended to the selected bidder to strictly abide guidelines from ICAO Annex 14, its amendments, DGCA CAR/GSR 751E & 770E guidelines for surface generation and validation. Proposed solutions shall be developed for automated surface generation, simulation and validation considering future changes and amendments approved/to=be approved in ICAO assembly and further by DGCA. However, for preliminary and indicative understanding purpose we are providing guidelines (indicative only) to generate OLS Surfaces as follows:		
399	Automated Surface Generation, Simulation, and Validation	To construct Runway centerline and runway. I. Placement of runway end points, THR points and proposed extension points, surveyed coordinates with elevation shall be provided by the competent authority (ATM-DOAS). II. Once runway extremities coordinate with elevation placed on the map, a runway centerline to be created joining both the extremities Please refer Figure 11 below for an indicative depiction of Runway Centerline.		

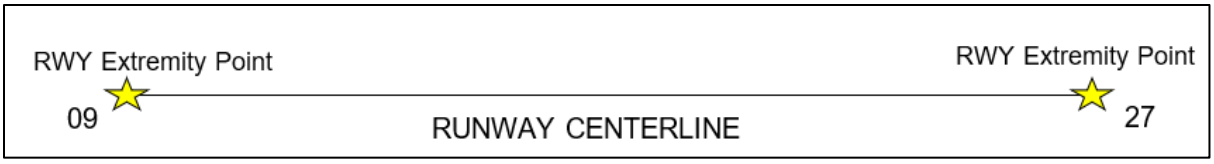


Figure 11: Runway Centerline

400	Automated Surface Generation, Simulation, and Validation	Runway polygon shall be created on centerline as per as per dimensions data (Length & Width) provided by ATM-DOAS		
401	Automated Surface Generation, Simulation, and Validation	A. BASIC STRIP: A defined area including the runway and stop way. a) Basic Strip is created to protect runway from obstruction and strictly obstacle free zone. From the NOC point of view, no construction shall be permitted in this area. b) No fixed object, other than visual aids required for air navigation or those required for aircraft safety purposes and which must be sited on the runway strip and satisfying the relevant frangibility requirement in para 5 of the CAR, shall be permitted any part of on a runway strip of a precision approach runway delineated by the lower edges of the inner transitional surfaces. No mobile object shall be permitted on this part of the runway strip during the use of the runway for landing or take-off. Please refer to Figure 12 below for an indicative depiction of a basic strip. Note: Code may be upgraded in future for higher code it is suggested to keep it 60M. Same should be done wherever applicable.		

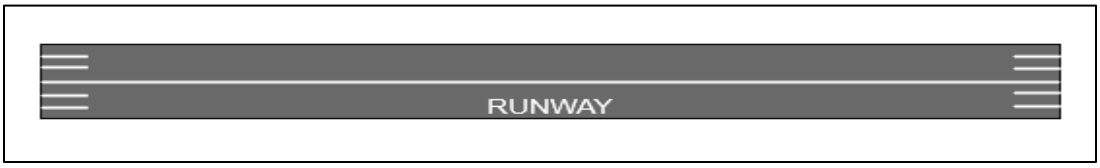


Figure 12: Runway Basic Strip

402	Automated Surface Generation, Simulation, and Validation	1. Length of runway strips A strip shall extend before the threshold and beyond the end of the runway or stop way for a distance of at least: — 60 m where the code number is 2, 3 or 4; — 60 m where the code number is 1 and the runway is an instrument one; and. — 30 m where the code number is 1 and the runway is a non-instrument one Note: Code may be upgraded in future for higher code it is suggested to keep it 60M. Same should be done wherever applicable.		
403	Automated Surface Generation, Simulation, and Validation	2. Width of runway strips A strip including a precision approach runway shall, wherever practicable, be extend laterally to a distance of at least: — 140 m where the code number is 3 or 4; and — 70 m where the code number is 1 or 2; On each side of the center line of the runway and its extended center line throughout the length of the strip. A strip including a non-precision approach runway should extend laterally to a distance of at least: — 140 m where the code number is 3 or 4; and — 70 m where the code number is 1 or 2; On each side of the center line of the runway and its extended center line throughout the length of the strip. A strip including a non-instrument runway should extend on each side of the center line of the runway and its extended center line throughout the length of the strip, to a distance of at least: — 75 m where the code number is 3 or 4; — 40 m where the code number is 2; and — 30 m where the code number is 1. Note: Code may be upgraded in future for higher code it is suggested to keep it 60M. Same should be done wherever applicable. Please refer Figure 13 below for an indicative depiction.		

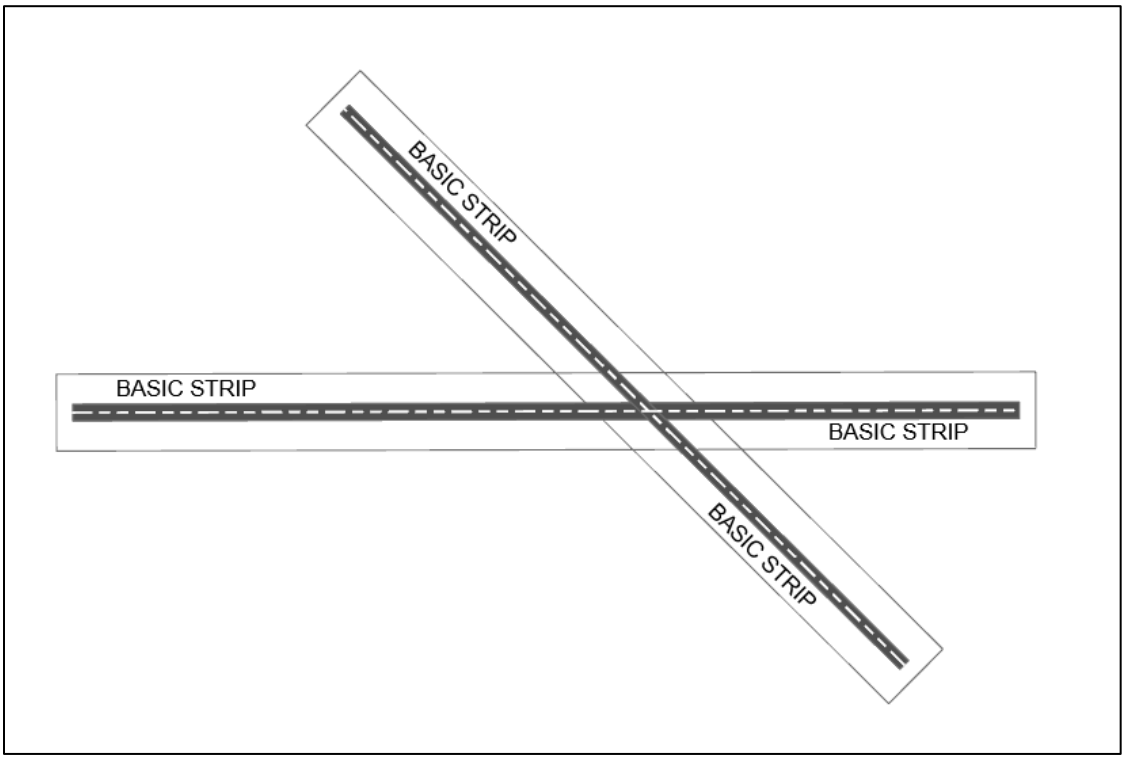


Figure 13: Length and Breadth of Basic Strips

404	Automated Surface Generation, Simulation, and Validation	To create basic strips, the selected bidder may also refer to the dimension table that is published on GSR-770E. Please refer to Figure 14 below for a glimpse of the dimension table. Selected bidder is suggested to refer the latest amendments and notifications of GSR-751(E), 770(E) and AIM AIP before implementation.		

RUNWAY		INSTRUMENT RUNWAY		NON-INSTRUMENT RUNWAY	
Runway Code	Airplane Reference Field	Width Extending laterally on either side of Runway Centre Line (Meter)	Length beyond Runway End/Stop way (Meter)	Width Extending laterally on either side of Runway Centre Line (Meter)	Length beyond Runway End/Stop way (Meter)
(1)	(2)	(3)	(4)	(5)	(6)
1.	<800	70	60	30	30
2.	800<1200	70	60	40	60
3.	1200<1800	140	60	75	60
4.	1800 & above	140	60	75	60

Figure 14: dimension table that is published on GSR-770E

Note: Code may be upgraded in future for higher code it is suggested to keep it 60M. Same should be done wherever applicable.

405	Automated Surface Generation, Simulation, and Validation	B. TRANSITIONAL SURFACE: 1. The outer limit of the transitional surface is determined by its intersection with the plane containing inner horizontal surface and the slopes of transitional surfaces are as given below, namely: (Please refer to GSR 751E & GSR 770E) (i) Precision Approach Runway 14.3% (1:7) (ii) (ii) Non-Precision Runway 14.3% (1:7) for code 3 & 4 20% (1:5) for code 1 & 2 (iii) (iii) Non-Instrument Runway 14.3% (1:7) for code 3 & 4 20% (1:5) for code 1 & 2 The slope of the transitional surface shall be measured in a vertical plane at right angles to the center line of the runway. Please refer to Figure 15 below for an indicative depiction of TS. Selected bidder is suggested to refer to the latest amendments and notifications of GSR-751(E), 770(E) and AIM AIP before automation of TS. Note: Code may be upgraded in future for higher code it is suggested to keep it 60M. Same should be done wherever applicable.		

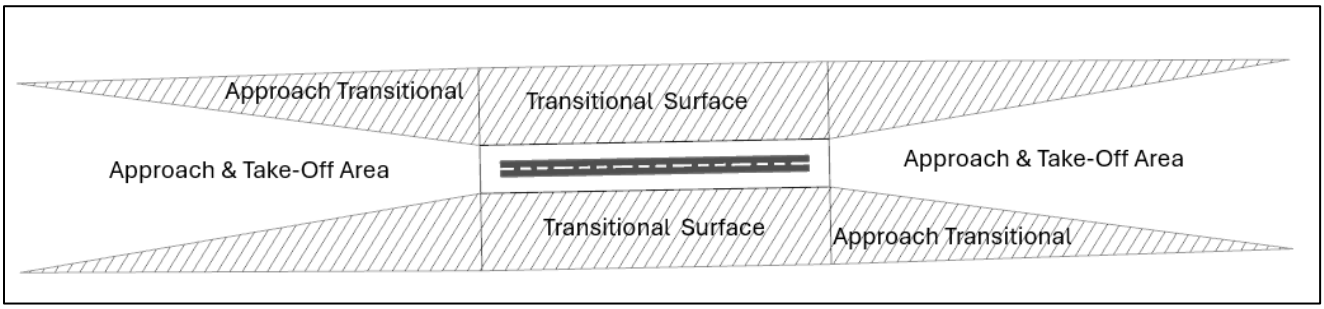


Figure 15: Transition Surface

406	Automated Surface Generation, Simulation, and Validation	2. The elevation of a point on a lower edge shall be – (a) along the side of approach surface, equal to the elevation of approach surface at that point; and (b) along the strip, equal to the elevation of nearest point on the center line of the Runway or its extension.		
407	Automated Surface Generation, Simulation, and Validation	3. Transitional surface shall rise from basic strip till it reaches the height of the 45 mts. and meets Inner Horizontal Surface in which height is 45 mts.		
408	Automated Surface Generation, Simulation, and Validation	C. APPROACH SURFACE The approach surface shall be established for each runway strip in the direction of intended landing of the Aeroplane. Please refer to Figure 16 below for an indicative depiction of Approach surface. The limits and slopes are given in table in Figure 17 below. Selected bidder is suggested to refer to the latest amendments and notifications of GSR-751(E), 770(E) and AIM AIP before automation of Approach surface.		

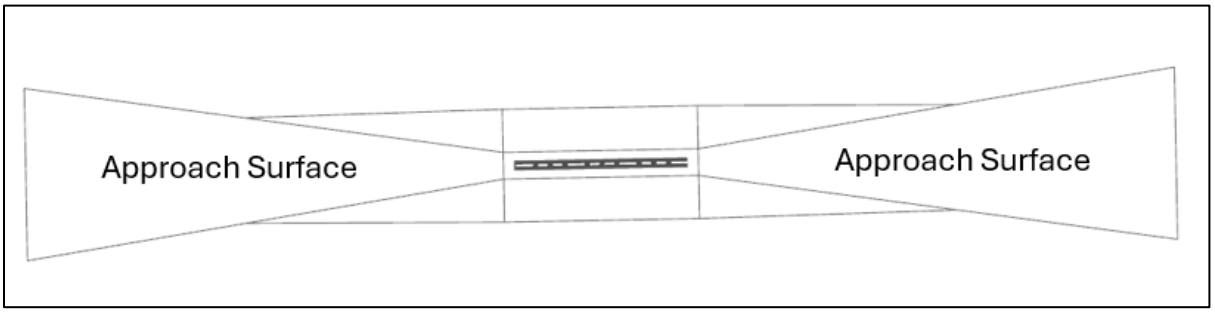


Figure 16: Approach surface

409	Automated Surface Generation, Simulation, and Validation	1. Instrument Runway Inner Edge of Approach Surface: Length of Inner edge - 140 meters for Code No. 1 and 2 - 280 meters for Code No. 3 and 4 Distance from runway threshold - 60 meters Divergence -15% on either side Length & Slope of Approach Surface: as given in table below (Refer GSR 770E)		

Table 2.2 -Approach Surface Slope of Instrument Runway

Runway		Precision Approach Runway		Non Precision Approach Runway		
Code No.	Aerodrome Reference Field Length (meter)	First Section Length & (Meter) Slope	Second Section Length (Meter) & Slope	First Section Length (Meter) & Slope	Second Section Length (Meter)& Slope	Horizontal Section (Meter)
1.	<800	3000 2.5%	**12000**** **3%**	2500 3.33%	- -	- -
2.	800<1200	3000 2.5%	**12000**** **3.00%**	2500 3.33%	- -	- -
3.	1200<1800	3000 2%	3600 2.5%	3000 2%	3600 2.5%	**8400***
4.	1800 and Above	3000 2%	3600 2.5%	3000 2%	3600 2.5%	**8400***

Figure 17: Approach Surface Slope

410	Automated Surface Generation, Simulation, and Validation	* Total length of approach surface for runway code number 3 and 4 with precision and non-precision shall be 15000 meters. ** Total length of approach surface for Precision approach Runway Code number 1 and 2 shall be 15000 meters.		

411	Automated Surface Generation, Simulation, and Validation	2. Non-Instrument runway Inner Edge of Approach Surface: Length of Inner edge - 60 meters for Code No. 1 - 80 meters for code No. 2 - 150 meters for Code No. 3 and 4 Distance from runway threshold - 30 meters for code 1 - 60 meters for code No. 2, 3 and 4 Divergence -10% on either side		
412	Automated Surface Generation, Simulation, and Validation	a. Aerodrome where there is more than one runway with overlapping approach areas and associated surface, most stringent of the two would be the applicable criteria.		
413	Automated Surface Generation, Simulation, and Validation	b. For determining the approach, the physical extremities of the runway shall only be considered. In case of displaced threshold, the permissible height shall be calculated based on approach surface and transitional surface with respect to the runway extremity or displaced threshold whichever is more restrictive.		
414	Automated Surface Generation, Simulation, and Validation	c. At Aerodromes, where the proposals for runway extension exist, the requisite surface shall be determined from the proposed extension as well as from the existing runway strip/associated clearway, as applicable and the lower of the two elevations shall be permitted. The elevation of the associated runway extremity/displaced threshold/proposed extension of runway shall be the datum for approach surface.		
415	Automated Surface Generation, Simulation, and Validation	d. The slope of the approach surface shall be measured in a vertical plane containing the centerline of the runway.		
416	Automated Surface Generation, Simulation, and Validation	D. TAKE-OFF CLIMB SURFACE The dimensions of the take-off climb surface shall not be less than the dimensions specified in the table given below except that if a runway is meant for takeoff, a lesser length may be adopted for the takeoff climb surface where such lesser length would be consistent with procedural measures adopted to govern the outward flight of aeroplanes. Take-off surface shall be established for displaced threshold, runway extremities and proposed runway extension.		

417	Automated Surface Generation, Simulation, and Validation	E. INNER HORIZONTAL SURFACE (I.H.S) Dimensions and permissible heights of Inner Horizontal Surface are given in the tables and diagram below in Figure 18, 19, and 20 from GSR 751E & GSR 770E. Selected bidder is suggested to refer to the latest amendments and notifications of ICAO Annex-14, GSR-751(E), 770(E) and AIM AIP before automation of OLS surface.		

Table 2.1 -Dimensions and Slopes of Obstacle Limitation Surfaces

(Runways Meant for Take-Off)

Surface and dimension *	Code Number		
	1	2	3 or 4
(1)	(2)	(3)	(4)
TAKE OFF CLIMB			
Length of inner edge	60 meters	80 meters	180 meters
Distance from runway end	30 meters	60 meters	60 meters
Divergence (each side)	10%	10%	12.5%
Final width	380 meters	580 meters	1200 meters 1800 meters**
Length	1600 meters	2500 meters	15000 meters
Slope	5%	4%	2%

* All dimensions are measured horizontally.

**When the intended track includes changes of heading greater than 15 degree for operations conducted in IMC, VMC by night.

Figure 18: Dimensions and permissible heights of Inner Horizontal Surface

SCHEDULE VIII
APPENDIX -H

ICAO Annex 14 Obstacle Limitation Surfaces (OLS)

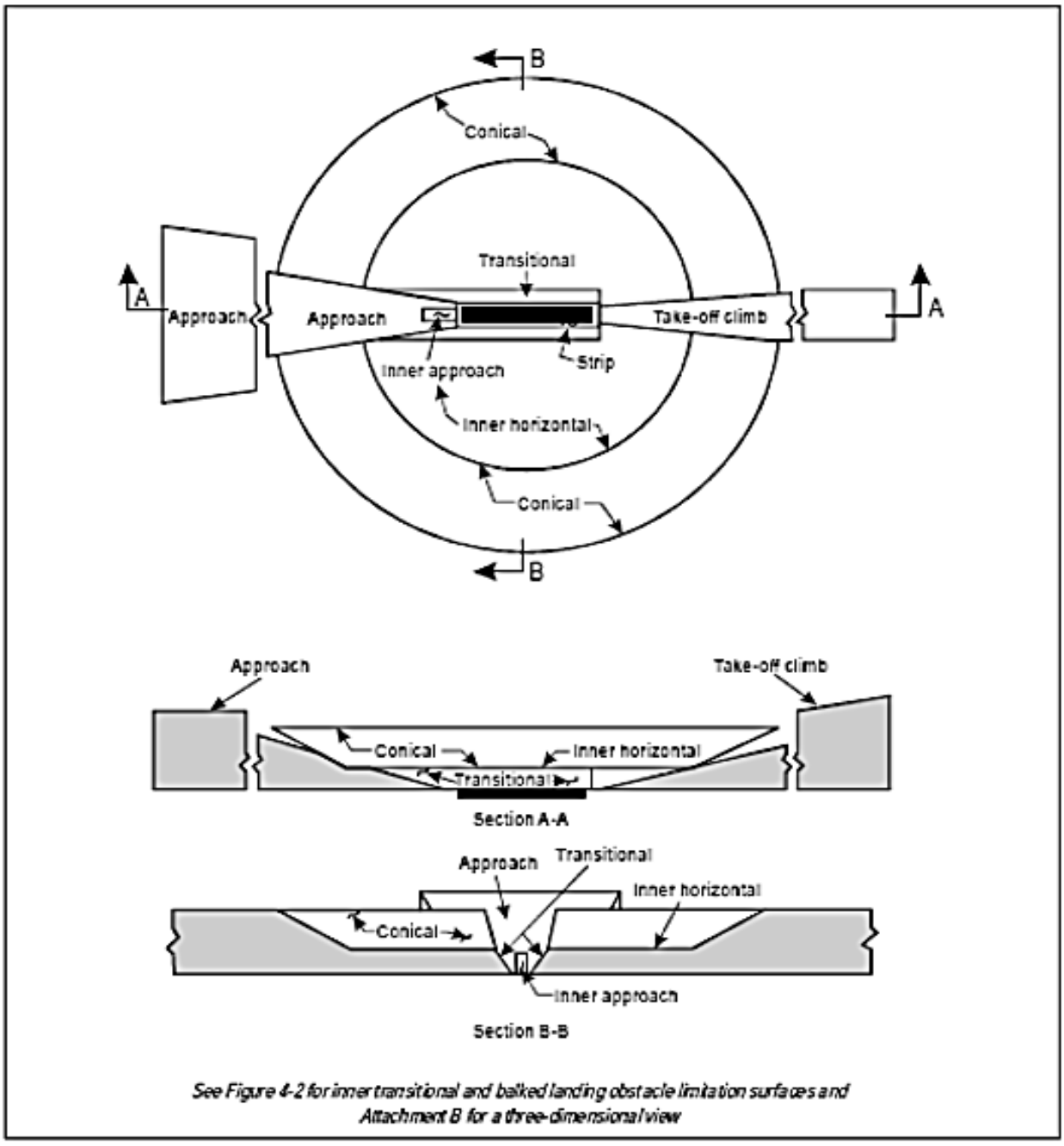


Figure 19: OLS - ICAO Annex 14

Table 2.4 -Dimensions and Permissible Heights of Inner Horizontal Surface

Runway		Instrument		Non-Instrument	
Code No.	Aerodrome Reference Field Length (meter)	Radius (Meter)	Height (Meter)	Radius (Meter)	Height above Aerodrome Elevation (Meter)
1.	<800	3500*	45	2000*	45
2.	800<1200	3500*	45	2000*	45
3.	1200<1800	4000**	45	4000**	45
4.	1800 and Above	4000**	45	4000**	45

Figure 20: Dimensions and Permissible Height of IHS

418	Automated Surface Generation, Simulation, and Validation	*For runway code number 1 and 2, radius of IHS shall be measured from the Aerodrome Reference Point (ARP). ** For runway code number 3 and 4, radius of IHS shall be measured from the runway extremity.		
419	Automated Surface Generation, Simulation, and Validation	i. The reference datum for Inner-Horizontal Surface shall be the aerodrome elevation as defined in clause (g) of the Explanation to this notification		
420	Automated Surface Generation, Simulation, and Validation	ii. For Runway code 3 and 4, the Inner Horizontal Surface shall be a composite pattern, which consists of two circular areas centered at the two ends with a radius of 4000 meters. These areas shall be joined tangentially to form an elliptical shape as shown in Appendix-A of Schedule VIII.		

421	Automated Surface Generation, Simulation, and Validation	iii. Where it is required to protect two or more widely spaced long runways, a more complex pattern involving four or more circular areas are formed. These areas should be joined tangentially by straight lines, and the Inner Horizontal Surface shall be defined by the external limits of the resulting pattern (Refer Appendix -A of Schedule VIII). Please refer to Figure 21 below for a schematic depiction of HIS for such runways. Selected bidder is suggested to refer to the latest amendments and notifications of ICAO Annex-14, GSR-751(E), 770(E) and AIM AIP before automation of OLS surface.		
422	Automated Surface Generation, Simulation, and Validation	iv. When two aerodromes are close to each other with overlapping circuits the Inner Horizontal Surface will be drawn as prescribed in para 1.4.1.3. The inner horizontal surface of these two aerodromes shall be joined tangentially to form one common Inner Horizontal Surface.		

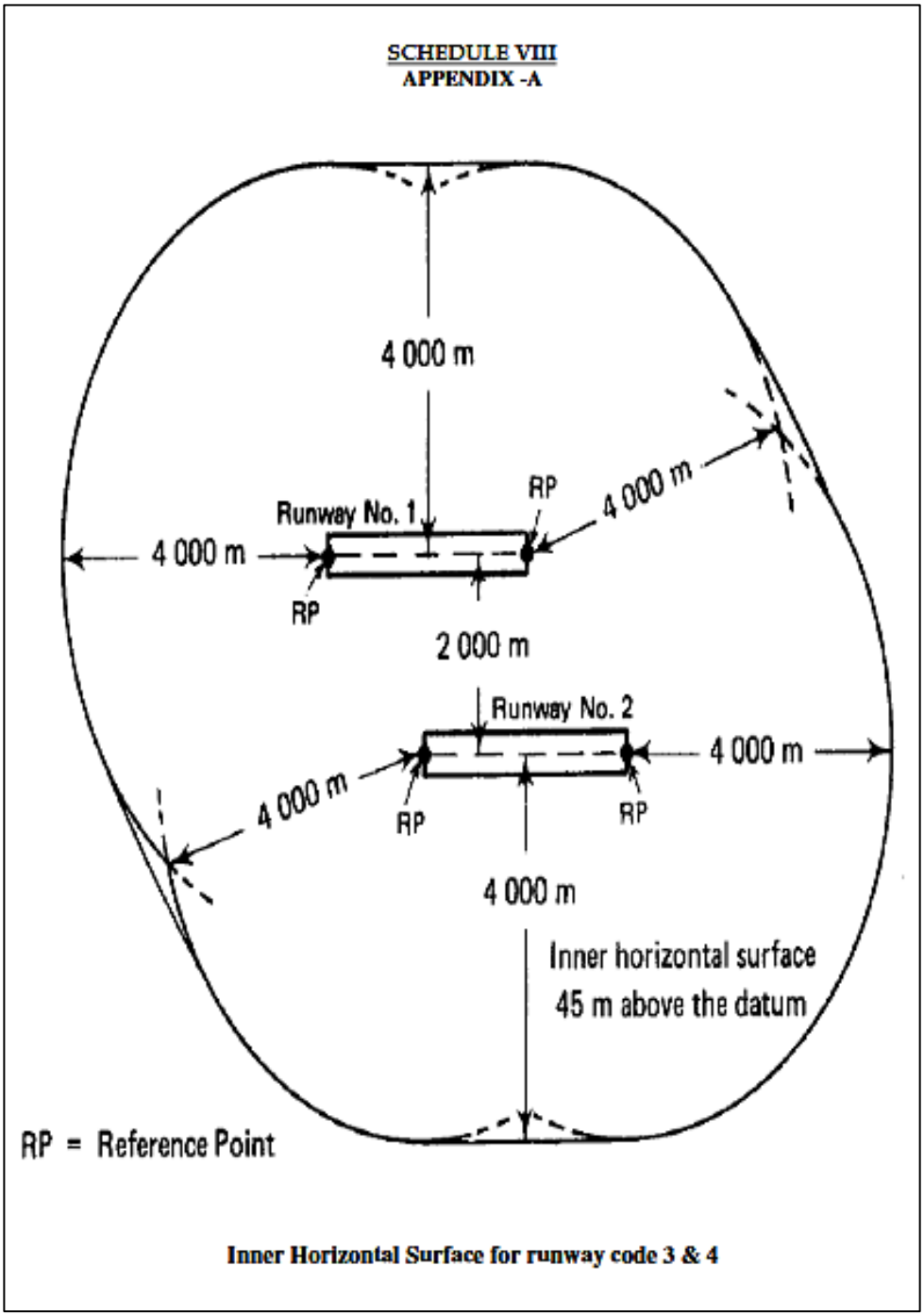


Figure 21: Schedule VIII Appendix A for IHS for Runway Code 3 & 4

423	Automated Surface Generation, Simulation, and	In case of common horizontal surface serving two aerodromes, the elevation of the Inner Horizontal Surface will be referenced to the lower of the two aerodromes.		

	Validation			
424	Automated Surface Generation, Simulation, and Validation	F. CONICAL SURFACE The conical surface shall be projected upwards and outwards from the periphery of the Inner Horizontal Surface. The slope 5% (1:20) of the conical surface shall be measured in a vertical plane perpendicular to the Inner Horizontal Surface. The reference datum for Conical Surface shall be the aerodrome elevations (Refer to Appendix -B of Schedule VIII for illustration of the various surfaces including the conical surface). Note: Where a part of Inner Horizontal Surface and conical surface lies below the approach/take-off climb surface, the permissible heights shall be the lowest of the applicable surfaces Please refer Figure 22 below for an indicative depiction of Conical surface from Appendix -B of Schedule VIII of GSR-751(E). Selected bidder is suggested to refer to the latest amendments and notifications of ICAO Annex-14, GSR-751(E), 770(E) and AIM AIP before automation of this surface.		

SCHEDULE VIII
APPENDIX -B

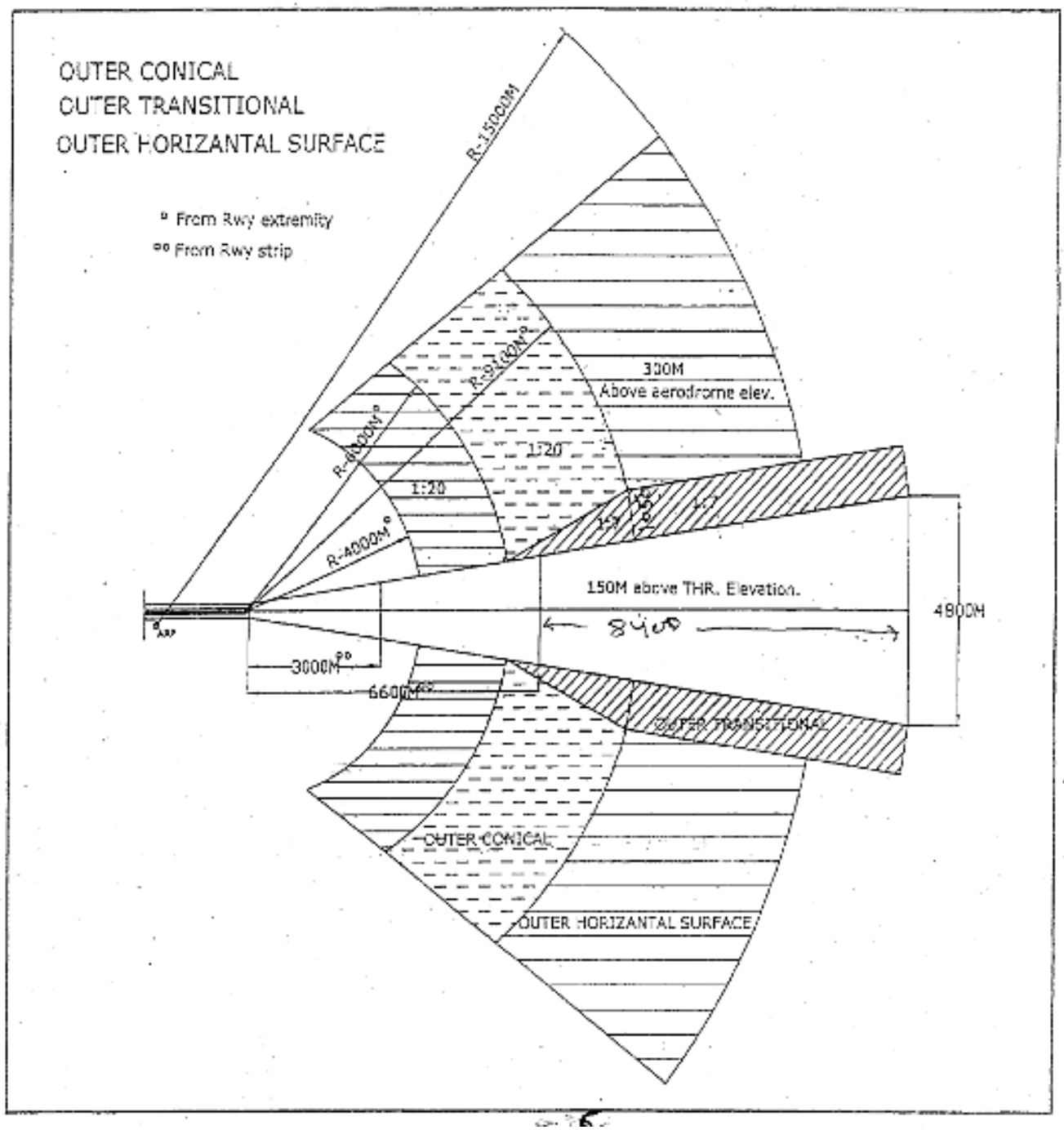


Figure 22: Appendix -B of Schedule VIII - Conical Surface

425	Automated Surface Generation, Simulation, and Validation	G. OUTER HORIZONTAL SURFACE (OHS) i. The Outer Horizontal Surface shall extend to 15000 meters from the Aerodrome Reference Point for Aerodrome with runway code 3 and 4		
426	Automated Surface Generation, Simulation, and Validation	ii. In case of Aerodrome with runway Code 2, the Outer Horizontal Surface shall extend to 14740 meters from Aerodrome Reference Point for Instrument runways and 13740 meters for non-instrument runways		
427	Automated Surface Generation, Simulation, and Validation	iii. Where combined Outer Horizontal Surface is established for two Aerodromes, the Outer Horizontal Surface shall be centered on the Aerodrome Reference Point of the Aerodrome of higher category. iv. Outer Horizontal Surface for Aerodrome with runway code No.1 shall not be established		
428	Automated Surface Generation, Simulation, and Validation	v. The Outer Horizontal Surface, would be defined as such that the Conical Surface may continue to be extended at 5% slope to a point wherein the permissible maximum height of *300 meters (above aerodrome elevation) is reached and thereafter this surface is maintained up to 15 kilometers from Aerodrome Reference Point. Construction(s) protruding above these surfaces shall normally not be permitted. Obstructions existing in the area should be marked or lighted. Please refer Figure 23 below for an indicative depiction of OLS surfaces from Appendix -B of Schedule VIII of GSR-751(E). Selected bidder is suggested to refer to the latest amendments and notifications of ICAO Annex-14, GSR-751(E), 770(E) and AIM AIP before automation of this surface.		

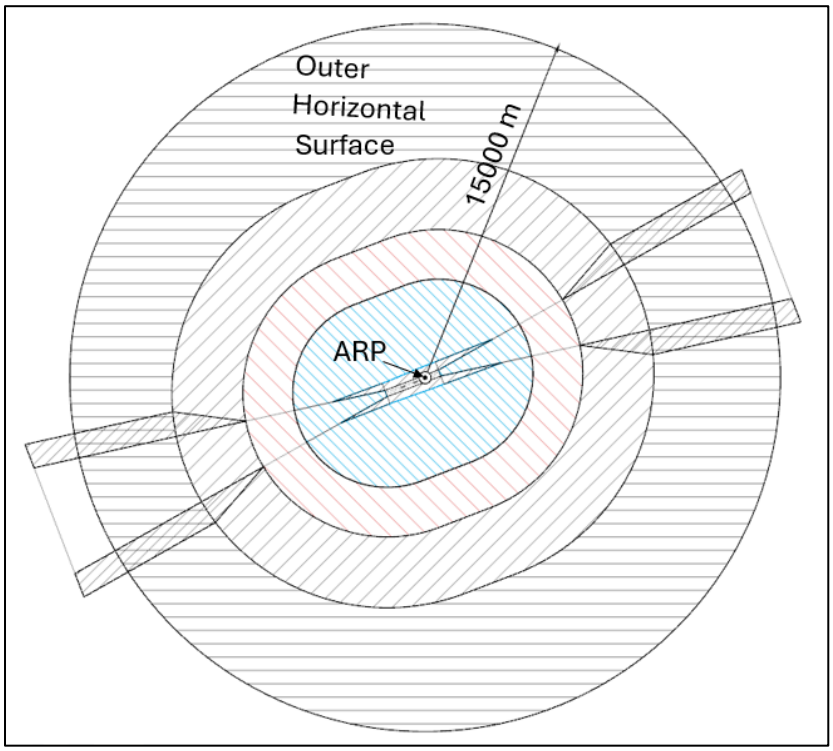


Figure 23: Outer Horizontal Surface for type 3 and 4 runways

429	Automated Surface Generation, Simulation, and Validation	OUTER TRANSIONAL SURFACE In order to avoid abrupt vertical changes in surfaces, the surfaces beyond the conical surfaces will slope laterally at 1:7 from edges of the approach surface between the permissible heights of 150m to 300m.		
430	Automated Surface Generation, Simulation, and Validation	The selected bidder is suggested to refer to GSR 751E Schedule VIII Appendix-B for details of implementation of above points A to H		
431	Automated Surface Generation, Simulation, and Validation	The system shall be able to provide unit validation for metric/imperial entries and normalize calculations to the system standard (meters/EGM-08) with clear unit conversion display in the height sheet		
432	Automated Surface Generation, Simulation, and Validation	The system shall automatically generate OLS surfaces based on the data provided. Please refer Figure 24 below for depiction of OTS from GSR-751(E). Selected bidder is suggested to refer to the latest amendments and notifications of ICAO Annex-14, GSR-751(E), 770(E) and AIM AIP before automation of this surface.		

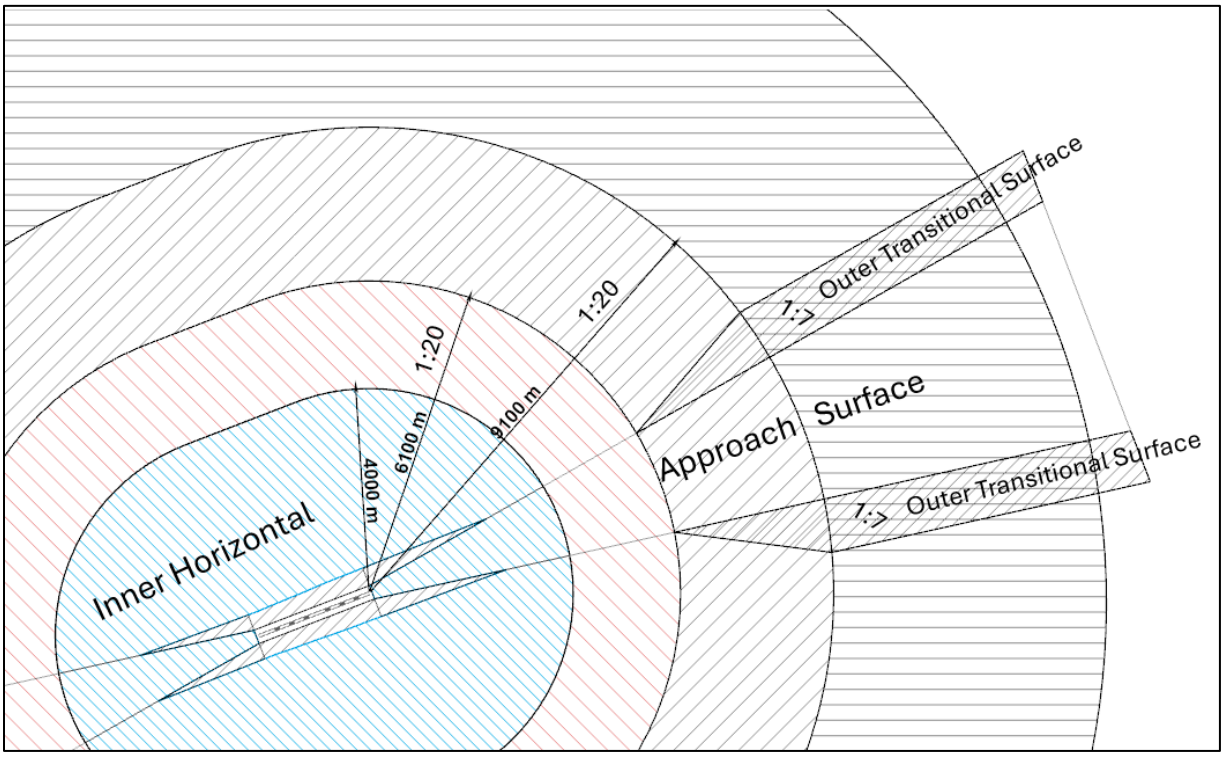


Figure 24: Outer Transition Surface

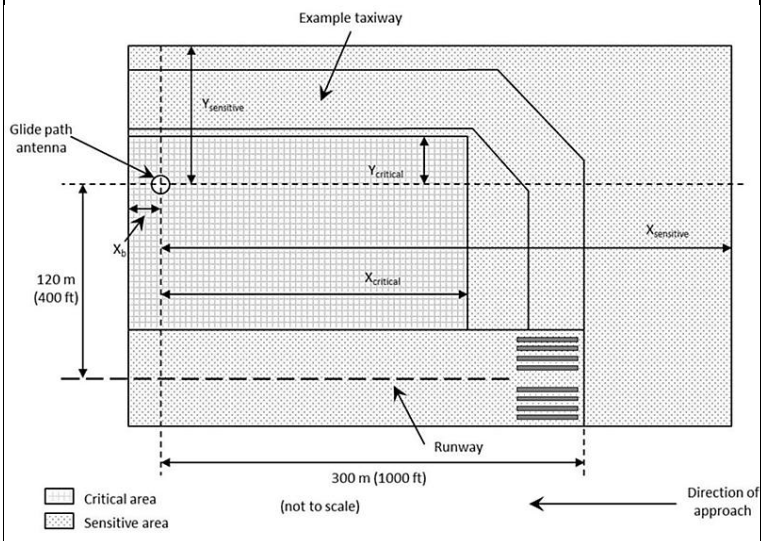
433	Automated Surface Generation, Simulation, and Validation	The system shall explore and implement any possibility of direct input of Airport Data in the standard AIS - AIP format after integration with AeroDB database to further streamline this process		
434	Automated Surface Generation, Simulation, and Validation	Similar procedures of using automation for creating areas around CNS facilities and PANS-OPS procedures should be taken up in accordance with regulatory guidelines mentioned in ADSACs, GSRs and ICAO standards.		
435	Automated Surface Generation, Simulation, and Validation	The system shall ensure to update these auto-generated surface on the Staging environment for user acceptance.		
436	Automated Surface Generation, Simulation, and Validation	The system shall provide export options for surfaces data in standard formats (e.g., DXF, SHP, PDF) for use in planning and analysis		

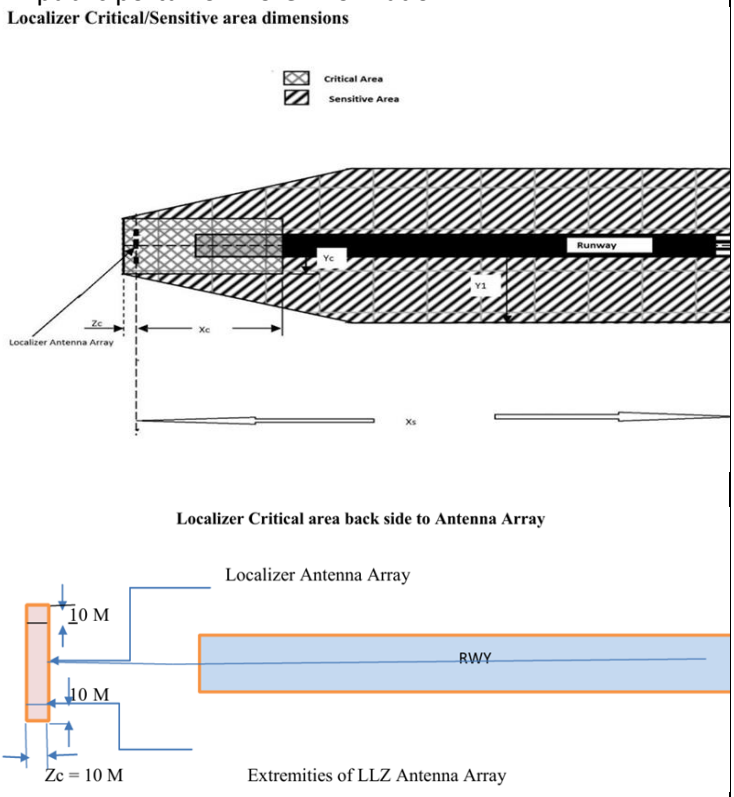
437	Automated Surface Generation, Simulation, and Validation	The system shall establish robust checkpoints with validation & approval workflows to ensure accuracy and compliance before finalization of surface data into the production environment.		
438	Automated Surface Generation, Simulation, and Validation	The system shall implement version control for surface configurations using adaptation/config files, enabling i. Tracking of historical changes ii. Rollback to previous versions iii. Simulation of new surface definitions before deployment. (Refer NOCAS- 3 architecture)		
439	Automated Surface Generation, Simulation, and Validation	A cross checking validation algorithm will verify the generated 3D surfaces and confirm in the Staging and production and alert in case of inconsistency.		
440	Automated Surface Generation, Simulation, and Validation	All 3D OLS surfaces will be autogenerated any surface not generated as per laid down specifications shall be treated as a severe software Bug.		
441	Automated Surface Generation, Simulation, and Validation	After agreement from CHQ AGA user and Nodal officer, GM DOAS to provide approval		
442	Automated Surface Generation, Simulation, and Validation	After GM DOAS approval, AO will also agree to the changes		
443	Automated Surface Generation, Simulation, and Validation	After agreement from AO, AAI NOC technical team will get option to "Make Surface Changes Live" .		
444	Automated Surface Generation, Simulation, and Validation	Sanity check post migration by AAI NOC technical team to verify correct migration "Go live" of generated surfaces.		

445	Automated Surface Generation, Simulation, and Validation	This sanity checks to be automated in the system by comparing temp height sheets using a validation algorithm for every possible scenario.		
446	Configurable Rule Engine	System should have option to update the AGA, CNS surface generation formula and calculation, PTE (Permissible Top Elevation) calculation ,in case of any updates in the GSR and ADSAC or any other Govt regulations.		
447	Audit Trail Management	System shall implement a comprehensive, automated data log to track all changes made to AGA, CNS, and PANS-OPS parameters along with record of previous CCZMs, ensuring transparency.		
448	Audit Trail Management	Maintain audit logs for all surface-related configuration changes, capturing: i. User identity ii. Timestamp iii. Nature of change iv. Affected surface parameters The system shall maintain non-repudiation, integrity, timestamping, and traceable audit logs for each action/event.		
449	Automated Surface Generation, Simulation, and Validation	The system shall auto-generate surface validation reports post-creation to confirm: i. Accuracy of surface geometry ii. Compliance with ICAO/DGCA standards iii. Alignment with airport-specific operational requirements iv. Surface type and parameters v. Obstacle intersection analysis vi. Visual maps and overlays vii. Summary of compliance status These reports to be exportable in standard formats (PDF, CSV, GeoTIFF) and accessible through the administrative dashboard		

450	Automated Surface Generation, Simulation, and Validation	CNS stands for Communication, Navigation and surveillance. The proposed system shall protect, and safeguard CNS facility surfaces along with AGA OLS and PANS-OPS Surfaces. CNS related protection criteria, which includes: (1) No Construction Zone (NCZ) AREA and Restricted Area of CNS facilities (SCHEDULE – I GSR 751 E/ GSR-770 (E)-amendments) (2) Criterion of Safeguarding of CNS facilities In proposed solution (SCHEDULE – II GSR 751 E/ GSR-770 (E)-Amendments)		
451	Automated Surface Generation, Simulation, and Validation	CNS Facilities Requiring Protection of Service Volumes of: (A) Communication (B) NAVIGATIONAL AIDS (C) SURVEILLANCE SYSTEM (D) Satellite based Navigation & Communication		
452	Automated Surface Generation, Simulation, and Validation	CNS facilities work on basic principle of travelling of electromagnetic waves CNS facilities work on/Above VHF band and utilize the line-of -sight principle of propagation		
453	Automated Surface Generation, Simulation, and Validation	Any hindrance between source and Aircraft (observer) may cause loss of signal or discontinuity in service		
454	Automated Surface Generation, Simulation, and Validation	For Navigation, ICAO has specified certain parameters viz; availability, reliability, integrity and continuity of signal		
455	Service Volume of CNS Facilities	The limit of service volume of CNS equipment extends up to a maximum distance of 20 km from the CNS Facility Antenna System, except in case of ILS Localizer, wherein it extends up to 35 Km. Please refer GSR751E –Schedule-II, Para 2 and associated amendment in 770E at S.No. 11(ii) x		

456	Service Volume of CNS Facilities	The system shall be able to publish CNS protection service volumes and non-construction zones (e.g., DVOR/DME, ILS Localizer and Glide Path, NDB/Locators, ASR/ARSR/MSSR, ADS-B, RCAG, GBAS) as 3D analytical layers derived from facility locations and rules (angles, distances, offsets), and run height calculations by evaluating object intersection along azimuth/vertical constraints using Geoprocessing services		
457	CNS facilities requiring Protection of service volumes	(A) Communication (1) RCAG (VHF), HF Tx/Rx (2) Microwave/RF Link (B) NAVIGATIONAL AIDS : (1) DVOR & DME, Instrument Landing System (Localizer & Glide Path) (2) NDB, Markers & Locators (C) SURVEILLANCE SYSTEM : RADAR- ASR / MSSR / ARSR/ADS-B/ASMGCS- M LAT / SMR (D) Satellite based Navigation & Communication		
458	Safeguarding of CNS facilities	It is recommended to the selected bidder to strictly abide guidelines from ICAO Annex 10, its amendments, DGCA CAR/GSR 751E & 770E guidelines, specifically SCHEDULE – I & II of GSR 751 E/ GSR-770 (E)-amendments for criterion of Safeguarding of CNS facilities. However, for preliminary understanding purposes we are providing guidelines (indicative only) for some of the CNS facilities height calculation as follows:		
459	Safeguarding of CNS facilities	Middle Marker / Outer Marker: (a) NCZ Area is the land within a radius of 30 meters of the site of markers and locator beacons. (b) For Site falling outside NCZ- No Restriction.		
460	Safeguarding of CNS facilities: NDB/Locator	Non-Directional Beacon / Locator: No structure (located beyond the area of 60 Meter radius as specified in Schedule-I) shall subtend a vertical angle greater than 5.0 degree up to a radius of 1 km from the center of NDB/ Locators/Enroute Beacon Antenna.		

461	Safeguarding of CNS facilities: Glide Path	(a) NCZ Area: Glide Path (a component of Instrument Landing System providing vertical guidance): the critical area as mentioned in Appendix-J of Schedule VIII of GSR 770(E). (b) Calculation: Beyond areas specified in Schedule I (NCZ) and within ± 8 degrees azimuth in front of the glide path antenna (in the direction of approach), a building/structure should not subtend an angle of elevation of more than 1.1 degree at antenna base. Please refer to Figure 25 below for indicative depiction of Glide Path (CAT2/3 ILS/GP). Please refer to Appendix-J of Schedule VIII of GSR 770(E) on AAI public portal for more information.  *Figure 25: Glide Path (CAT2/3 ILS/GP)*		
462	Safeguarding of CNS facilities	LLZ (Localizer: If structure lies in NCZ area of a Localizer, then No calculation will be done from LLZ point of view. Critical Area (NCZ) dimension value X and Y as per Appendix K of Schedule VIII of GSR-770(E). And in Height Sheet the Remark column will show "No Construction Zone" mean no permission for any construction in NCZ Area. Within + 10 degrees azimuth in front of LLZ antenna, an object (located beyond the area specified in Annexure I (NCZ)) should not subtend an angle of elevation more than 0.75 degrees at the centre of antenna array. Within + 10 degrees to + 35 degrees LLZ azimuth in front of antenna an object (located beyond the area specified in		

		Annexure I (NCZ)) should not subtend an angle of elevation more than 1.1 degree. Please refer Figure 26 below for an indicative depiction of LLZ Antenna (critical/sensitive area dimensions and Localizer Critical area back side to Antenna Array diagram. Please refer to Appendix K of Schedule VIII of GSR-770(E) on AAI public portal for more information.  Figure 26: LLZ (Localizer Antenna)		
462.1	CNS DATA INCORPORATION/UPDATION IN PROPOSED SYSTEM	Please refer Figure 27 below for flowchart (indicative) of CNS DATA INCORPORATION/UPDATION IN PROPOSED SYSTEM depicted below.		

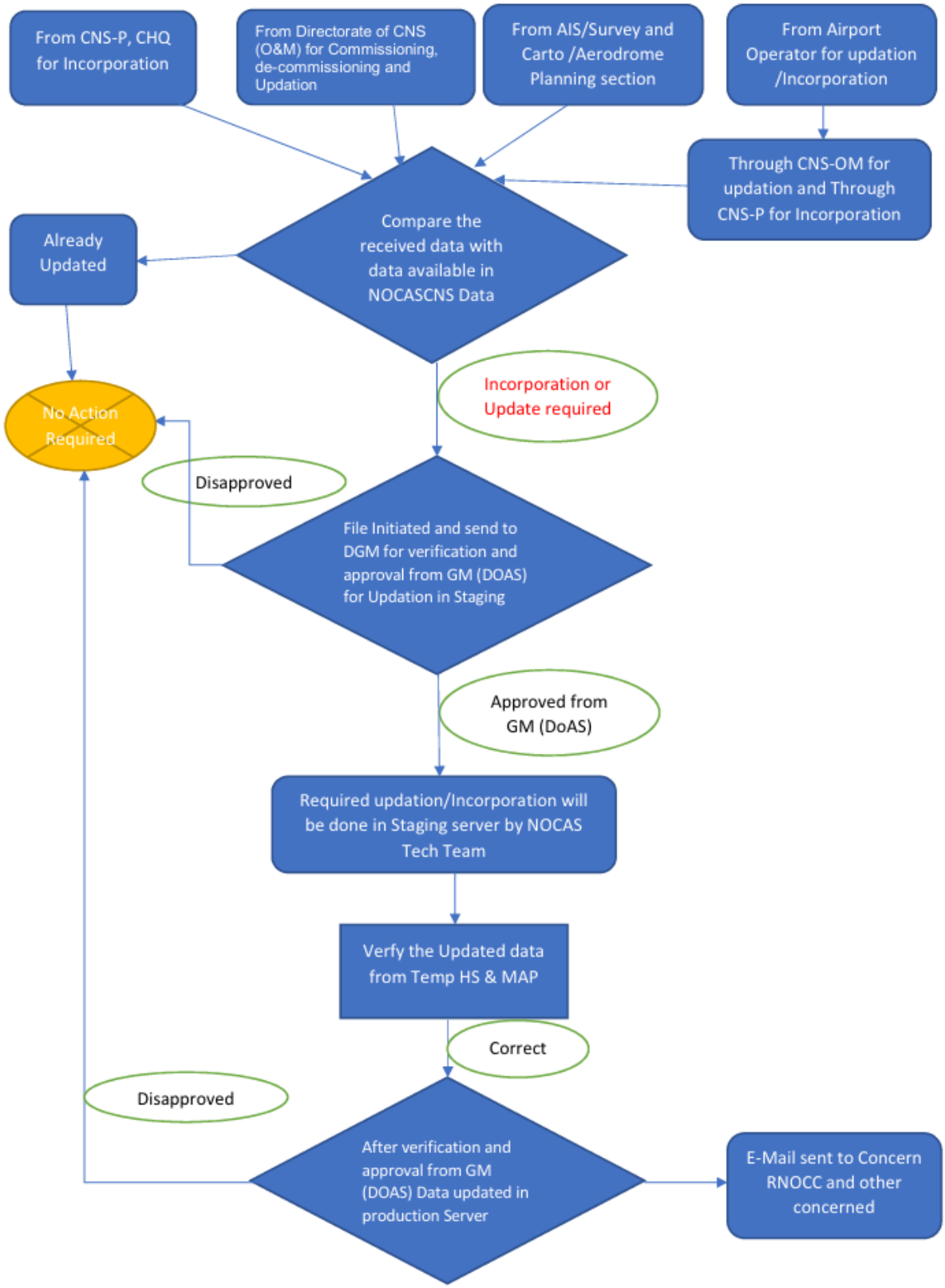
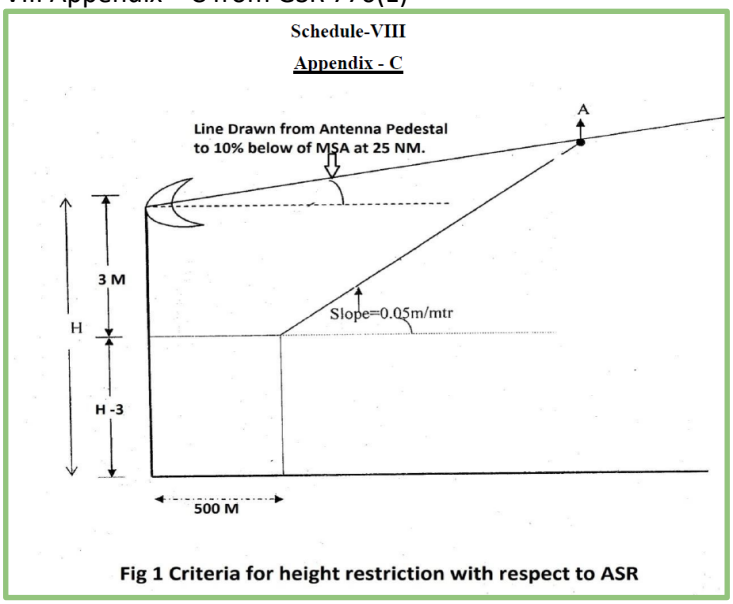
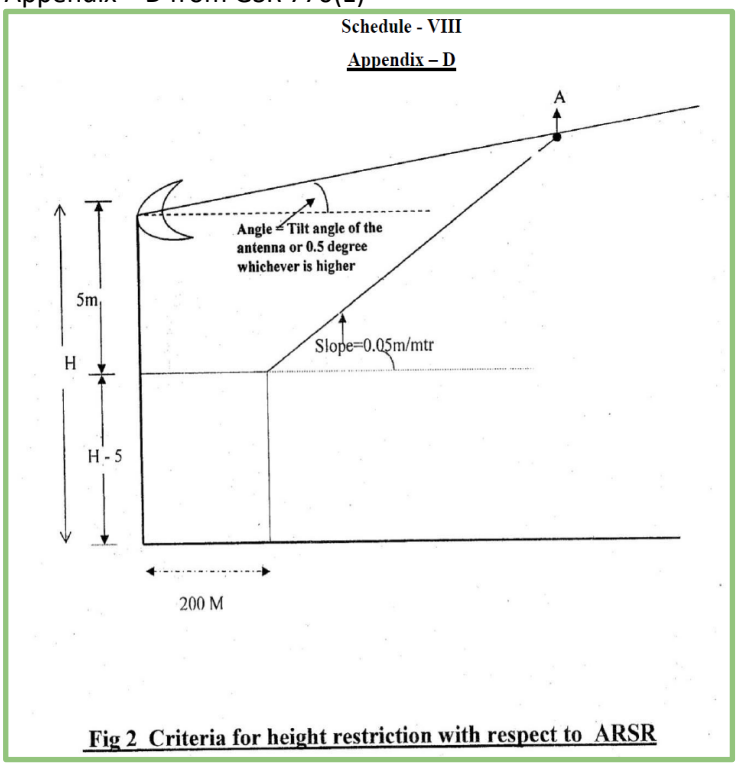


Figure 27: CNS DATA INCORPORATION/UPDATION IN PROPOSED SYSTE

463.A	Safeguarding of CNS facilities	DVOR (Doppler VHF Omnidirectional Radio Range): No structure (located beyond the area of 300M radius as specified in Annexure I (NCZ)) shall subtend a vertical angle greater than 1.5 degree at the centre of the Very High Frequency Omni Range counterpoise from the horizontal plane passing through the counterpoise. Please refer Figure 28 below for DVOR image on an aerodrome.  *Figure 28: DVOR*		
463.B	Safeguarding of CNS facilities	For ASR Calculation: a) No structure will be permitted on the land above the level of 3 meters below the pedestal height up to the distance of 500 meters from Radar antenna. b) Beyond 500 meters from particular Radar site, the height of the permissible structures shall be increased at the rate of 0.05 meter per meter from 3 meter below the center of antenna pedestal upto a point wherein the line drawn from a point 10 per-cent below the minimum sector altitude at the farthest point (from Radar site) or any other designated minimum sector altitude at different distance in same sector whichever is closer to horizon, to the center of antenna pedestal intersects. Beyond the above stated point no large object shall be permitted to protrude above the line drawn from a point 10 per-cent below the minimum sector		

		altitude at the farthest point (from Radar site) or any other designated MSA at different distance in same sector whichever is closer to horizon to the center of antenna pedestal depending on the minimum sector altitude in that particular sector. c) For illustration & implementation refer to Schedule-VIII Appendix – C from GSR 770(E)  Fig 1 Criteria for height restriction with respect to ASR		
463.C	Safeguarding of CNS facilities	For ARSR Calculation: a)No structure will be permitted on the land above the level of 5 meters below the pedestal height up to the distance of 200 meters from Radar antenna. b)Beyond 200 meters from particular Radar site the height of the permissible structures may be increased at the rate of 0.05 meter per meter, upto a point wherein the height of the permissible structure does not protrude above an angle of elevation of more than 0.5 degree at the antenna pedestal or an angle equal to antenna tilt angle set during last flight inspection whoever is higher. c)Beyond the above stated point, no large object would be permitted to protrude above the line drawn at an angle of 0.5 degree from antenna pedestal or an angle equal to antenna tilt angle set during last flight inspection whichever is higher. Large object means the structure subtending azimuth angle of 0.4 degree or above at Radar antenna. d)In case of cluster of buildings wherein the gap between the two adjacent buildings subtends an azimuth angle of less than 0.4 degree on the antenna pedestal, the entire cluster should be considered as one object		

		e)For illustration & implementation refer to Schedule-VIII Appendix – D from GSR 770(E)  Fig 2 Criteria for height restriction with respect to ARSR		
463 D	Safeguarding of CNS facilities: Like RCAG, ADS-B, DME, ASMGCS SMR and GAGAN - INRES /INLUS	It is recommended to the selected bidder to strictly abide guidelines from ICAO Annex 10, its amendments, DGCA CAR/GSR 751E & 770E guidelines, specifically SCHEDULE – I & II of GSR 751 E/ GSR-770 (E)-amendments for criterion of Safeguarding of CNS facilities.		
464	CNS Simulation Study	As per ADSAC 02 of 2022 (amended): The Communication Navigation Surveillance (CNS) Simulation Study is a process of validated electromagnetic 3D computer modelling of obstacle environment including terrain, obstacles (existing or proposed/manmade or natural) interfering system, ground and airborne NAV-AID equipment characteristics in an airport scenario and to check the electromagnetic propagation signal-in-space, to find out any degradation or impact caused by the environment, as above, on the particular CNS (VOR, DME, ILS, RADAR, etc.) facility which may affect it's continuity, integrity, coverage and Signal performance with reference to defined operational limits in ICAO Annex-10 Vol-I, DOC 8168 and DGCA CAR's. The		

		selected bidder shall ensure that this requirement stands as is in the proposed solution.		
465	CNS Simulation Study	The system shall ensure that as per GSR-751(E) Para 5.2 of Schedule II, "in case any structure is required to be made within aerodrome premises (airside and city side) by the Aerodrome Operator which creates obstruction from CNS point of view, a simulation study could be carried out to study the impact of this structure on the performance of the relevant facility and in case the study confirms that the impact would not hamper the operability of the facility, such structure could be permitted within the aerodrome premises".		
466	CNS Simulation Study	The system shall ensure that the initiation workflow of this study shall abide the clauses referred below from ADSAC 02 of 2022 (amended) for eligibility of application of the simulation study: 6.1 Need for CNS simulation study may arise if an airport project has received the NOC for restricted height from the Designated Officer of AAI and the restriction has been caused by one of the CNS facilities. 6.2 Need for a CNS Simulation Study may also arise for the siting of CNS Facilities at new Airport or site, owned by AAI or other than AAI. Other requirements of simulation study include: a) Feasibility Study for site selection and installation of new CNS facilities. b) Development of new airports. c) Modernization and upgradation of existing airports such as ATC Tower, Terminal building, metro infrastructure etc. d) Construction of any new building/structure in and around aerodrome premises. e) To assess the degradation in performance of any CNS facilities. f) Project of National importance (e.g. Metro Project, AIIMS building, NHAI Project etc.)		

467	CNS Simulation Study	On the request of the concerned Airport Operator under the provision of GSR-751(E) as stated above, CNS Simulation Study (CSS) is done by the CNS Simulation Cell at CNS-OM Directorate of AAI CHQ in coordination with the Department of Aerodrome Safeguarding at AAI CHQ using a 3rd party CNS simulator system.		
468	CNS Simulation Study	As per para 6.4.8 of ADSAC 02 of 2022 (amended): AAI CHQ through CNS simulation study will assess the feasibility to overcome the restrictions caused by the CNS facilities. Such revised permitted top elevation in respect of CNS, will be communicated through the proposed solution to respective DoAS office. AGA & PANS-OPS criteria will not be assessed by AAI CHQ. DoAS RHQ/Station level office will continue to examine the same even for the simulation study cases.		
469	CNS Simulation Study	The system shall be able to integrate external electromagnetic simulation outputs (e.g., EMACS-generated DGN/CSV/plots) by storing results as attachments and metadata linked to the application, and update PTE values based on accepted CNS simulation outcomes, preserving the lineage in the height sheet.		
470	CNS Simulation Study	As per para 7 of ADSAC 02 of 2022, the proposed system shall ensure CNS Simulation Study fee to be charged from the Private & Joint Venture Airports (other than AAI airports) as per CNS Circular 13 of 2021, Annexure-I in ADSAC 02 of 2022. The applicant shall also submit an Undertaking along with the Fees, as per Annexure-II in ADSAC 02 of 2022. The CNS Simulation Study shall start only after submission of requisite fee and undertaking by the applicant.		
471	CNS Simulation Study	Currently the sharing of information for request of this study is manually initiated by the APD of concerned AO using an e-file in e-office.aai.aero mentioning the input data, circumstances and need for the study along with required documents. The proposed solution shall ensure end-to-end integration with the system used by CNS O&M users for performing CNS Simulation study. The scope of this integration is Rest-API based two-way integration to share requirement data for simulation as input to the CNS simulator system and receiving output of simulation study from the CNS simulator system to be used for NOC decision making purpose.		

472	CNS Simulation Study	Simulation Study is currently being done using IDS-EMACS Simulation Software Application and MicroStation by CNS Simulation team. A virtual airport environment which includes natural and man-made obstacles, antenna system models and digital terrain model is created to mimic the actual airport environment using EMACS Software Application		
473	CNS Simulation Study	For implementation information and approval workflow at each step of simulation study from Initiation to Impact Analysis to Resolution of the case through this study in the proposed solution, the selected bidder shall refer ADSAC 02 of 2022 (amended) and provisions of GSR-751(E)		
474	Small/Large Object Analysis	The system shall implement this study in the study in a fully automated manner. Refer Standard operating procedure for Small/Large Object Analysis w.r.t ASR/MSSR and ARSR/MSSR criteria in GSR 751/770 (E): NM-18015/1/2021-CNS-O&M for implementation details. Following is the brief procedure.		
475	Multi Radar Criteria	The system shall be able to visualize multi-radar criteria by showing integrated ASR/MSSR systems.		
476	Multi Radar Criteria	Wherever airport is served or is proposed to be served by operational and integrated Multiple Radars, i.e. more than one Airport Surveillance Radar – to be termed as multi radar, following criteria shall be applicable		
477	Multi Radar Criteria	In case only one Airport surveillance Radar is operational and proposed Airport Surveillance Radar(s)is/are yet to be operationalized and integrated, the existing Airport Surveillance Radar as well proposed Airport Surveillance Radar shall be considered independently for height restrictions as per the provisions of GSR 751 E and minimum of the height as above shall be permitted. The multi-Radar criteria shall be applicable only after operationalization and integration of the proposed and existing Airport Surveillance Radar in the ATM automation system		
478	Multi Radar Criteria	After Multi-Radar System is operationalized and integrated, the maximum Height permissible in the integrated system shall be considered for grant of height to the applicant. However, from Radar performance point of view, the structures are to be examined as follows, to ensure that there is no degradation of radar performance		

479	Multi Radar Criteria	structures within two kilometers from any of the Radar(s) (ASR) shall be examined from respective Radar (ASR) independently		
480	Multi Radar Criteria	for structures beyond two kilometers from each individual Radar(s) (ASR), highest permissible height among integrated and operational ASR system shall be permitted		
481	Multi Radar Criteria	Wherever airport is being served with —Multi-Radar System and one of the Airport Surveillance Radars, which is part of the operational —Multi Radar System is planned to be replaced by a proposed Airport Surveillance Radar, the —existing Multi Radar System as well as the —proposed Multi Radar System shall be considered independently for height restrictions and minimum of the two heights shall be permitted		
482	Small/Large Object Analysis	Determination of large objects as defined in schedule II, para 2.5.1.1 and 2.6 of GSR 770(E), GSR770 (E), ICAO ANNEXURE-10 and other regulatory norms., has not been fully automated in the absence of 3D satellite imagery data of adjacent buildings of the proposed building for which higher height has been sought through appeal procedure in the existing system.		
483	Small/Large Object Analysis	Existing system can determine whether the building(s) / structure(s) of the applicant is small/large in isolation. However, analysis of cluster of buildings wherein the gap between the two adjacent buildings subtends an azimuth angle of less than or more than 0.4 degree on the antenna, to determine whether the entire cluster should be considered as one object is not presently possible in the absence of suitable imagery analysis capabilities & data.		
484	Small/Large Object Analysis	Small/Large angle study is processed by CNS officers posted in CNS-OM Directorate after receipt of same from DoAS.		

485	Small/Large Object Analysis	If the site is restricted due to CNS Radar criteria and after analysis in angle summary of Height sheet of case, it is found that the proposed building/structure is subtending: an azimuth angle of ≥0.4° in isolation on ASR (for Single RADAR Airport) and all operational ASRs antenna (in case of multi radar system operational at Airport), subject building/structure is classified as a large object in isolation and height will be restricted accordingly and no further examination will be done. In this case file will be submitted with all findings & observations of the case to GM DOAS through GM CNS O&M		
486	Small/Large Object Analysis	If the site is restricted due to CNS Radar criteria and after analysis in angle summary of Height sheet of case, it is found that the proposed building/structure is subtending an azimuth angle of< 0.4 ° in isolation on ASR (for Single RADAR Airport) and any one of the ASRs antennas (in case of multi radar system operational at Airport), it will be further examined for large/small object collectively with the buildings/ structures, adjacent to the proposed building/structure as per details made available during Site Survey and database at CHQ		
487	Small/Large Object Analysis	During examination if the gap between the proposed structure/building and any such adjacent structure(s)/ building(s) (Qualified as small object after analysis and cleared from Radar criteria), subtends an azimuth angle< 0.4 degree together on the Radar antenna, this will be collectively considered as one cluster.		
488	Small/Large Object Analysis	If the angle subtended by such cluster is greater than or equal to 0.4 degree on Radar antenna, then proposed building/structure will be large object and height will be restricted accordingly.		
489	Small/Large Object Analysis	If the angle subtended by such collective cluster is still less than 0.4 degree on the radar antenna, the proposed building/structure will be small object, and height will be permitted accordingly.		
490	Small/Large Object Analysis	Currently, to examine a case of small angle study in cluster with adjacent building structures, GM DOAS sends case for onsite verification to carry our surveys of all building structures		

491	Small/Large Object Analysis	Cluster study is done to ensure that no other building near the building which is subtending at angle less than 0.4 is collectively subtending an angle greater than or equal to 0.4 degree and may act as an obstacle		
492	CNS Small angle study – verification by CNS User	Currently this process is manual. The proposed solution shall ensure complete automation of the subject workflow. For reference, key steps of the workflow for understanding purpose are as follows. Note: The selected bidder has to verify this workflow during SDD workshops and implement the proposed solution accordingly. Within Small Angle Study, technical process workflow for Cluster Study is as follows: 1) User creates a buffer of distance 150m as radius from the farthest corner (of the building) from the center (of the proposed building) 2) User adds 0.4-degree angle to both the sides of angle subtended on the proposed building 3) User checks if any building structure falls within the expanded buffer created above and is qualified as small object after analysis and cleared from radar criteria 4) User checks if the gap between these two adjacent structures (proposed and existing)subtends an angle less than 0.4-degrees together on radar antenna, 5) If step 4 is positive, a cluster is formed and total angle subtended on the radar antenna is checked 6) If total angle subtended on the radar antenna is greater than 0.4-dregrees, proposed building / structure is considered as large object, and approved height will be restricted accordingly, 7) If total angle subtended on the radar antenna is less than 0.4-dregrees, then proposed building / structure is considered as small object, 8) User checks for restricted heights from other CNS facilities and give permitted height according to the height sheet confirming whichever is less. 9) Formula used for calculating angle subtended Individually = max angle of building – min angle of building 10) Angle subtended by cluster (of buildings A & B) = max of building A – max of building B 11) Within overlap if smallest building segment falls within it, then whole building will be considered for small angle study. 12) Note: Cluster will always formed by grouping two buildings		

493	CNS Small angle study – verification by CNS User	The system shall be able to perform CNS small-angle and cluster analysis for ASR/MSSR by computing the azimuth angle subtended by the proposed structure and adjacent structures at radar pedestal, form clusters when gaps subtend <0.4° and classify large/small objects; analysis shall use spatial buffers, angular computations and geometry engines exposed via server GP tools. The system shall be able to support measurement of vertical angles and azimuths from facilities to obstacles, returning angle values used in CNS calculations to improve transparency.		
494	CNS Small angle study – verification by CNS User	The system shall be able to include nearby structures during examination by visualizing 150 m buffers and broader AOI windows in maps, compute angles and cluster formation in CNS analyses, and assess impact on radar performance thresholds		
495	Site Visit Performa for Small/Large angle Study	Refer Standard operating procedure for Small/Large Object Analysis w.r.t ASR/MSSR and ARSR/MSSR criteria in GSR 751/770 (E): NM-18015/1/2021-CNS-O&M for Site visit Performa.		
496	Aeronautical Study guidelines	The selected bidder shall refer ADSAC 05 of 2020 dated 3rd July 2020 (Aeronautical Study Guidelines) and ADSAC 08 of 2020 (Procedure for processing of appeal application to the appellate committee) for implementing aeronautical study in the proposed system		
497	Aeronautical Study Guidelines	Director General of Civil Aviation Civil Aviation Requirement (CAR) on Aerodrome Design and Operations Section 4 (Series 'B' Part 1), Chapter 4 and GSR 751(E) mandate the establishment and safeguarding of Obstacle Limitation Surfaces (OLS) at an airport, to permit safe aircraft operations and to prevent the airport from becoming unusable by the growth of obstacles around it.		
498	Aeronautical Study Guidelines	As per the DGCA CAR paras 4.2.4, 4.2.5 and GSR 751 E schedule II para 5.1, penetration of some of the obstacle Limitation surfaces may be allowed, if in the opinion of the Appropriate Authority, after the conduct of aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of the aircraft operations.		

499	Aeronautical Study Guidelines	As per rule 11 of the GSR751(E), Appellate Committee has been constituted which acts as the Appropriate Authority for considering the recommendations for higher height through the aeronautical study report for a suitable decision.		
500	Aeronautical Study Guidelines	The system shall be able to implement aeronautical-study "lifting" rules for AGA OLS penetrations by applying composite slopes of 1.27% from the upper edge of the transitional surface up to 90 m above aerodrome elevation, and 4.11% from the IHS outer edge up to 300 m above aerodrome elevation, presenting comparative plots against OLS to enforce the lower of computed or OLS elevation as mentioned below		
501	Aeronautical Study Guidelines	With reference to the standards and guidelines mentioned above, the following indications for the restricted penetration of the OLS by the structures, which are granted higher height through aeronautical studies, may be referred for implementation by the proposed solution:		
502	Aeronautical Study Guidelines	In IHS, higher heights penetrating the OLS to be restricted to the slope of 1.27 % from the upper edge of transitional surface, up to the maximum height of 90 m above the aerodrome elevation. Please refer Figure 29 below for an indicative depiction of shortest distance from upper edge of the Transitional Surface. The selected bidder shall refer DGCA CAR paras 4.2.4, 4.2.5 and GSR 751 E schedule II para 5.1 before implementation.		

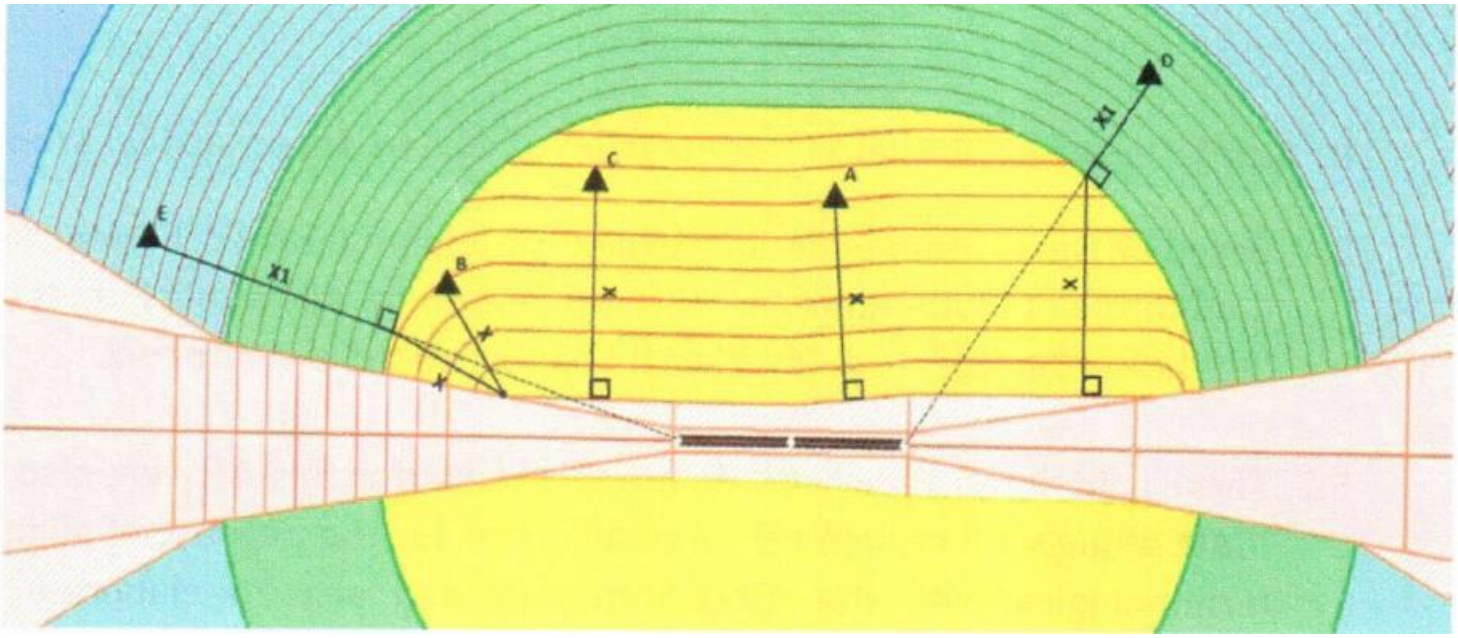


Figure 29: Shortest distance from upper edge of the Transitional Surface

503	Aeronautical Study Guidelines	In continuation there to, in the conical surface including outer conical surface the heights penetrating the OLS to be restricted in the slope of 4.11 % from the outer edge of the IHS up to the maximum height of 300 above aerodrome elevation.		
504	Aeronautical Study Guidelines	Maximum allowable penetration of Inner Horizontal Surface: the formula used to calculate the allowable penetration of Inner Horizontal Surface is Aerodrome Elevation + 45M + 1.27% of distance X.		
504.1	Aeronautical Study Guidelines	By using the formula, allowable penetration has been calculated for the different portions of the IHS of the Mumbai Airport for the indicated in figure 30, 31 and 32.		

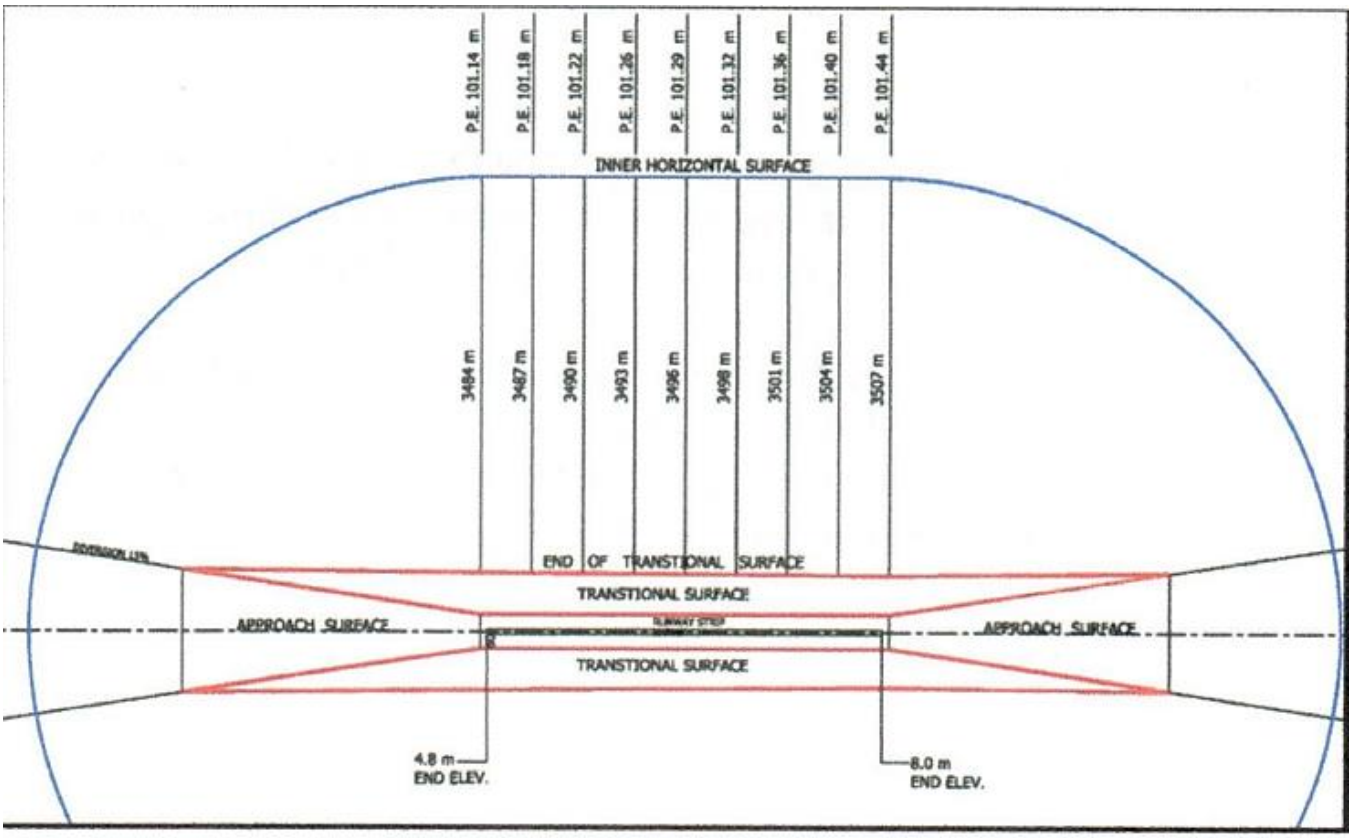


Figure 30: Distance measurement between the upper edge of TS and IHS outer edge (Central portion)

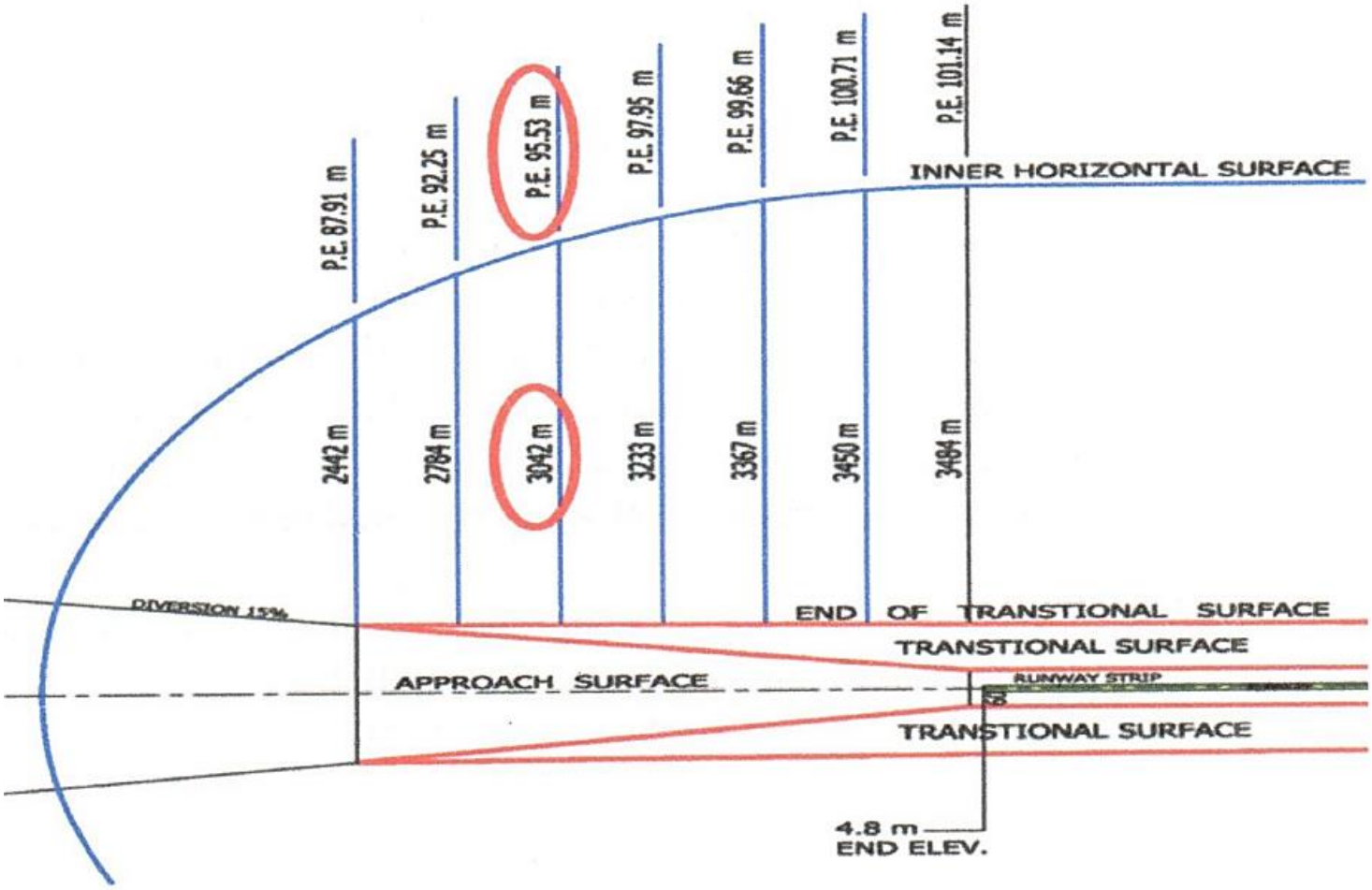


Figure 31: Distance measurement between the upper edge of TS and IHS Outer Edge (Approach portion)

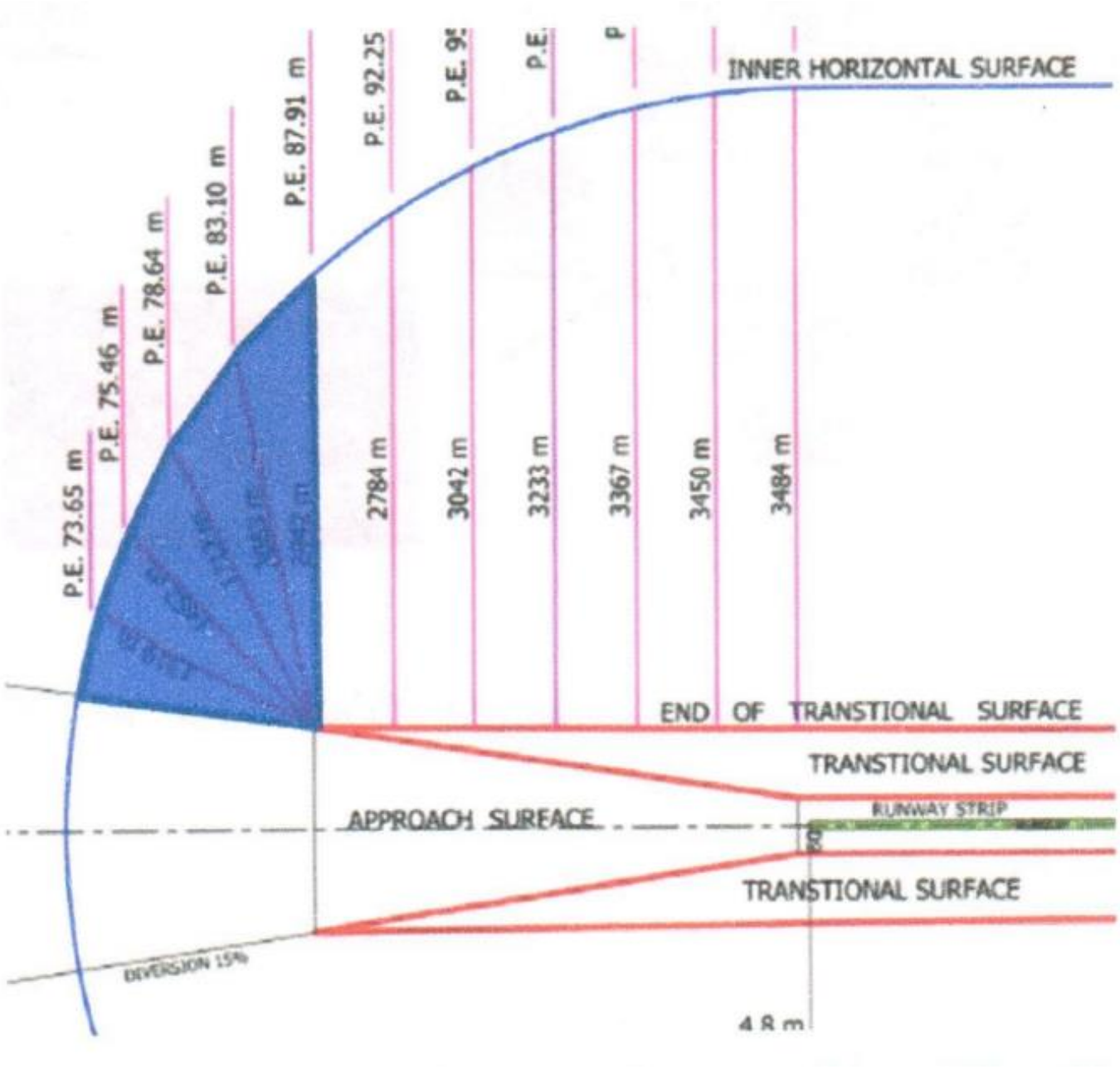


Figure 32: Distance Measurement between the upper edge of TS and IHS Outer Edge (other area)

505	Aeronautical Study Guidelines	Maximum allowable penetration of OLS in Conical and Outer conical surface: if the site lies in the conical surface, first the distance X1 is calculated by drawing a perpendicular from the proposed structure site to the IHS outer edge. Then the distance X is found out by drawing a perpendicular from the point, where the previous line X1 meets the outer edge of IHS, to the upper edge of the transition surface. The formula		

		used to calculate the allowable penetration of Inner Horizontal Surface is Aerodrome Elevation + 45M + 1.27% of distance X +4.11% of the X1.		
506	Aeronautical Study Guidelines	In the situations where the above calculations of allowable penetration yield lesser elevations than the OLS, permitted top elevations from the AGA OLS will prevail.		
507	Aeronautical Study Guidelines	To ensure the gradual increase of the elevations laterally from the Approach surface so as not to exceed 14.3% of the approach surface elevations, Outer Transition Surface (0TS) is extended up to the IHS. The extension of the Outer Transitional Surface (14.3%) could avoid abrupt vertical changes in the vicinity of approach surface. This extension of OTS concerns the Guidelines only and has no bearing on the G.S.R. 751 (E) surfaces		
508	Aeronautical Study Guidelines	The above guidelines, i.e. the allowable penetration of OLS through Aeronautical Study shall be applicable for Instrument Runways as well as Non-Instrument Runway of Code 1, 2, 3 and 4.		
509	Aeronautical Study Guidelines	The results of every Aeronautical Study so conducted, including the recommendation for higher height if any, shall be presented to the Appellate Committee of MoCA. In accordance with the decision of the Appellate Committee, AAI shall dispose of the appeal. NOC issued after conduction of Aeronautical study shall have the remark provision for "Issued after Aeronautical study".		
510	Aeronautical Study Guidelines	The system shall be able to support aeronautical study lifting rules for OLS penetration within Inner Horizontal and Conical surfaces by applying composite slopes 1.27% (from upper edge of transitional up to 90 m AGL) and 4.11% (from IHS outer edge up to 300 m AGL), compute allowable penetrations, and present comparative plots where OLS remains more restrictive		
511	Aeronautical Study Guidelines	A) System shall ensure that PANS-OPS non-penetration remains mandatory ahead of any lifting. B) System shall ensure that data generated from Aeronautical Study and important for NOC decision making shall be reconciled with the centralized database of the proposed solution to be accessible with role-based access control.	C)	D)

512	Existing FPD Procedure design data update process	a) New Procedure update in Policy/Rule Engine b) New Surfaces design in 3rd party FPDAM Simulator System c) Generated Surface sent via email to AAI NOC tech team d) Airdrome Implementation e) Draft Height Sheet Generation f) Verification & Validation of Height Sheet (To & From) g) Production Go Live		
513	Integration Requirements - Proposed solution with 3rd party FPD simulator system	The diagram outlines the tentative data flow and integration process between AeroDB and proposed solution, along with associated components such as PJM, FPDAM, and Procedures & Protected Areas		
514	Integration Requirements - Proposed solution with 3rd party FPD simulator system	Block Diagram depicted in Figure 33 below represents how aeronautical data is staged, approved, and shared in various formats for integration with proposed solution		

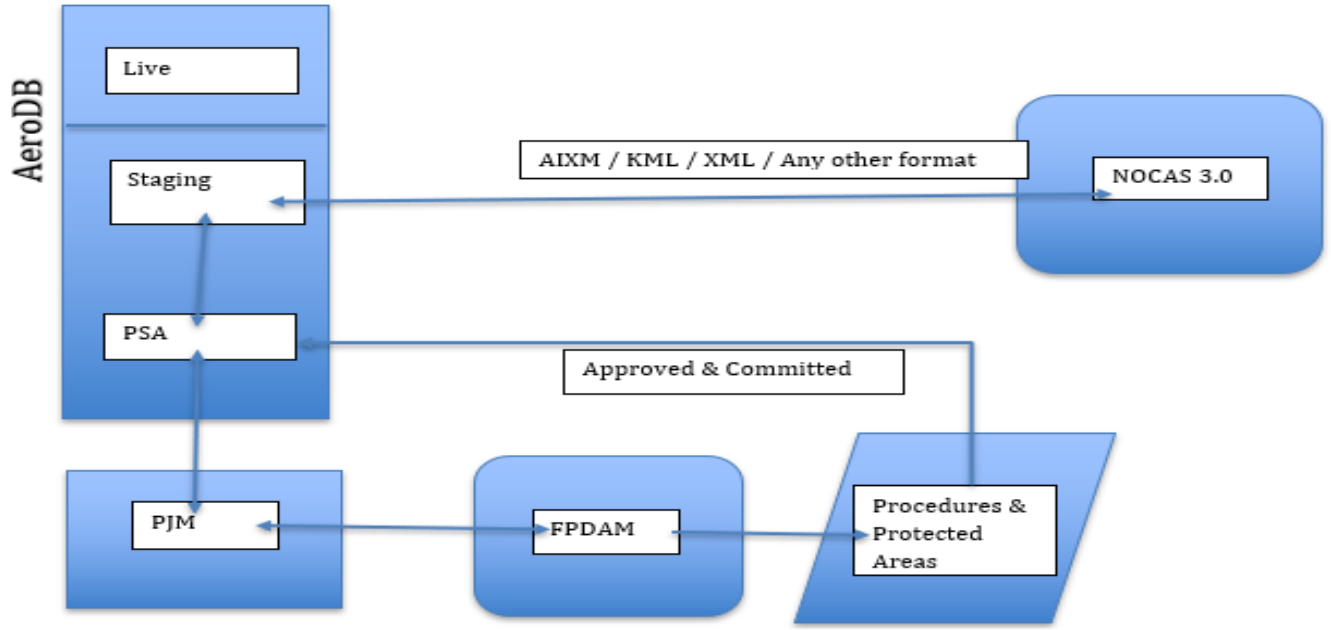


Figure 33: Proposed solution and the AeroDB ecosystem

515	Component 1: Aero DB database	Live: Represents the production environment where finalized and operational aeronautical data resides.		
516	Component 1: Aero DB database	Staging: A temporary environment where data is prepared, validated, and approved before being committed to the live database.		
517	Component 1: Aero DB database	PSA: A subsystem within AeroDB that interacts with PJM for FPDAM-specific aeronautical data.		
518	Data Flow from AeroDB	Data moves from Staging to external systems once it is Approved & Committed. Approved data can be exported in multiple formats such as AIXM, KML, XML, or any other required format for interoperability.		
519	Proposed solution	Receives aeronautical data from AeroDB in standardized formats. This integration ensures compliance with obstacle clearance and airspace management requirements		

520	Component 2: PJM (Project Management Module)	Connected to PSA within AeroDB. Handles project-specific data and workflows before passing relevant information to FPDAM PJM and FPDAM modules handle project and flight procedure data, ensuring compliance with protected areas.		
521	Component 3: FPDAM (Flight Procedure Design and Management) / any other flight procedure design simulator software	3rd party simulator system to be integrated with proposed solution Works in conjunction with PJM and **Procedures & Protected Areas**. Ensures that flight procedures and protected zones are accurately defined and maintained.		
522	Component 4: Procedures & Protected Areas	Represents the repository or system where flight procedures and protected airspace areas are stored and managed. This data is critical for safe navigation and compliance with aviation standards.		
523	Integration Requirements - Proposed solution with 3rd party FPD simulator system	The seamless communication between the two systems - procedure design simulation software and proposed solution need to be automated preferably using APIs or using any such interim arrangement that minimizes manual intervention.		
524	Integration with AeroDB / AIS AIM database	The Airports Authority of India (AAI) will supply an API to enable seamless data exchange between AeroDB/AIS AIM and the proposed solution. The system shall be able to assume access to AIS/AeroDB change feeds aligned to AIRAC cycles and GDPDC guidelines. AIS Integration: The system shall provide a robust API for seamless integration and data interoperability with existing Aeronautical Information Services (AIS).		
525	Component 4: Procedures & Protected Areas	To achieve the lowest possible operating minima for aircraft operation, it is necessary to safeguard the PANS-OPS Surfaces as per standards ICAO Document 8168 and 9905		

526	Component 4: Procedures & Protected Areas	The limit of PANS-OPS surfaces extends up to 30NM from the facility i.e. VOR or NDB serving the aerodrome.		
527	Component 4: Procedures & Protected Areas	Consideration needs to be given to the objects which penetrate the PANS-OPS surfaces, regardless whether they penetrate Annex 14 OLS.		
528	Component 4: Procedures & Protected Areas	Such obstacles may result in an operational penalty like higher Obstacle Clearance Altitude/Height (OCA/H) and introduction of longer approach segment.		
529	Component 4: Procedures & Protected Areas	Therefore, while examining the cases for issue of NOC from PANS-OPS point of view, the operational criteria need to be considered based on the provisions of Documents 8168, Vol.-II.		
530	Component 4: Procedures & Protected Areas	It needs to be ensured that the minimum altitudes of the following segments, for published or the proposed flight procedures (conventional and PBN both), are not infringed: i. Minimum Sector Altitude (MSA) ii. Minimum Holding Altitude (MHA) iii. Minimum Vectoring Altitude (MVA) iv. Minimum Altitude of Initial and Intermediate Segments v. OCA/H (Straight-in-and Circling) for all aircraft categories vi. STARs /SIDs procedure altitude. vii. Basic ILS Surface		
531	Integration Requirements - Proposed solution with 3rd party FPD simulator system	The system shall be able to constrain edits to procedures and protected areas to approved inputs (AIXM/KML/XML) from FPDAM/AIS with real-time integration; manual digitization in production shall be disallowed except under documented exceptions.		
532	FPD user requirements	The system shall provision following functionalities for FPD departmental users: 1. 3D representation of PANS-OPS surfaces. 2. Automation workflow for the IFPs to be extracted from 3rd party design software used for flight procedure designing, as well as the proposed solution should share the NOC obstacles into this 3rd party design software used for flight procedure designing.		

		3. Calculation of height must be in accordance with criteria of DOC 8168 Vol 2, DOC 9905, DOC 9613 and provisions of GSR751 or other applicable regulations and issued or amended from time to time. 4. Inclusion of CAD like operations functionality specially measuring tool such as distance, bearing and drawing tools like perpendicular, parallels and arc. 5. Complete IFPs to be protected (i.e. all segments to be protected). 6. Airport and particular RWY based procedure depiction, and Depiction of different segments can be invoked by PANS-OPS users as and when required. 7. Height sheet must include the calculations of PTE (preferably as pop-up message/formula box- Only for authorized FPD Users). 8. Real-time visualization with obstacle markers, auto-feasibility checks for new structures based on spatial location and elevation. 9. Vertical tolerance as mandated by DGCA to to be included for PANS-OPS PTE.		
533	Component 4: Procedures & Protected Areas	The system shall be able to compute and display OCA/H derivations as per Doc 8168 Volume II, including terrain effects and obstacle-profile generation, and provide authorized users with formula boxes and intermediate values (distances, angles, heights) in the height sheet.		
534	Component 4: Procedures & Protected Areas	The system shall be able to evaluate PANS-OPS protected surfaces and procedure segments (MSA, MVA, MHA, initial/intermediate/final, circling minima, SIDs/STARs, basic ILS), compute OCA/H with terrain and obstacle inputs, and prohibit any penetration by design; ingestion shall support AIXM 5.1 and KML/XML formats with validations, aligned to Doc 8168 and the RNP AR design manual where applicable		
535	Survey/Carto onboarding use-cases	The system shall onboard and support Survey Carto User to provide inputs during aerodrome planning, design, development and NOC process		
536	Survey/Carto onboarding use-cases	Key data input parameters during onsite surveys by a Survey Carto user: a) Runway extremities b) CNS NAVAIDS c) Aerodrome Reference Point (ARP)		

		d) Aerodrome Elevation e) Runway Threshold f) Displacements in runway parameters or CNS facility parameters, if any g) Runway Centerline Marking System shall ensure to capture these inputs for implementing below requirements		
537	Survey/Carto onboarding use-cases	During planning stage of a new airport, Carto Survey is not the member of pre-feasibility team, hence a benchmark/reference point within proposed airport having Surveyed co-ordinates in WGS 84 may be provided to draw the Proposed OLS surfaces.		
538	Survey/Carto onboarding use-cases	During Airport Licensing time, the system shall facilitate Survey Carto team for site survey of obstacle data of survey surfaces, before the airport goes operational. The system shall automate/assist Survey Carto of new development whose NOC issued by system and same is constructed at site for the purpose of Aeronautical Chart.		
539	Survey/Carto onboarding use-cases	A) The system shall automate / assist Survey carto users to prepare aeronautical charts to be published in AIS AIP(Aeronautical Information Publication) as per AIRAC cycle of 56 days which traditionally provided essential flight info via the AIP and NOTAMs, ensuring safety and regularity in air navigation by managing data for pilots and aviation professionals: OR B) Integration with software being developed by Survey/Carto department for automation of aeronautical charts to be published in AIS AIP database; AND C) Automation of AGA Transition Surface Examination at initial stage; AND D) Automation of Shielding criteria for survey inputs specific use cases.	E)	F)
540	Survey/Carto onboarding use-cases	Survey Carto users are responsible for layout formation for publishing, its printing & signing requirements. System shall have a new module for automating this workflow with digital verification and e-signing.		

541	Survey/Carto onboarding use-cases	System shall establish a new module required for automatic Grid correction by respective departmental users for the purpose of CCZM NOC Evaluation		
542	Survey/Carto onboarding use-cases	There is currently no automated workflow of OLS Update from Survey Carto user data inputs. System shall implement an automated workflow for seamless data update from Survey Carto user inputs.		
543	Survey/Carto onboarding use-cases	System shall implement new features so that rather than coming to Survey Carto users for verification/ layout formation from DoAS, Initial CCZM shall come for validation by Survey Carto users, same as AGA, CNS, PANS-Ops users		
544	Survey/Carto onboarding use-cases	System shall have provision for Automatic color coding of CCZM for the different PTEs required which must be common for all airports		
545	Survey/Carto onboarding use-cases	Survey Carto user work efficiency increases if reference to ground features (2D as well as 3D) are available below Interactive CCZM as a basemap. System shall have a provision to let the user toggle between various available basemap as gallery		
546	Survey/Carto onboarding use-cases	System shall automate shielding criteria study using DEM data to be validated by conducting onsite survey w.r.t. Shielding criteria by Survey/Carto user		
547	Survey/Carto onboarding use-cases	System shall automate the workflow for examining AGA OLS surfaces at initial stages of CCZM preparation w.r.t. Survey Carto user		
548	Survey/Carto onboarding use-cases	System shall automate transitional surfaces examination workflow w.r.t. Survey Carto user		
549	Recommendation w.r.t AMDT 18	The proposed solution is envisaged to act as a prescriptive and predictive recommendation system considering current regulations as well as upcoming changes in year 2030 w.r.t Amdt 18 of ICAO Annex 14. This is a priority feature.		

		The system shall be able to recommend to the application and NOC evaluating officers/departments in alignment with ongoing Annex 14 revisions (OFS/OES under Amendment 18/2025), structuring rules to support legacy OLS and future OFS/OES, ensuring forward compatibility to the applicability date.		
550	Aeronautical Data Ingestion Pipeline	System shall establish a data input pipeline with templates & approval and audit of inputs for: a) Master plan data from Planning dte (w.r.t pre-feasibility) b) Survey Carto for approved survey modification data / operational data c) AIS data to be referred to for published operational information d) DoAS for approval e) Coordination between all the data providers for maintaining integrity of data f) Alert and notifications with SLAs to all stake holders		
551	3D Scene Viewer	The system shall provide 2D & 3D information up to 56 km of an airport. The system shall be able to generate and maintain 3D visualization of airports, terrain and obstacles using 3D web scene viewer/web map viewer		
552	3D Scene Viewer	The selected bidder to establish data processing workflow for converting 2D GIS satellite imagery data into 3D block information for obstacles within 56 kms of an airport.		
553	Aeronautical Data Ingestion Pipeline	The DEM data to contain obstacle topographic data will top elevation		
554	Windrose data	API Integration with Met dept Wind data		
555	Aeronautical Data Ingestion Pipeline	a) Highest obstacle info to be available within AOI and b) Water body info within AOI to be available as part of 3D basemap	c)	d)

556	AIS AIM & AeroDB Integration	Pursuant to Article 28 of the Convention on International Civil Aviation each contracting State undertakes to provide Air navigation facilities and standard systems in accordance with standards which may be recommended or established from time to time, pursuant to this Convention.		
557	Integration with AeroDB / AIS AIM database	International Civil Aviation Organization adopts and amends from time to time, as may be necessary, international standards and recommended practices and procedures for Aeronautical Information Services in Annex 15.		
558	Integration with AeroDB / AIS AIM database	As a contracting State of ICAO, the provision of Aeronautical Information Services in India shall be in conformity with the promulgated standards and recommended practices/procedures of ICAO.		
559	Integration with AeroDB / AIS AIM database	DGCA India has adopted these standards and recommended practices/procedures by promulgation of Civil Aviation Requirement Section-9, Series 'I', Part I applicable for provision of Aeronautical Information Services in India.		
560	Integration with AeroDB / AIS AIM database	In India the Aeronautical Information Service (excluding publication of Aeronautical Information Circulars (AIC)) is provided by Airports Authority of India (AAI) for the whole of Indian territory and adjoining oceanic airspace over Bay of Bengal, Indian Ocean and Arabian Sea allocated to India by ICAO for the provision of Air Traffic Services. AIC are published by Director General of Civil Aviation (DGCA) India.		
561	Integration with AeroDB / AIS AIM database	AIS Section of CHQ, RG Bhavan, New Delhi and NOF Centers located at Chennai, Delhi, Kolkata and Mumbai are responsible to receive/originate, collate or assemble, edit, format, publish/store and distribute aeronautical information/data in accordance with the laid down rules, regulations, procedures and guidelines		
562	Integration with AeroDB / AIS AIM database	Aeronautical data and information are provided in the form of an integrated Aeronautical Information Package consisting of the following elements: 1. Aeronautical Information Publication (AIP) 2. Amendment service to the AIP (AIP AMDT) 3. Supplement to the AIP (AIP SUP) 4. NOTAM and Pre-Flight information bulletins (PIB) 5. Aeronautical Information Circulars (AIC) 6. Checklists, summaries and lists of valid NOTAM		
563	Integration with AeroDB / AIS AIM database	1. New Survey Data is received by AIS from Survey/Airports (Initiation by AIS) 2. A new CNS facility is commissioned or translocated (Initiation by CNS) 3. A new procedure is designed by FPD (Initiation by FPD)		

		4. A routine review of published IAP is done by FPD (Initiation by FPD) 5. Commissioning of VHF Communication facilities (Initiation by CNS)		
564	Integration with AeroDB / AIS AIM database	Possibility of providing data to proposed solution as AIS dept is already providing data to FPD, CNS, ASM and OPS		
565	Integration with AeroDB / AIS AIM database	The selected bidder to check compatibility of integration with AeroDB database environments which comprise published operational data. To establish this integration, the system shall establish a functional data pipeline automation workflow of AIS with planning / proposed information coming from Planning Dte and Survey Carto users.		
566	Integration with AeroDB / AIS AIM database	AAI shall ensure that AeroDB database all components (live, staging and PSA) are integrated with each other to establish the integration workflow mentioned in this document.		
567	Integration with AeroDB / AIS AIM database	The selected bidder to explore integration with AIXM data format available from AIS databases/		
568	Integration with AeroDB / AIS AIM database	AIS as central data provider via IDS - IAS as common data source for EMCAS, FPDAM and AIS. AIS has databases with unpublished /interim airports as well. The selected bidder is recommended to propose a Joint meeting with all data providers to formalize the NOC data update flow.		
569	Monitoring on demand beyond the current administrative reach of 56km	The system shall be able to visualize air route corridors beyond 56 km in optional analytical modules, overlay known obstacles (statues, windmills, high-rise) and provide advisory analytics without binding impact on NOC decisions unless policy dictates.		
570	Monitoring on demand beyond the current administrative reach of 56km	The selected bidder shall explore and design a solution for monitoring obstacles along air routes extending beyond 56 kilometers from airport reference points, to include features: a) Monitoring and detection of potential obstacles such as statues, windmills, high-rise developments, and other vertical structures that may impact airspace safety or flight operations. b) Supporting route planning for low-capacity aircraft, especially in regions with evolving urban landscapes or terrain constraints. c) Integration of satellite imagery, drone surveys, and geospatial analytics to identify and assess obstacles along		

		extended air corridors. d) The bidder shall engage with relevant stakeholders within the department to further elaborate the scope, data requirements, and operational feasibility of this feature. e) Any proposed solution must align with regulatory guidelines and be scalable for future integration into the proposed solution or associated/related platforms. f) Integration with MoCA/DGCA UTM APIs g) Alerts for no-drone zones or UTM corridors.		
571	Application Status Tracker	The system shall be able to generate applicant-facing status trackers showing document verification progress, department evaluations, pending payments, site visits, committee scheduling, and final outcome, synchronized.		
572	Public Notification Module	The bidder shall explore and design a module to provide a public-facing portal to publish NOC proposals with 3D map-based and document-based visualization tools. This module enables citizens to submit objections with supporting documents or geotagged photos via secure upload interface.		
573	Public Notification Module	This module shall use AI-based sentiment analysis to categorize public feedback for decision support and trend monitoring. The system shall be able to constrain public objections and feedback analytics to advisory status; sentiment categorizations shall not drive decisions without committee review.		
574	Public Notification Module	This module shall use Natural Language Processing /LLM to generate simplified, transparent explanations of NOC decisions for public understanding.		
575	Public Notification Module	This module shall support multilingual content and regional workflows, policies, and format.		
576	Integration with 3rd party simulators	Development of 3rd party simulators is not in scope of proposed solution; however, the proposed solution will be integrated with these simulators using Rest API bound integrations with provided information by Simulator developer. The system shall be able to constrain multipath and CNS simulation study to export/import enablement of study packs and results; proposed solution shall not compute electromagnetic performance but shall consume approved conclusions to update PTE and lineage.		
577	Aeronautical Data Ingestion Pipeline	The system shall be able to support IoT and external data ingestion via the enterprise geospatial platform REST/webhooks and scheduled ETL from AIS/AeroDB/FPDAM/PANS-Ops simulator into geodatabase while validating schema and authenticity through signed payloads.		

578	Application Status Tracker	The system shall configure Service Level Agreements (SLAs) for each stage of the application lifecycle, including document verification, inspection scheduling, and final approval in the upgraded application, as defined by AAI.		
579	Escalation of breach of SLA	The system shall implement an automated escalation mechanism that triggers alerts and escalates the application to the next level of authority if the SLA duration is breached. The system shall ensure that these escalation rules are fully configurable and adaptable to future changes in departmental policies or workflows.		
580	Escalation on breach of SLA	The system shall be able to assume that all stakeholders agree on SLA definitions and escalation paths, SLA rules shall be configurable per department and case type, and escalations shall record intermediate and final resolutions.		
581	Notification Integration	The system shall provide notification channels in real time. including but not limited to: i. Email alerts ii. SMS notifications iii. In-app alerts (for both web and mobile platforms) iv. notification templates shall be editable and versioned. V. all the EMAIL/SMS communication with applicants shall be stored in the application . the system should send an alert to DO in case of applicant reply to Reminder mails is overdue.		
582	KPI Dashboard	The system shall provide analytical dashboards and periodic reports to visualize trends, identify bottlenecks, and support data-driven decision-making. It shall provide information of Key performance indicators (KPIs) to monitor and improve the efficiency of the application process, including: i. Average application processing time ii. SLA compliance rate iii. Escalation frequency and resolution time iv. Verification turnaround time v. User satisfaction scores The selected bidder shall ensure the solution delivers a minimum 95% reduction in manual processing effort/time compared to the existing NOCAS-2 process, measured using defined KPIs. The selected bidder shall propose measurable KPIs such as average processing time per application, number of manual calculation touchpoints, deficiency cycles, manual drafting effort, and operator time.		

		The bidder shall provide a baseline vs. target methodology and commit to acceptance criteria demonstrating the reduction during UAT/Go-Live stabilization.		
583	Audit trail management	The system shall implement a comprehensive audit trail mechanism to log all user actions, system events, and workflow transitions across the application lifecycle.		
584	Audit trail management	The system shall ensure audit logs capture:		
585	Audit trail management	i. User identity		
586	Audit trail management	ii. Timestamp of action		
587	Audit trail management	iii. Nature of activity (e.g., data entry, approval, escalation)		
588	Audit trail management	iv. Affected records or modules		
589	Audit trail management	The system shall provide secure access to audit logs for authorized personnel, with filtering and export capabilities for compliance and review purposes.		
590	Data retention & archival	The system shall be able to constrain storage retention for audit logs, letters, attachments and case artifacts per AAI's IT data retention policies and regulatory guidelines whereas long-term archives shall be moved to immutable storage with indexable metadata.		
591	Periodic Data Review, Notification System, and Approval Workflow	The system shall incorporate a configurable mechanism for scheduled data reviews after a configured period from all stakeholders, ensuring validation of critical aeronautical and operational datasets.		
592	Periodic Data Review, Notification System, and Approval Workflow	The system shall ensure configurable Review Cycles with ability to define periodic review intervals (e.g., monthly, quarterly, annually) for each data category based on data type and stakeholder requirements		
593	Periodic Data Review, Notification System, and	The system shall facilitate generation of automated due date notifications, reminders, and warning alerts for upcoming or overdue data reviews		

	Approval Workflow			
594	Periodic Data Review, Notification System, and Approval Workflow	The system shall implement role-based workflows enabling data providers such as Aerodrome Operator (AO), Survey Section, CNS Planning, CNS (Communication, Navigation, and Surveillance), FPD (Flight Procedure Design), Cartography, AIS (Aeronautical Information Services), and Planning departments etc., to review and approve data updates.		
595	Periodic Data Review, Notification System, and Approval Workflow	The system shall be able to manage data provenance with signed submissions from CNS Planning/O&M, Survey Carto, FPD and AIS; the system shall expose preview and approval interfaces, discourage email loops and centralize approvals within proposed solution.		
596	Periodic Data Review, Notification System, and Approval Workflow	The system shall support for Aadhaar-based e-signing or other government-approved digital signature services to ensure legal compliance and auditability		
597	Service Request Tracker	The system shall provide a Data Service Request Tracker module. This will act as a Ticketing/ Helpline system for queries/ issues/ data-errors communication to AAI from Internal/External users attended.		
598	Service Request Tracker	This module shall implement a helpline style request tracker to enhance user support and ensure timely resolution of data errors, system issues, procedural queries etc.		
599	Service Request Tracker	This module shall enable internal and external users to raise service requests.		
600	Service Request Tracker	This module will function as a single window / centralized ticketing dashboard to track, assign, and resolve issues with automatic routing of tickets to relevant AAI departments or personnel based on issue type.		
601	Service Request Tracker	This system must be able to handle complex, non-standard issues requiring human intervention and follow-up, and will not work at the level of AI Chatbot only.		
602	Service Request Tracker	However, the system must implement integration with AI chatbot logs to convert unresolved queries into formal tickets		

603	Service Request Tracker	The system shall implement automated notifications to users regarding ticket status updates, resolution timelines, and feedback collection.		
604	Service Request Tracker	The system shall implement generation of: a) periodic reports on ticket volumes, resolution times, stakeholder performance, and common issue trends. B) Dashboard for AAI administrators to monitor service levels and user satisfaction.		
605	View case on map feature for anyone and everyone (Applicant, case evaluators and AAI decision making officials and authorities)	For bringing more transparency and efficient decision making, the system shall provide a dedicated module to "View case on map" depicting the case under consideration.		
606	View case on map feature for anyone and everyone (Applicant, case evaluators and AAI decision making officials and authorities)	This module shall accept coordinates and details of the application (as agreed during SDD workshops) and shows in real-time 3D view with features like topographic maps, 360 degrees rotate, flip, check/uncheck-able list of all layers with AGA and CNS Surfaces, projectable on Google map		
607	View case on map feature for anyone and everyone (Applicant, case evaluators and AAI decision making officials and authorities)	This module shall render a 3D view of the case under consideration with visual interpretation of penetration and PTE v/s RTE analysis and visible CNS/AGA/PANS-Ops facilities and obstacles and adjacent known buildings with RTE & PTE information as tag		
608	View case on map feature for anyone and everyone (Applicant,	This module shall facilitate case evaluators and decision makers should have access to all the calculation parameters & constraints in height sheet calculation		

	case evaluators and AAI decision making officials and authorities)			
609	View case on map feature for anyone and everyone (Applicant, case evaluators and AAI decision making officials and authorities)	This module shall enable Past, legacy and current data in co-related fashion visible on the map		
610	View case on map feature for anyone and everyone (Applicant, case evaluators and AAI decision making officials and authorities)	The system shall be able to provide comprehensive search, filter and map exploration of historical NOC cases, height sheets, overlaps, and authorizations to assist stations in revalidation and reopening of old cases.		
611	View case on map feature for anyone and everyone (Applicant, case evaluators and AAI decision making officials and authorities)	In case of adjacent higher buildings with NOC allotted, the user should be provided with suitable system-generated justification in simple language to understand the difference in calculation of PTE. Use of LLM AI ML model trained for AAI cases is recommended.		
612	View case on map feature for anyone and everyone (Applicant, case evaluators and AAI decision	This module shall have Terrain profile and AMSL information from the 3D basemap.		

	making officials and authorities)			
613	View case on map feature for anyone and everyone (Applicant, case evaluators and AAI decision making officials and authorities)	The system shall be able to compute height evaluations over 3D terrain basemap using ETOD/DEM/LiDAR elevation services.		
614	View case on map feature for anyone and everyone (Applicant, case evaluators and AAI decision making officials and authorities)	This module shall also provide building NOC profile on top of terrain in 3D with legacy data of existing system.		
615	View case on map feature for anyone and everyone (Applicant, case evaluators and AAI decision making officials and authorities)	The User interface /User experience should be very simple and intuitive for this module as it will facilitate non-GIS and non-AAI users with transparent factual interpretation of their subject case.		
616	View case on map feature for anyone and everyone (Applicant, case evaluators and AAI decision making officials and authorities)	The system shall be able to generate 3D obstruction-identification surfaces and analyze obstacles for penetrations and deltas, producing outputs that include surface elevation at obstacle location and ΔZ (top minus surface), and render penetrations in 2D/3D for immediate visualization by examiners.		

617	View case on map feature for anyone and everyone (Applicant, case evaluators and AAI decision making officials and authorities)	The system shall be able to maintain a centralized repository of all issued NOC/authorization/rejection letters as content portal documents linked to applications; letters shall be generated from templates via printing services and carry applicant name, User ID, contact, coordinates and permitted elevations (single minimum or point-wise for CNS simulation cases).		
618.A	NOCAS-3 API Ecosystem	a) Development and publication of a Full API suite for all NOCAS-3 functionalities. b) Mandatory publication of the NOCAS-3 API on API Setu (Govt. of India platform) to facilitate G2G and G2B data exchange.		
618.B	API Development and data sharing	The system shall be able to expose REST endpoints and webhooks for integration with Urban Local Bodies (CAF portals), SACFA/e-NIVASH, and other government platforms, allowing single-window intake while preserving NOC workflow orchestration		
619	API Development and data sharing	The system shall undertake exhaustive API Development to ensure selective data sharing (2- way) with external parties like airport operators, ULBs, and third-party entities and other regulatory agencies.		
620	API Development and data sharing	The system shall be able to assume integration endpoints for external systems (3rd party simulators, AeroDB/AIXM, SAP/AIMS, ULBs/CAF, SACFA/e NIVASH, e-Sign/DigiLocker etc.) are reachable over secure networks (site to site VPN or private links), expose documented REST/SOAP specifications, and are permitted under the owner's cybersecurity policies. API shall support secure integration with external systems (ULB/SACFA/DigiLocker/Payments/GIS layers) as applicable.		
621	API Development and data sharing	The system shall be able to constrain integration failures (API downtime, schema changes, etc.) to graceful degradation and the queued jobs shall be retracked with backoff, and stakeholders shall be notified of integration incidents, ensuring data integrity in the geodatabase.		
622	Offline maps and data	The system shall support offline maps and data for enterprise users in compliance with AAI IT data and cybersecurity policies.		

623	3D Scene Viewer	The system shall be able to constrain 3D rendering to supported browser/graphic capabilities; fallback to 2D web map viewers shall be provided for devices/browsers lacking WebGL performance.		
624	Revenue Management Module	The system shall implement a Revenue Management Module to support aeronautical study charges and NOC fee calculation processes. The system shall be able to manage fee demand and payment links for aeronautical studies and shielding studies, validate receipts, and route cases to CNS/AGA/PANS-OPS dashboards for analysis. At present, summary of charges (excluding GST) levied are: NOCC – Free, Appeal – Rs. 2 Lac, CNS Simulation Study for AO – Rs 14 Lac, Aeronautical Study – Rs. 20 Lac. These charges are subject to changes and hence should be made configurable through Revenue Management Module.		
625.A	Revenue Management Module	The Revenue management module shall be Integrated with financial systems like SAP, AIMS etc. for real time billing/invoice generation.		
625.B	Revenue Management Module - AAI SAP Integration	The module shall enable end-to-end integration with AAI's SAP system for real-time billing and payment reconciliation.		
625.C	TDS Compliance Lock income TAX API integration:	a) The system must trigger an alert for income tax TDS Challan generation after payment b) Strict Validation: The system must prevent the issuance of an Authorization Letter if the applicant has not generated/uploaded the required TDS Challan with 3 months of aeronautical study fees deposit.		
626	Revenue Management Module	This module shall provision features supporting dynamic fee calculation methods such as building-wise, volume-wise, floor-wise, and area-wise, configurable using rule engine as per AAI discretion and policy decisions.		
627	Revenue Management Module	The system shall provision integration with AAI AIMS portal		
628	Revenue Management Module	The system shall provision integration with SAP ERP or any other agreed accounting system of AAI		
629	Revenue Management Module	The system shall provision end-to-end automation of payment management against NOC workflow.		

630	Revenue Management Module	The system shall be able to enforce secure transaction flows; fee receipts and invoices shall be recorded with transaction IDs and reconciled periodically. The invoice format shall be kept configurable to accommodate changes in future / w.r.t different billers and State of invoice.		
631	Revenue Management Module	The system shall be able to implement multiple payment gateways (SBI and/or any other as agreed by AAI during SDD workshops)		
632	Revenue Management Module	The system shall ensure integrating this Revenue management module with a GST Suvidha Provider (GSP) e-invoicing.		
633	Deployment guidelines w.r.t proposed solution	The system shall be able to support distributed deployment and disaster recovery through database replication and content portal content backups, test failover quarterly with documented RPO/RTO, and monitor health via the enterprise geospatial platform Manager and custom dashboards.		
634	Deployment guidelines w.r.t proposed solution	The system shall be able to log and display queue times before the service instance handles requests, response latency percentiles, and error rates, and allow capacity planning based on observed throughput and concurrency.		
635	Deployment guidelines w.r.t proposed solution	The system shall be able to deliver a complete enterprise geospatial platform-based solution that leverages COTS capabilities (portal, application server, GP/Feature services, Workflow management, raster analytics/vector analytics, configurable dashboards, web experience, mobile app based smart survey forms), integrates external 3rd party simulation and digital verification systems where required, and adheres to aviation safety, regulatory compliance and AAI cybersecurity policies while maintaining end-to-end transparency, auditability and performance.		
636	Deployment guidelines w.r.t proposed solution	The system shall be able to assume multi-environment operation (dev,testing,staging and production) and DR topology with documented RPO/RTO and promotion to production shall require automated checkpoints sign-offs as defined in the workflow during SDD workshops.		
637	Deployment guidelines w.r.t proposed solution	The system shall be able to implement environment within production for migration for surfaces and procedures, including automated sanity checks that compare temporary height sheets across environments for representative scenarios before "Make Live" promotion.		
638	Deployment guidelines w.r.t proposed solution	AAI IT security Policy mandates use of Firewall, WAF, DDOS, Web gateway, IDS and intrusion prevention system, Threat protection (Current devices in place), NCIPC , NACS, CERT-in, NIA guidelines etc. due to highly sensitive safety critical data		

		underneath. The selected bidder is recommended to refer IT Cybersecurity policies and technical architecture guidelines for critical deployment design viz. Hosting Platform, DC and DR Requirements & design, Scope of Upgrade/Migration, existing scale and infra environment , network bandwidth available, Total, active and concurrent Users, anticipated users growth, Database Transition, User transaction data and Data Ingestion policies to meet the requirements of the proposed solution.		
639	Training & capacity building	The selected bidder shall conduct user wise and region wise extensive training of AAI users immediately after successful Go- Live of the solution		
640	Training & capacity building	The selected bidder shall formulate comprehensive training content and an online interactive NOCAS-3 integrated including help manuals,3D diagrams, user manuals, video and audio help files to help AAI Officials ensure rapid onboarding on the developed solution. Knowledge Transfer: A dedicated Training Module within the platform for stakeholders, including user manuals, video tutorials, and simulation environments for officials.		
641	Training & capacity building	AAI reserves the right to conduct this training as and when required by concerned user department of AAI		
642	Training & capacity building	AAI shall in agreement with selected bidder provide venue & required infrastructure at its own premises or outside for conducting these trainings.		
643	Training & capacity building	AAI shall in agreement with the selected bidder to prepare the training plan and an online interactive NOCAS-3 integrated training module as per their requirement.		
644	Training & capacity building	The system shall be able to assume that training datasets and sandbox exercises will use anonymized/synthetic/sample/dummy data; synthetic test / training data shall be clearly labeled and segregated from production.		
645	Indicative process flow design for proposed solution	Indicative process flow design for proposed solution is given below in Figure 34 (as per new Proposed NOCAS -3 process flow design provided by DoAS dated 23 January 2026) The selected bidder shall refer to the GSRs, ICAO Annex-14, DGCA CAR and respective latest amendments for implementation level details. Apply → Self check via CCZM → Auto settle? → Assessment letter Else → AGA/CNS/PANS OPS parallel evaluation → Height sheet (most restrictive)		

		CNS trigger? → Multipath simulation pack → ingest results → update PTE Appeal → Shielding (DEM LOS) + CNS small angle/cluster + AGA lifting (1.27%/4.11%) → Appellate Committee → DO letter (3D scene & formulas attached)		

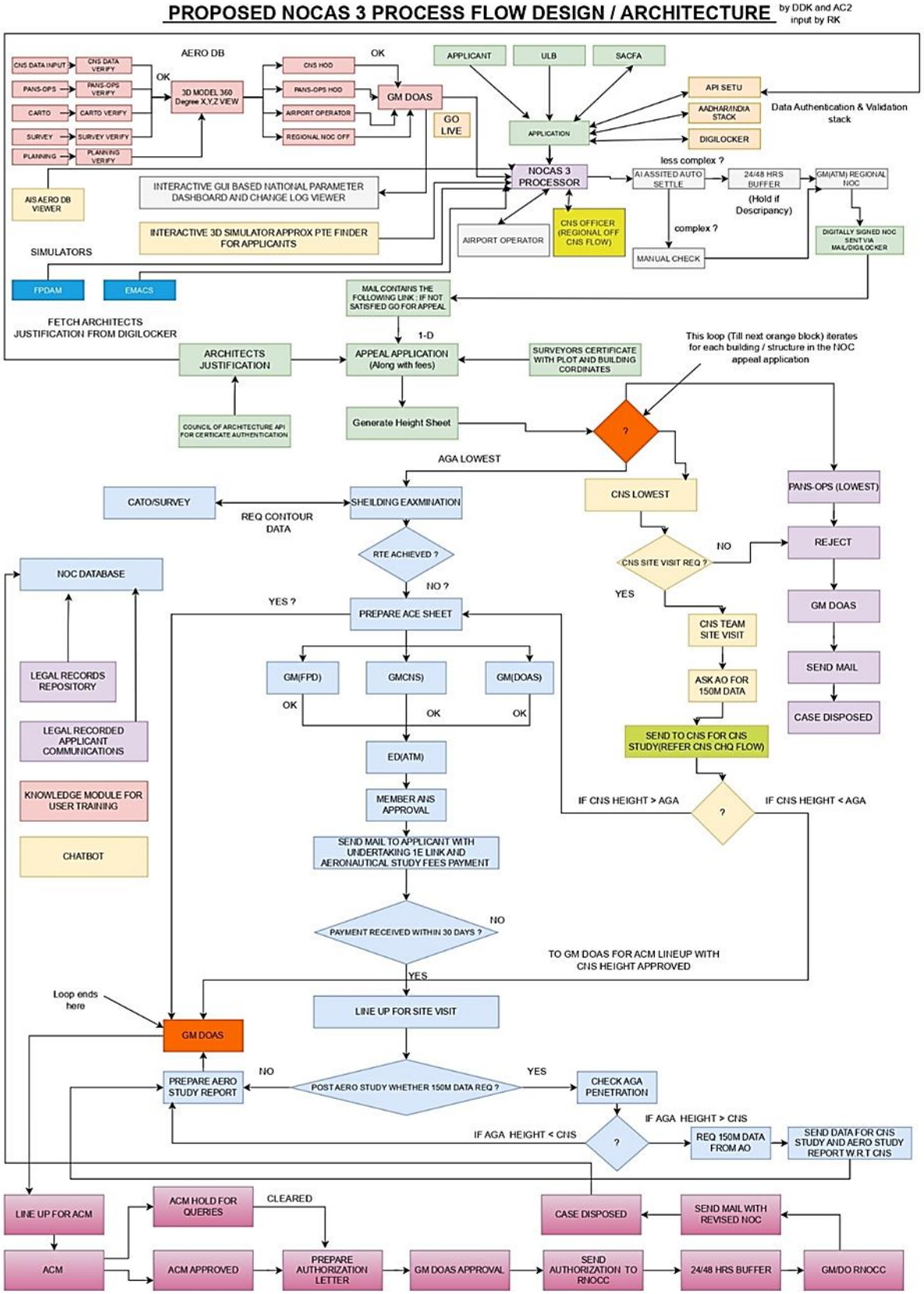


Figure 34: Proposed process flow design / architecture

646	National Parameter Dashboard	The system shall implement an interactive GUI based National Parameter Change log , Dashboard with Configurable Rule Engine and Audit trail management to sanity check data ingestion pipeline just prior to NOC application processing initiation step. This shall adhere with ICAO, DGCA and GSR standards.		
647	Architect's ID	The system shall be able to fetch Architect's identity verification from Govt ID platforms / DigiLocker / Council of Architects' APIs etc. for document sufficiency in appeal cases		
648	Post Issuance of NOC	1. The system shall enable post-issue communication and notification to the applicant. 2. The system should enable departmental users to upload history of legal cases to a particular application ID. 3. Establish a centralized Legal Repository within the system to track litigation and court orders. 4. The system shall enable departmental users to initiate withdrawal / revoking of NOC as per AAI statutory guidelines. 5. The system shall provide a form-based interface to implement above features (file upload, initiate revocation/withdrawal.		
649	Regulatory amendments envisaged for project implementation	1) Stamp paper streamlined undertakings 2) E-Signature 3) Digital KYC 4) Consuming and Exposing API endpoints for data sharing, with secure handshaking with Government entities 5) SLA / implicative timelines for NOC evaluation 6) AI Assisted evaluation touchpoints 7) Automated surface creation and AMSL calculation from DEM data 8) Using a virtual environment for pre-feasibility study 9) Integration with Simulators for Aeronautical study 10) Dynamic fee calculation against current practice of structure based 11) Legal inclusion 12) Virtual/ AI Assisted Site visit in addition to physical site visit wherever required/deemed necessary 13) Use of AIS AIM AeroDB database as a de-facto data provider for Aerodrome safety and NOC purposes 14) Updates to existing GSRs and ADSACs		

650	Project Deliverables for Sign off during implementation	AAI shall in agreement with the selected bidder and other stakeholders provide sign off duly on all important project deliverables including but not limited to: a) Data Gap reports b) Data Model Design c) SRS - FRS d) SDD (LLD/HLD) e) Phase wise development f) UAT g) Go-Live h) Training conduction i) Project closure certificate. The vendor shall make extensive use of Artificial Intelligence to write the most optimized code.		
651	Testing & Acceptance	The selected bidder needs to conduct testing by developing Test cases. Required testing includes unit testing, integration testing and user acceptance testing (UAT) with the AAI users for acceptance. The applications will be tested for various functionalities mentioned in the RFP including accuracy of the NOC calculation of the new applications. The Testing should be done manually and automatically using testing tools and the NOCAS-3 application shall be tested to exhaustion. Acceptance Requirement: The solution shall pass a defined "golden dataset" validation with 100% matching outputs before Go-Live.		
651.A	Indemnity Clause	The vendor shall provide an unconditional indemnity in favor of Airports Authority of India against any third-party legal claims,legal costs, damages, penalties, or losses arising due to: calculation defects, algorithmic errors, geoid conversion issues, template/document generation errors, or system bugs; incorrect or misleading outputs produced by the solution (where inputs provided are correct and system use is as per defined process). The indemnity shall include costs of litigation, settlement, legal fees, and related expenses, and shall be backed by appropriate contractual safeguards (including limitation carve-outs that do not exclude gross negligence/system defects)		

652	Implementation Schedule & milestones			

Activity	Deliverables	Description	Timeline (T=Date of contract agreement)
Software Licenses	Software license	Delivery & Installation	T+1 weeks
Project Kick off	Kick-off	Meeting with all stakeholders	T+1 weeks
SRS workshops	Software Requirements (Functional Specifications) documentation workshops	SRS-FRS documentation workshops	T+4 weeks
SDD with Data model design	Software design with Data model development	Data model development	T+7 weeks
Software Engineering & testing	Coding & Development	Phase wise Software development, internal testing and bug-fixing	T+54 weeks
UAT on Staging environment	UAT	CUG testing	T+58 weeks
Legacy Data Migration			T+ 60 weeks
Production Deployment	Go-Live on AAI Production Server		T+ 62 weeks
Training & Capacity Building	Training & Capacity Building	Training & Capacity Building	T+64 weeks

		Others	Any other work and every work of s/w Development required to achieve the Goal & objective of project		Within contract period		
		Maintenance/ AMC of the developed application	Application Maintenance		07 years (84 months) after Go-Live		

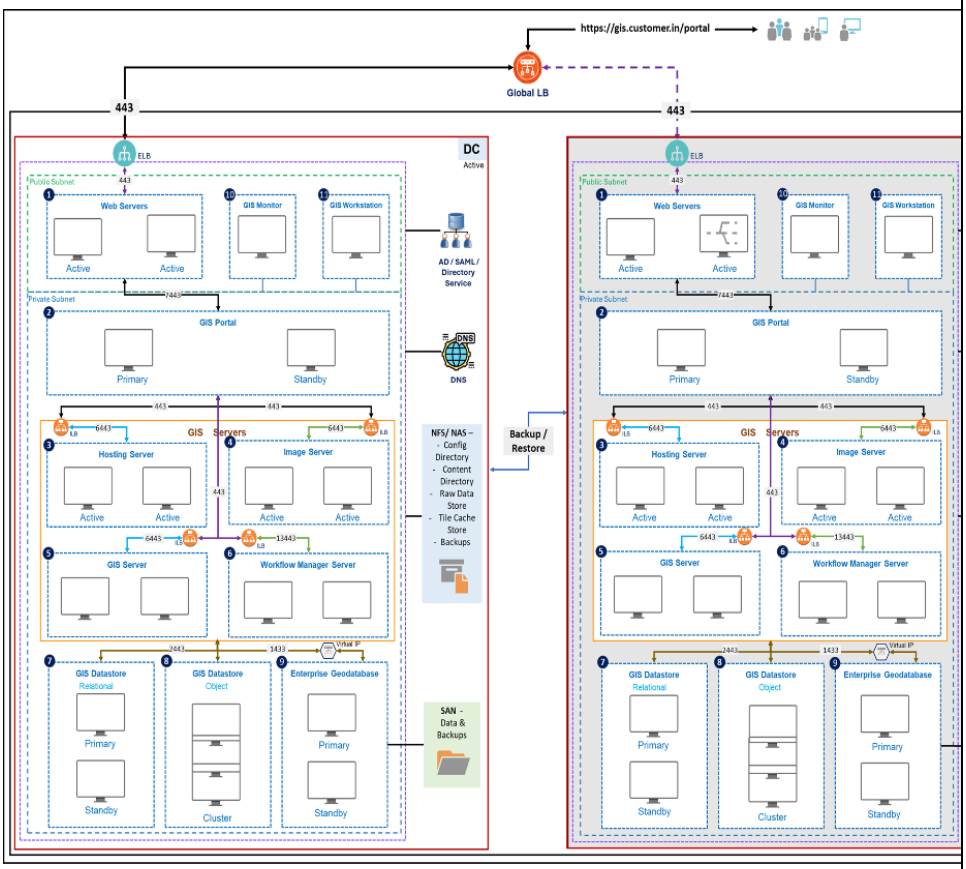
Scope of Work (SOW)/Qualitative Requirements (QRs): Part-III

PRODUCT PROPOSED ARCHITECTURES REQUIREMENTS

COMPLIANCE MATRIX

Note:

9. For stating Compliance: Write "C" in the third column below.
10. For stating Non-Compliance: Write "NC" in the third column below.
11. For stating Partial or Conditional Compliance: Write "PC" in the third column below.
12. Against each compliance statement, write specific para and page of supporting technical documentation (from where the stated compliance could be verified) in fourth column below.

S No	Specifications	Compliance	Reference
1	**Proposed Architecture for Production Environment:** This outlines the production architecture having DC with two node HA design in each stack For High availability, redundancy & load balancing, and DC–DR active-passive (Warm) deployment for disaster recovery**.** 		

2

Proposed Server Sizing for Production Environment (DC):

This represents the sizing details of each Server/Client component for the production data center (DC) environment.

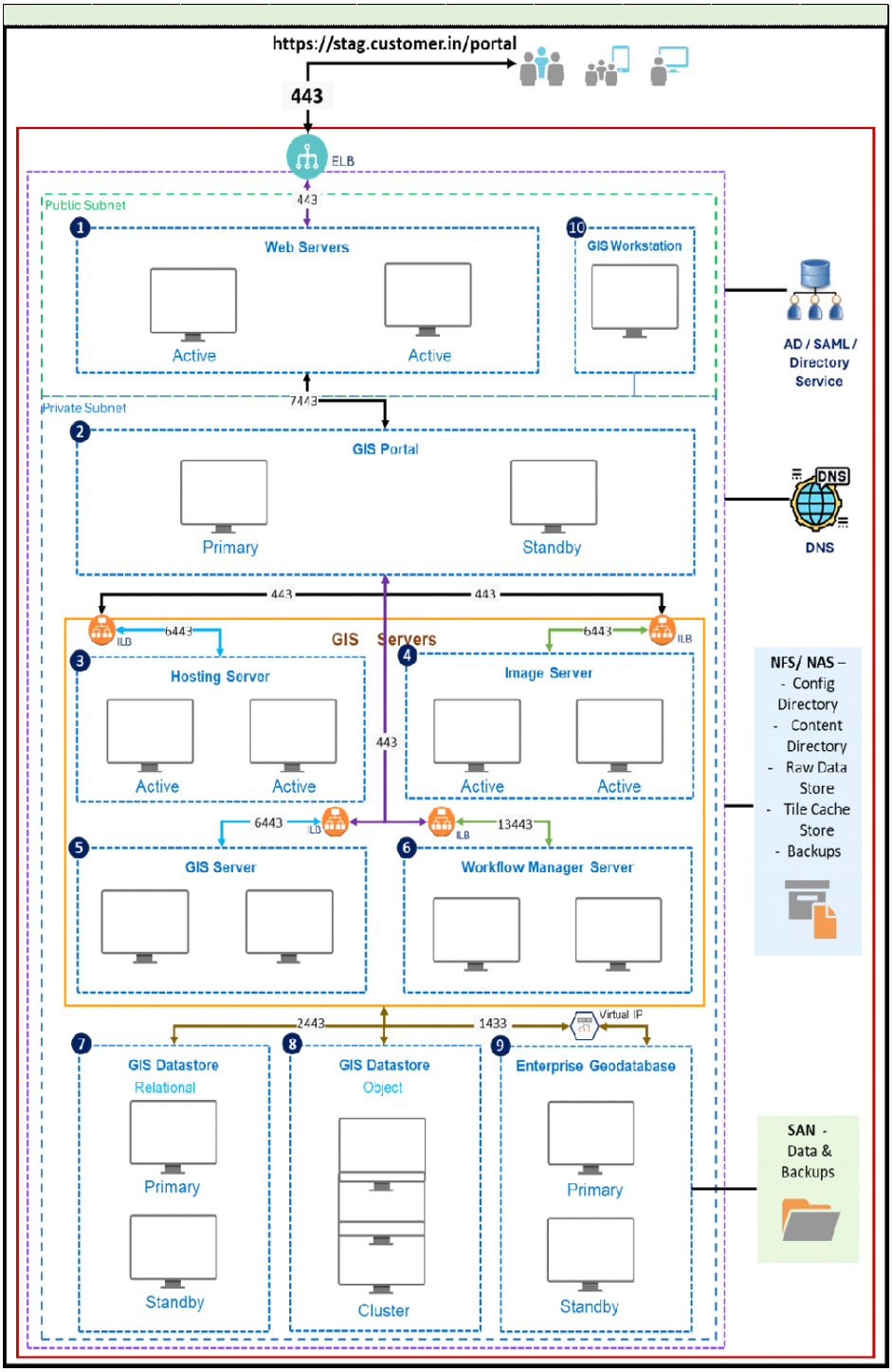
Proposed Server Sizing for Production Environment (DC)														
#	Server Role	Business Application		OS	Workstation / VM Qty.	Highly Available HA	VCPUs / VM (1:1)	RAM (in GB) per machine	Recommended GPU (in GB)	OS Sizing (Recommended) IN GB	Additional Storage(SSD) in GB	Storage in (GB) - SAN	Storage in (PB) - NFS/ NAS	IOPS
		Name	Version	Name										
1	Web Server	IIS/ Web Adaptor for Portal, Hosting Server, Image Server, GIS Server, Raster Basemap Server & Workflow Manager Server	12.x	Windows Server 2025 Standard and Datacenter	2	Yes	8	64	NA	250	500		3.5 PB (Initial Size)	15k SSD preferred
2	Portal Server	GIS Enterprise Portal	12.x		2	Yes	8	64		250	500			
3	Hosting Server	GIS Enterprise Server Advanced with Aviation Charting & Aviation Airports Extensions	12.x		2	Yes	8	64		250	750			
4	Image Server	GIS Enterprise Image Server	12.x		2	Yes	4	64	Minimum 8 GB, optional, for Raster Analytics	250	1000			
5	GIS Server	GIS Enterprise Server Advanced	12.x		2	Yes	8	64	NA	250	750			
6	Workflow Manager Server	GIS Enterprise Workflow Manager Server	12.x		2	Yes	4	32		250	500			
7	GIS Datastore	GIS Datastore- Relational	12.x		2	Yes	8	64		250	1000			
8	GIS Datastore	GIS Datastore- Object Store	12.x		3	Cluster	8	64		250	1.5 PB NVMe SSD			
9	Enterprise Geodatabase	Microsoft SQL Server 2025 (64 bit)			2	Yes	8	64		5000 (Initial Size)				
10	GIS Monitor	GIS Monitor 2025.x / PostgreSQL 17.x			1	No	4	32		250	500			
11	GIS Workstation	GIS Pro Advanced with Aviation Charting & Aviation Airports Extensions	3.x	Windows 11 Home, Pro, and Enterprise (64 bit)	1	No	16	64	16	250	500			

3

Proposed Server Sizing for Production Environment (DR):

This represents the sizing details of each Server/Client for the production disaster recovery (DR) environment. This Passive Warm environment with DB Synched using RDBMS Asynchronous replication, this environment will be active and accept user requests Only when DC is down due to any disaster.

Proposed Server Sizing for Production Environment (DR)														
#	Server Role	Business Application		OS	Workstation / VM Qty.	Highly Available HA	VCPUs / VM (1:1)	RAM (in GB) per machine	Recommended GPU (in GB)	OS Sizing (Recommended) IN GB	Additional Storage(SSD) in GB	Storage in (GB) - SAN	Storage in (TB) - NFS/ NAS	IOPS
		Name	Version	Name										
1	Web Server	IIS/ Web Adaptor for Portal, Hosting Server, Image Server, GIS Server, Raster Basemap Server & Workflow Manager Server	12.x	Windows Server 2025 Standard and Datacenter	2	Yes	8	64	NA	250	500		3.5 PB (Initial Size)	15k SSD preferred
2	Portal Server	GIS Enterprise Portal	12.x		2	Yes	8	64		250	500			
3	Hosting Server	GIS Enterprise Server Advanced with Aviation Charting & Aviation Airports Extensions	12.x		2	Yes	8	64		250	750			
4	Image Server	GIS Enterprise Image Server	12.x		2	Yes	4	64	Minimum 8 GB, optional, for Raster Analytics	250	1000			
5	GIS Server	GIS Enterprise Server Advanced	12.x		2	Yes	8	64	NA	250	750			
6	Workflow Manager Server	GIS Enterprise Workflow Manager Server	12.x		2	Yes	4	32		250	500			
7	GIS Datastore	GIS Datastore- Relational	12.x		2	Yes	8	64		250	1000			
8	GIS Datastore	GIS Datastore- Object Store	12.x		3	Cluster	8	64		250	1.5 PB NVMe SSD			
9	Enterprise Geodatabase	Microsoft SQL Server 2025 (64 bit)			2	Yes	8	64		5000 (Initial Size)				
10	GIS Monitor	GIS Monitor 2025.x / PostgreSQL			1	No	4	32		250	500			
11	GIS Workstation	GIS Pro Advanced with Aviation Charting & Aviation Airports Extensions	3.x	Windows 11 Home, Pro, and Enterprise (64 bit)	1	No	16	64	16	250	500			

4	**Proposed Architecture for Staging Environment:** This outlines the staging environment architecture designed with equivalent components with high availability (HA) deployment model for Performance & Load testing, APT, UAT and operational testing.  		

5

Proposed Server Sizing for Staging Environment:

This represents the sizing details for the staging environment.

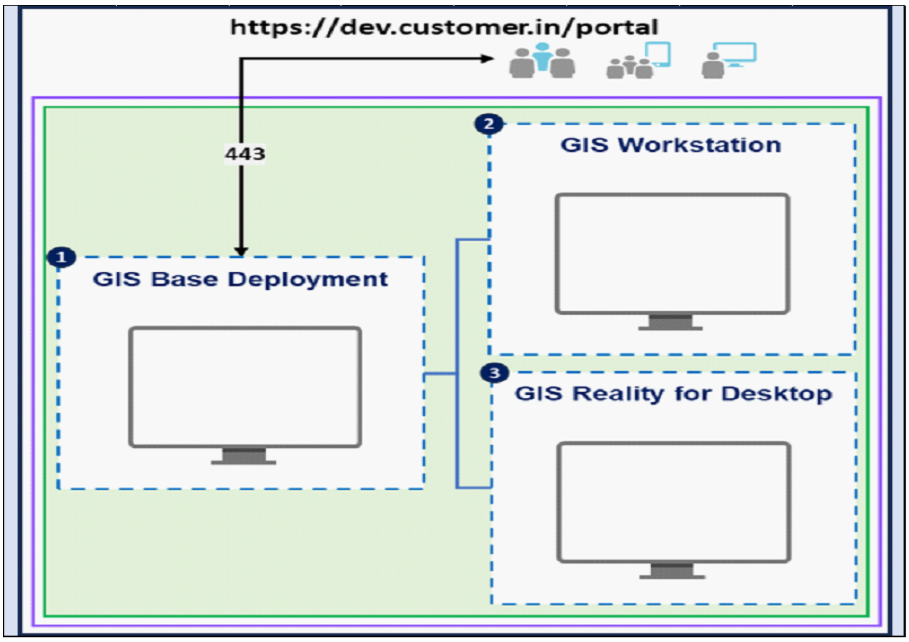
Proposed Server Sizing for Staging Environment

#	Server Role	Business Application		OS	Workstation / VM Qty.	Highly Available HA	VCPUs / VM (1:1)	RAM (in GB) per machine	Recommended GPU (in GB)	OS Sizing (Recommended) IN GB	Additional Storage(SSD) in GB	Storage in (GB) - SAN	Storage in (TB) - NFS/ NAS	IOPS
		Name	Version	Name										
1	Web Server	IIS/ Web Adaptor for Portal, Hosting Server, Image Server, GIS Server, Raster Basemap Server & Workflow Manager Server	12.x	Windows Server 2025 Standard and Datacenter	2	Yes	8	64	NA	250	500		3.5 PB (Initial Size)	15k SSD preferred
2	Portal Server	GIS Enterprise Portal	12.x		2	Yes	8	64		250	500			
3	Hosting Server	GIS Enterprise Server Advanced with Aviation Charting & Aviation Airports Extensions	12.x		2	Yes	8	64		250	750			
4	Image Server	GIS Enterprise Image Server	12.x		2	Yes	4	64	Minimum 8 GB, optional , for Raster Analytics	250	1000			
5	GIS Server	GIS Enterprise Server Advanced	12.x		2	Yes	8	64		250	750			
7	Workflow Manager Server	GIS Enterprise Workflow Manager Server	12.x		2	Yes	4	32		250	500			
8	GIS Datastore	GIS Datastore- Relational	12.x		2	Yes	8	64	NA	250	1000			
9	GIS Datastore	GIS Datastore- Object Store	12.x		3	Cluster	8	64		250	1.5 PB NVMe SSD			
10	Enterprise Geodatabase	Microsoft SQL Server 2025 (64 bit)			2	Yes	8	64		5000 (Initial Size)				
11	GIS Workstation	GIS Pro Advanced with Aviation Charting & Aviation Airports Extensions	3.x	Windows 11 Home, Pro, and Enterprise (64 bit)	1	No	16	64	16	250	500			

6

Proposed Architecture for Development Environment:

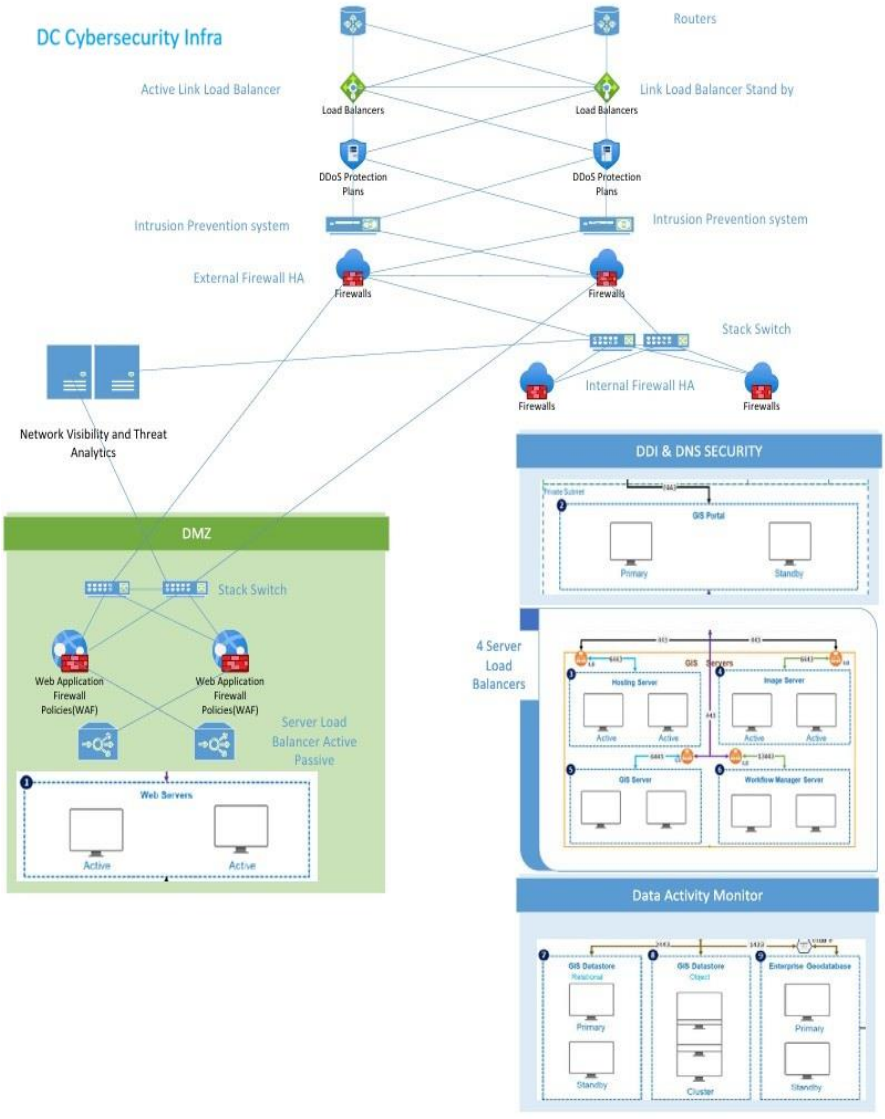
This outlines the architecture for the development environment. This Environment will be used by developers for developing the functionalities, Functional & Integration testing etc.

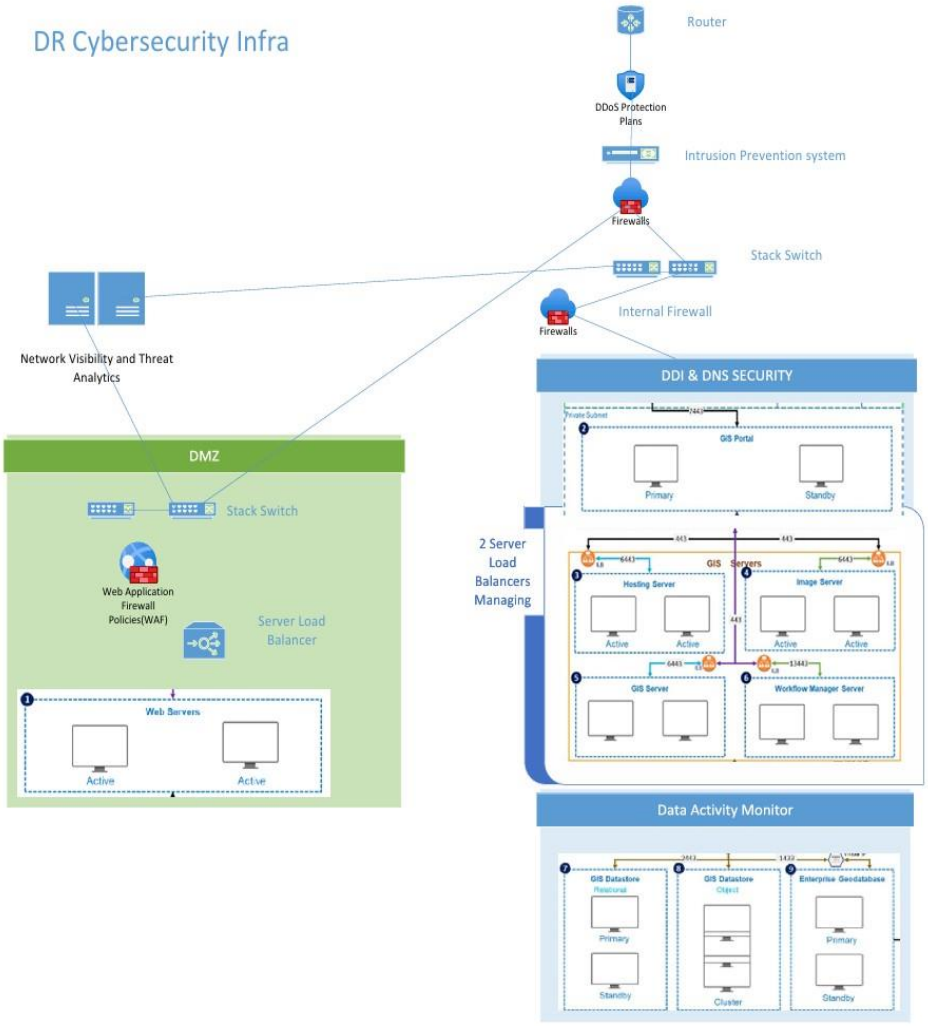


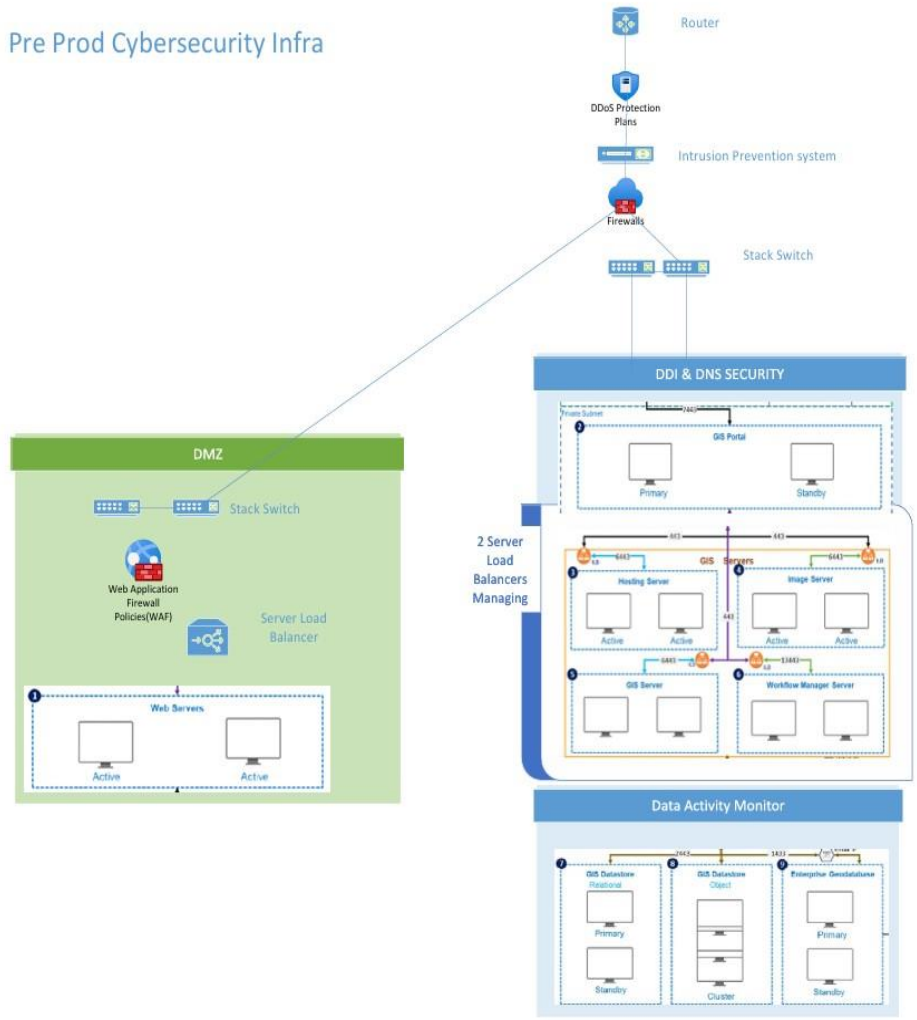
7	**Proposed Server Sizing for Development Environment:** This sheet presents the sizing details for the development environment. Proposed Server Sizing for Development Environment | # | Server Role | Business Application: Name | Business Application: Version | OS: Name | Workstation / VM Qty. | VCPUs / VM (1:1) | RAM (in GB) per machine | Recommended GPU (in GB) | OS Sizing (Recommended) IN GB | Additional Storage(SSD) in GB | | 1 | GIS Enterprise Base Deployment | IIS/ Web Adaptor for GIS Portal & Hosting Server, GIS Enterprise Portal & GIS Enterprise Server Advanced with Aviation Charting & Aviation Airports Extensions, GIS Datastore - Relational, Microsoft SQL Server 2025 (64 bit) | 12.x | Windows Server 2025 Standard and Datacenter | 10 | 4 | 64 | 8 | 250 | 1000 | | 2 | GIS Workstation | GIS Pro Advanced with Aviation Charting & Aviation Airports Extensions | 3.x | Windows 11 Home, Pro, and Enterprise (64 bit) | 5 | 8 | 64 | 8 | 250 | 500 | | 3 | GIS Workstation | GIS Reality for Desktop | 3.x | Windows 11 Home, Pro, and Enterprise (64 bit) | 5 | 8 | 64 | 16 | 250 | 500 |		
8	**Recommendations:** 1) We have proposed a HA Active–Active deployment for GIS Enterprise Server's ensures continuous availability, load-balanced performance, and zero-downtime maintenance for mission-critical GIS services. 2) It is strongly advised to configure the servers with Intel Platinum/Gold family processors. Opting for processors of a lower grade could result in system underperformance. 3) The sizing is proposed based on the existing processing workloads, workflows, and user concurrency with minimum requirements for successful deployment of Enterprise solution. In future, resources shall be scalable in nature, to accommodate the user loads. 4) Any upward changes in number of total users / concurrent users, application workflow changes require architecture revisit to confirm that the underlying infrastructure is capable enough to support the deployment. The infrastructure shall be scaled up to meet added load. 5) Customer shall monitor data growth on a regular basis as additional storage space if required. 6) All the machines shall be on the customer's AD/DNS server. Fully qualified domain name (FQDN) is recommended. 7) GIS Administrator Account - Domain Account for Installation, Configuration and Administration operations. 8) Domain account is required as service account, for install and implementation process with admin rights in all the machines. 9) Public DNS URL, CA Signed SSL are mandatory. 10) All the required infrastructure / OS / software along with licenses shall be provisioned, commissioned.		

	11) Regular maintenance activities shall be carried out to maintain the overall system performance. 12) Regular Performance tuning, along with monitoring of memory and CPU optimization, shall be conducted in accordance with user load and application functionality requirements. 13) Workstation (GIS Client machine) requires a dedicated Class I GPU Card (16 GB) - NVIDIA if any GPU based workflows (e.g.,3D, imagery processing etc.) are proposed/required. 14) Proper backup mechanism shall be implemented at GIS Enterprise stack level, DB level and at VM level. 15) It is recommended that to observe data growth and allocate additional storage for database. 16) It is highly recommended to execute performance and load testing once the system is deployed and ready. Based on the results and observations, further enhancements may need to be carried out to improve the performance and overall system stability. 17) For optimal system performance, it is highly advisable to position NAS in close proximity to the servers to minimize latency. Additionally, it is strongly recommended to establish a high-bandwidth network, preferably 10 GBPS, between the GIS Portal / Server machines and the storage infrastructure. 18) To facilitate the seamless integration of NAS within a networked environment, it is recommended to assign a Fully Qualified Domain Name (FQDN) to the storage. Moreover, it is advisable to position the storage within a domain to enhance authentication processes and access control mechanisms. 19) It is strongly recommended that the GIS service account possesses the necessary access rights to NAS. Essential for smooth operation, the service account shall be granted appropriate permissions, allowing it to interact with and retrieve data from the storage seamlessly. 20) It is highly recommended to configure auto-scalable SAN storage. 21) It is highly recommended to configure auto-scalable NAS storage. 22) All GIS client's machines in a highly available GIS Enterprise deployment shall be in the same data center; the primary and standby machines cannot be split across separate data centers. 23) GIS Monitor Agent shall be configured on all participating components. 24) GIS Monitor requires a backend PostgreSQL database configured.		

	25) GIS Monitor Agent shall be configured on all participating components. It may require allocating additional licenses for this. 26) It is highly recommended to create and consume 3D tile cache wherever possible for optimum system performance. 27) It is recommended that to locally host static vector layers in local Geo-database format on GIS Server to get good performance. a. This might require expending additional efforts as the local GDB e.g., FGDB need to be copied locally to each participating GIS Server machine, register the data store, replace the FGDBs as on when required, etc. An appropriate mechanism / Standard Operating Procedures shall be established for the same. b. The proper mechanism shall be in place to back up the local GDBs (FGDBs) to avoid data loss due to any unforeseen situation. 28) Solution has been proposed to consider the system requirement shared considering current infrastructure will be utilized 40 % to start with and any upward changes in number of total users / concurrent users, application workflow changes, new workflows adoption, and data growth require architecture revisit to confirm that the underlying infrastructure is capable enough to support the deployment. The infrastructure shall be scaled up to meet added load. 29) Based on the overall system performance, user load, and user workflows, the customer plans to horizontally / vertically scale-up the environment. 30) It is highly recommended that appropriate caching mechanism for 3D Data, 3D mesh, image hosting and delivery strategies, local caches to be tested and implemented in the production environment. 31) It is recommended not to place all workloads on a single volume; segregate storage by workload type (OS, application, database, logs, backups) to avoid I/O contention, improve performance, and simplify management and recovery. 32) Recommended Core network speed: Use 16/32 Gbps Fibre Channel or 25 Gbps iSCSI for Server ↔ SAN connectivity, and 10 Gbps (minimum) or 25 Gbps (preferred) Ethernet for Server ↔ Server communication via SAN/core switches.		

9	**Proposed Security Architecture for Production Environment:** This outlines the Security infrastructure for production architecture having DC with HA design. For High availability, redundancy & load balancing, and active-passive (Warm) deployment. 		

10	**Proposed Security Architecture for DR Environment:** This outlines the Security infrastructure for DR with simplictic resource sharing design. 		
11	**Proposed Security Architecture for Pre-Prod Environment:** This outlines the Security infrastructure for Pre-Production infrastructure with simplictic resource sharing design.		


Pre Prod Cybersecurity Infra
Router
DDoS Protection Plans
Intrusion Prevention system
Firewalls
Stack Switch
DDI & DNS SECURITY
GIS Portal
Primary
Standby
2 Server Load Balancers Managing
GIS Servers
Hosting Server
Image Server
Active
GIS Server
Workflow Manager Server
Data Activity Monitor
Primary
Standby
Cluster
DMZ
Stack Switch
Web Application Firewall Policies(WAF)
Server Load Balancer
Web Servers
Active

Scope of Work (SOW)/Qualitative Requirements (QRs): Part-IV

PRODUCT TECHNICAL REQUIREMENTS

COMPLIANCE MATRIX

Note:

1. For stating Compliance: Write "C" in the third column below.
2. For stating Non-Compliance: Write "NC" in the third column below.
3. For stating Partial or Conditional Compliance: Write "PC" in the third column below.
4. Against each compliance statement, write specific para and page of supporting technical documentation (from where the stated compliance could be verified) in fourth column below.

SI No	Specification	Compliance	Reference
1	**GIS DESKTOP ADVANCE USER**		
1.1	**Data Management, Editing & Geodatabase Capabilities**		
1.1.1	**Geodatabase & Versioning** a) Create and manage **traditional and branch versioned data**. b) Support **data distribution and synchronization** across geodatabases, ensuring changes in one database are reflected in another. c) Perform **on-the-fly dynamic joins** between different databases.		
1.1.2	**Data Integrity & Attribute Management** a) Enforce **field dependencies**, dictating valid values of one field based on another. b) Support **attribute rules** (calculation, constraint, validation) to enforce data integrity and automate edits. c) Provide **predefined attribute rule templates** (e.g., automatic symbol rotation, unique ID generation).		
1.1.3	**Editing & Feature Construction** a) Support **editing templates** (preset, group, and table templates) with predefined attributes. b) Construct polygons from features. c) Planarize polygon features. d) Split lines into COGO lines. e) Reverse COGO-enabled polylines without altering vertices. f) Densify vertices of line or polygon features, replacing curve segments (Bezier, circular, elliptical arcs) with line segments. g) Identify inconsistent portions of input features against target features within a search distance and align them accordingly. h) Provide spatial adjustment tools including **rubber sheeting, transformation, edge matching, and attribute transfer**.		
1.2	**Network & Infrastructure Modelling**		

1.2.1	**Linear Referencing & Dynamic Segmentation** a) Support **Linear Referencing System (LRS)** to store and locate routes using relative positions along measured line features. b) Find and display **Dynamic Segmentation Events** (point, linear, and continuous) on routes.		
1.2.2	**Trace & Network Modelling** a) Create, configure, and use **Trace Networks**. b) Convert **Geometric Networks to Trace Networks**.		
1.3	**2D, 3D & Advanced Visualization**		
1.3.1	**Feature & Layer Support** a) Support multipoint, polyline, multipatch features. b) Support elevation, graphics, building, time-enabled scene, integrated mesh, and 3D object layers. c) Create and visualize **voxel layers** for 3D raster data analysis. d) Support oriented imagery (oblique drone imagery, inspection images, street-level images). e) Support satellite trajectory files (series of points along orbital paths).		
1.3.2	**Raster & Imagery** a) Direct support for **PDF documents**, including georeferencing and spatial operations. b) Display mosaic datasets using a **time slider** for temporal raster analysis.		
1.3.3	**Cartography & Symbology** a) Support procedural rule-based symbology with complex cartographic representations. b) Provide multiple **blend modes** (multiply, lighten, screen, overlay, etc.). c) Implement feature clustering with dynamic aggregation based on scale and user-defined thresholds.		
1.4	**Spatial Analysis & Modelling**		
1.4.1	**Geoprocessing & Workflow Automation** a) Provide a **visual model-building tool** for creating, managing, and automating geoprocessing workflows. b) Allow dynamic integration of parameters using **inline variable substitution**.		
1.4.2	**Statistical & Pattern Analysis** a) Apply the **80/20 Pareto principle** to identify repeat incident locations, generate clusters, and calculate cumulative percentage fields. b) Support **micro-analysis** summarizing incident counts at street junctions and segments. c) Create **Thiessen polygons** from point features. d) Derive apportioned polygons with summed attributes of overlaying polygons. e) Compute geometric intersection of input and identity features.		
1.4.3	**Origin-Destination & Movement Analysis** a) Generate connecting lines between origins and destinations (spider diagrams). b) Analyse cell phone activity using call detail records, antenna sectors, and sector polygons to identify mobile device movement patterns.		
1.4.4	**Space-Time & Forecasting** a) Provide time series forecasting tools within a space-time cube framework.		

	b) Compare forecasting models including simple curve fitting, exponential smoothing, and forest-based methods.		
1.4.5	**Surface & Terrain Analysis** a) Provide interactive exploratory analysis tools including: I. Cut and Fill II. Line of Sight III. Viewshed IV. View Dome V. Slice VI. 2D, 3D Elevation Profiling		
1.4.6	**Environmental & Scenario Modelling** a) Model **flood simulation workflows and scenarios**, with capability to export analysis results.		
1.5	**Data Reconciliation & Quality Enhancement** a) Reconcile data from multiple sources to achieve optimal data quality for analysis and mapping. b) Perform geometric and attribute alignment between datasets.		
1.6	The platform shall provide an in-built visual model-building tool to create, manage, and automate geoprocessing workflows with inline variable substitutions, along with spatial adjustment tools (rubber sheeting, transformation, edge matching, attribute transfer) and capabilities to identify/align inconsistent geometries for integrating survey, contractor, drone, LiDAR, and aerodrome plan datasets.		
1.7	The system shall have in-built Linear Referencing (LRS) for runway/taxiway/road/utility corridors, display Dynamic Segmentation Events (point, linear, continuous), and provide full COGO measurement capabilities including reversing COGO-enabled polylines without altering geometry		
1.8	The software shall support in-built advanced surface and interpolation methods (Global, Local Polynomial, IDW 2D,3D, Radial Basis, Kernel with Barriers, all Kriging variants including EBK 2D/3D, Regression Prediction, Moving-window Kriging), and support smoothing surfaces, classifying landforms (ridges, valleys, plains), and generating surfaces that detect obstacles based on PAPI geometry and approach paths.		
1.9	The platform shall have in-built support a complete 3D exploration environment (Line of Sight, Viewshed, View Dome, Slice, Cut/Fill, Elevation Profiles), allow creating vertical cross-sectional fence views across overlapping surfaces, integrate with 3D stereo mouse devices generate 3D voxel layers with spatiotemporal density, perform voxel interpolation (NN, IDW), and publish 3D scenes to mobile/tablet devices while retaining full interactivity.		

1.10	The system shall have in-built support full FMV workflows: extracting frame images and metadata from FMV-compliant videos, extracting platform position/frame Centre/frame outline, and creating FMV-compliant videos by multiplexing video streams with synchronized metadata—supporting drone-based inspections		
1.11	The platform shall include in-built deep learning support with automated data augmentation, hyperparameter tuning, model evaluation, and exportable model packages for use cases like obstacle detection, pavement condition analysis, vegetation segmentation, and encroachment monitoring.		
1.12	The software shall support in-built flood simulation workflows and export flood-analysis outputs for monsoon preparedness around airport perimeters and critical areas. The platform shall in-built automate detection of data-quality issues including invalid/duplicate geometries, hollow polygons, non-compliant domains, cutbacks, and provide ready-to-use checks for attributes, LRS events, polygons, polylines, spatial relationships, elevation consistency, and feature integrity		
1.13	The software shall support have in-built fuzzy matching to identify and extract locations with approximate or misspelled names for field reporting and legacy datasets. It shall have in-built creation of Thiessen/Voronoi polygons for sensor influence zones, coverage modelling, and spatial proximity analyses across the airport environment.		
1.14	The platform shall allow creation and editing of airport signs in 2D/3D, compute distances from runway centerlines or runway ends, detect obstacles or LiDAR points penetrating OIS surfaces, and have in-built support creation/management of Electronic Terrain and Obstacle Data (eTOD) with layouts including runways, approach surfaces, and aviation-grade vertical scale bars		
1.15	The system shall support in-built aviation and aerodrome mapping standards, including DGCA CAR Section 4 Series 'B' Part I, ICAO Annex 14, ICAO Annex 15, ICAO Doc 9881 (Aerodrome Mapping Data), eTOD (Electronic Terrain and Obstacle Data) specifications, and the AIXM 5.1 schema. The system shall provide additional in-built tools to generate Obstruction Identification Surfaces (OIS) for heliports as well in accordance with FAA 2C, ICAO Annex 14 (Heliports), and Unified Facilities Criteria (UFC) standards.		

1.16	The software shall provide out of the box in-built tools to generate Obstruction Identification Surfaces (OIS) compliant with all major international specifications, including FAA AC 150/5300-13B (and associated Runway Protection Surfaces), FAA 150/5300-18B, FAA FAR Part 77, and ICAO Annex 4, Annex 14, and Annex 15 surface requirements.		
1.17	The system shall include in-built additional OIS creation out of the box tools such as Curved Approach Surface generation, OIS Intersection creation, Light Signal Clearance Surface generation, PAPI Obstacle Clearance Surface modelling, and support for surfaces defined under Unified Facilities Criteria (UFC).		
1.18	The system shall support in-built advanced Obstacle & Obstacle Limitation Surface (OLS) analysis, including creation of ICAO-compliant OLS surfaces, 3D obstacle modelling, import and use of drone and LiDAR survey data, automated obstacle penetration analysis with alert, generation of automated reports for NOTAM support, and visualization of all obstacles and surfaces within interactive 3D web scenes.		
1.19	The system shall include in-built comprehensive tools to examine, analyze, and enhance aviation data, including the ability to analyze airport features, analyze LAS runway obstacles, analyze runway obstacles, and generate both OIS obstacle data and OIS profile data. It shall also support in-built full 18B data interoperability, enabling export of 18B geodatabase features to 18B-compliant shapefiles and import of 18B-compliant shapefiles into a geodatabase with the correct schema.		
1.20	The system shall provide default in-built 3D basemaps for major cities and towns nationwide, built using high-quality commercial and community datasets to ensure realistic visuals. It shall come along with terrain dataset of India/ bare earth elevation data of ≤0.5 meters (50 cm). These curated, regularly updated basemaps shall offer ready-to-use, enterprise-grade 3D foundation layers optimized for advanced analysis such as viewshed, line-of-sight, and shadow modelling—making them reliable for planning, operations, and large-scale 3D projects		
2	**GIS DESKTOP ADVANCE USER FOR REALITY MAPPING**		
2.1	**Integrated Photogrammetry within GIS Environment** The platform shall provide an integrated environment that combines photogrammetric processing and GIS workflows within a single interface.		

	a) Enable processing of drone, aerial, and satellite imagery without requiring multiple external add-ons. b) Allow seamless transition from image processing to spatial analysis and mapping. Support end-to-end workflows from raw imagery ingestion to final geospatial product generation		
2.2	**Automated High-Fidelity Data Products** The system shall automatically generate high-accuracy geospatial outputs suitable for mapping, planning, and analysis. a) Generate: I. True Orthophotos II. Digital Surface Models (DSM) III. DSM Mesh IV. 3D Mesh V. Dense Point Clouds b) Support automated: I. Block adjustment II. Tie point generation III. Quality assurance (QA) reporting for accuracy validation c) Ensure production-ready outputs with minimal manual intervention.		
2.3	**Multi-Sensor & Multi-Resolution Support** The platform shall support diverse imagery sources and resolutions within unified workflows. a) Handle multi-sensor datasets (drone, aerial, satellite) within a single mosaic dataset. b) Support multi-resolution and multi-band imagery processing. c) Ensure compatibility with major commercial satellite data providers. Allow combined processing of datasets from different acquisition dates and sensors for comprehensive analysis		
2.4	**Advanced Sharing & Interoperability** The system shall support flexible publishing and open data exchange. a) Enable direct publishing of outputs as: I. Image layers II. Tile layers III. Scene layers		

	b) Support export to open and industry-standard formats, including: I. TIFF II. SLPK III. 3D Tiles c) Ensure interoperability with enterprise systems, web platforms, and third-party visualization environments.		
3	AVIATION CHARTING EXTENSION FOR GIS DESKTOP ADVANCE USER		
3.1	**Aeronautical Information Management (AIM) & Data Modelling** The system shall provide a comprehensive framework for managing aeronautical information, ensuring compliance with ICAO and national aviation standards. a) The tool shall efficiently manage **aeronautical information, products, and integrated workflows** to generate navigational products compliant with aviation regulatory standards (ICAO Annex 4, Annex 15, AIP requirements). b) The software shall provide an **out-of-the-box aeronautical data schema** modelled after the **Aeronautical Information Exchange Model (AIXM)**. c) The AIXM-based database shall: I. Support standardized aeronautical data exchange. II. Be engineered for high data integrity and validation. III. Be optimized for high-quality chart production. The system shall support enterprise geodatabase integration for centralized aeronautical data management across AIS, ATC, and planning divisions		
3.2	**Airspace Modelling & 3D Analysis** The system shall support advanced airspace design, modelling, and analysis for safe and efficient air navigation. a) The software shall enable the creation and management of aviation cartographic features, including: I. Changeover points II. Airway corridors III. Airspace areas IV. Airspace lines V. Derived airspace geometries b) The system shall synthesize and analyze complex 3D airspace, including: I. Controlled and restricted airspace volumes II. Vertical separation layers III. Obstacle limitation surfaces c) The software shall offset overlapping air traffic service routes and automatically generate bypasses where required to maintain clarity and compliance.		

	The system shall support 3D visualization and validation of airspace conflicts and route intersections.		
3.3	**Aeronautical Chart Production & Cartographic Automation** The system shall support end-to-end automated aeronautical chart production workflows. a) The software shall generate specialized **surround elements** for aeronautical charts, including: I. Legends II. Scale bars III. Compass roses IV. Grids V. Marginalia b) The tool shall automate the **rotation of point and annotation features** (e.g., navaids, holding patterns, runway identifiers) based on chart orientation and projection. c) The system shall automate the **abbreviation of aeronautical annotations**, reduce clutter while maintain regulatory compliance. d) The platform shall support automated layout generation for: I. Enroute charts II. Terminal charts III. SID/STAR charts IV. Approach charts e) The software shall ensure cartographic consistency through rule-based symbology and aviation-specific representation standards.		
3.4	**Change Management & Chart Revision Control** The system shall provide robust tools to monitor, validate, and report aeronautical data changes. a) The software shall track, compare, and report modifications in aeronautical data stored within enterprise geodatabases. b) The system shall analyze changes affecting navigational charts and identify impacted chart elements. c) The platform shall support: I. Version comparison II. Change detection reporting III. Audit trails for regulatory compliance d) The solution shall support controlled update cycles aligned with AIRAC schedules.		
4	AVIATION AIRPORT EXTENSION FOR GIS DESKTOP ADVANCE USER		
4.1	**Obstacle Limitation Surfaces (OLS/OIS) & Flight Path Protection** The system shall support the creation, analysis, and validation of obstacle limitation surfaces to ensure safe aircraft operations in accordance with ICAO and DGCA standards. a) The software shall create **flight path protection surfaces** based on visual landing aids such as the **Precision Approach Path Indicator (PAPI)** and other approach guidance systems. b) The system shall generate and manage **Obstacle Identification Surfaces (OIS)** including: I. Approach surfaces II. Take-off climb surfaces III. Transitional surfaces IV. Inner horizontal and conical surfaces c) The software shall compute the **distance of objects** from:		

	I. The runway centerlines II. The nearest runway threshold or end d) The system shall evaluate whether terrain, LiDAR data, buildings, cranes, or other vertical structures are **penetrating defined OIS/OLS surfaces**. e) The solution shall support 3D visualization and analytical validation of obstacle penetrations for safety assessment and regulatory reporting.		
4.2	**Electronic Terrain and Obstacle Data (eTOD) Management** The system shall support comprehensive management of Electronic Terrain and Obstacle Data (eTOD) as per ICAO Annex 15 requirements. a) The software shall create, store, manage, and validate **eTOD datasets**. b) The platform shall support integration of: I. High-resolution terrain models II. LiDAR datasets III. Surveyed obstacle data c) The system shall enable visualization of eTOD data in conjunction with: I. Runway geometries II. Approach and protection surfaces III. Declared distances d) The solution shall support preparation of map layouts incorporating: I. Terrain and obstacle data II. Runway profiles III. Approach surfaces IV. Aviation-specific vertical scale bars		
4.3	**Aerodrome Mapping & Airside Signage** The system shall support aerodrome mapping and operational airside asset management. a) The software shall provide tools to **create and edit airport signs** in both: I. 2D map view II. 3D scene view b) The system shall allow accurate placement and orientation of signage based on: I. Taxiway geometry II. Runway intersections III. ICAO-compliant design standards c) The platform shall support integration of airside signage within the broader aerodrome mapping framework for operational planning and maintenance.		
5	**RASTER VECTOR BASEMAP PACKAGE FOR INDIA**		
5.1	**Centralized Content in Your Own Infrastructure** A comprehensive content solution hosted within your own infrastructure, enabling full control, security, and performance. a) Terabytes of imagery, basemaps, reference layers, and elevation data b) Collection of global basemaps and authoritative reference layers c) Combine with your existing enterprise datasets d) Create, publish, and share map services internally e) Shared seamlessly across the organization		
5.2	**Optimized Performance & Publishing Efficiency** Designed for high-performance publishing and rapid deployment. a) Multi-scale maps pre-rendered and optimized for performance b) Map server cache in JPEG format		

	c) Quick and easy publishing without processing large and varied datasets d) Ready-to-use services to accelerate project timelines		
5.3	**Secure Deployment & Network Integration** Flexible deployment options to meet enterprise security requirements. a) Deploy within a secure private network or over the Internet b) Direct integration with internal enterprise networks c) Controlled access to sensitive geospatial data		
5.4	**Raster Basemaps & Imagery** High-quality imagery for accurate visualization and analysis. a) 0.3-meter resolution for select metropolitan areas b) 0.6-meter resolution imagery across India c) Lower-resolution imagery for the rest of the world d) High-resolution imagery basemaps for India e) Hill shade and Ocean base layers		
5.5	**Vector Basemaps** Dynamic, scalable, and customizable mapping solutions. a) Detailed vector maps for web and enterprise applications b) Vector tiles enabling dynamic cartography c) More than 10 vector map styles for India d) Flexibility to create custom basemap styles via geoprocessing toolboxes e) User-level JSON customization for styling f) Published using Web Mercator Auxiliary Sphere (WMA) projection tiling scheme g) Vector tile layers shareable through enterprise portals		
5.6	**Reference & Elevation Content** Foundational layers for analysis and 3D visualization. a) Reference layers for overlay on basemaps b) Global elevation layers for 2D and 3D visualization c) Elevation analysis tools for terrain-based geoprocessing d) World Gazetteer with 27 million geographical names for geocoding and location search		
5.7	**Enterprise-Wide Accessibility** Designed for broad usability across platforms and applications. a) Accessible through enterprise portals b) Compatible with web applications c) Supports mobile applications Usable in desktop GIS environments		
6	**GIS ENTERPRISE ADVANCED SERVER**		
6.1	**Deployment Architecture & Operational Modes** The system shall support flexible enterprise deployment models. a) Shall support deployment in both connected and disconnected environments, accommodating secure and restricted network configurations. b) Shall support read-only site mode, disable publishing of new services and restrict administrative operations during production or maintenance windows. c) Shall include a built-in utility to check for server software updates and patches.		

	d) Administrators shall be able to prevent unauthorized users from accessing cached service-related pages by disabling browser caching of sensitive information. e) All unauthorized user attempt shall be recorded in system logs.		
6.2	**Cloud & Big Data Integration** The platform shall integrate with modern cloud-native storage systems and big data ecosystems MEITY empaneled:		
6.2.1	**Cloud Data Warehouses** The server software shall support registration and integration of cloud-hosted data warehouses, including: a) Amazon Redshift (using AWS IAM credentials) b) Google Big Query c) Snowflake d) etc		
6.2.2	**Big Data File Share Support** The system shall support big data file shares, including: a) Apache Hadoop (HDFS) b) Apache Hive c) Amazon S3 and S3-compatible storage d) Azure Data Lake Storage e) Microsoft Azure Storage f) Local and network file shares g) Etc.		
6.2.3	**Raster File Share Support** The server software shall support raster data stored only MEITY empaneled: a) Amazon S3 and S3-compatible storage b) Azure Data Lake Storage c) Google Cloud Storage d) Microsoft Azure Storage e) Local file shares f) Etc.		
6.2.4	**2.4 Cloud-Native Storage** Shall support direct integration with: a) Amazon S3 b) Microsoft Azure Storage c) Alibaba Cloud OSS d) Google Cloud Storage e) Etc.		
6.3	**Database Connectivity & Replication** The system shall support enterprise-grade database integration and synchronization. a) Support query layers for: I. Dameng II. Microsoft Azure Cosmos DB for PostgreSQL III. SQLite IV. Teradata V. Etc. b) Support database **check-in/check-out workflows**. c) Support replication across multiple commercial databases in both connected and disconnected environments. d) Maintain **parent-child relationships** between master and replica databases.		

	e) Allow exporting data from feature services to: I. Enterprise geodatabases II. SQLite databases Custom client applications		
6.4	**Streaming Data & Real-Time Integration** The system shall support ingestion and analysis of streaming data. a) Provide add-on capability to support streaming input layers from: I. Kafka II. HTTP III. TCP IV. UDP V. RSS VI. WebSocket VII. Etc. b) Support spatiotemporal (space-time) analysis to: I. Analyze patterns II. Aggregate data spatially and temporally III. Identify trends over time IV. Etc.		
6.5	**Web Publishing & Application Development** The platform shall enable rapid application development without coding expertise. a) Shall provide a web publishing wizard allowing users to publish web applications without programming knowledge. b) Shall allow creation of applications through an integrated no-code/low-code interface. c) Shall include pre-built applications for: I. Field operations II. Office workflows III. Community engagement IV. Custom application development d) Shall support character-by-character auto-complete geocoding suggestions in client applications.		
6.6	**Web-Based Editing & Data Management** The system shall support robust web-based editing capabilities. a) Simultaneous multi-user editing of data services. b) Isolated version-based editing. c) Undo and Redo operations. d) Layer-based snapping and snapping to new geometry. e) Configurable snapping settings. f) Feature modification, merging, and splitting. g) Precise X and Y coordinate entry. h) Attribute creation and modification. i) Rule-based attribute maintenance using domains. j) Viewing and editing related records for feature-to-feature relationships in web maps (hosted, referenced, and sub-feature layers). k) Display related records in pop-ups for improved data interaction.		
6.7	**Network & Schematic Diagram Management** The system shall support automatic generation and maintenance of schematic diagrams. a) Automatically generate and manage schematic diagrams for: I. Physical networks II. Logical networks		

	b) Support creation, updating, editing, and viewing of network diagrams.		
6.8	**3D Data & Model Support** The server shall support advanced 3D data formats and browser-based 3D interaction.		
6.8.1	**3D Format Support** Shall support all of the following: a) COLLADA (.dae) b) Autodesk Filmbox (.fbx) c) Autodesk Drawing (.dwg) d) Industry Foundation Classes (.ifc) e) Universal Scene Description (.usdc, .usdz) f) Wavefront (.obj) g) glTF (.gltf) h) Binary glTF (.glb) i) Etc.		
6.8.2	**Web-Based 3D Capabilities** a) Web-based 3D planning tool for visualizing zoning codes and simulating development scenarios. b) Web-based 3D Viewer allowing modification of integrated mesh layers directly in the browser.		
6.9	**Web Map Enhancements & User Experience** The system shall provide enhanced web map interaction tools. a) Add titles and pop-ups simultaneously to multiple sketch features. b) View feature dimensions dynamically via screen tips during sketching. c) Enable specific time zone configuration for web maps to ensure consistent time display across devices.		
6.10	**Performance Monitoring & Service Statistics** The server shall provide comprehensive monitoring and logging. a) Log service statistics including: I. Total requests II. Average response time III. Timeouts b) Present metrics in Server Manager dashboards for performance optimization. c) Support LERC (Limited Error Raster Compression) for efficient image service caching.		
6.11	**Metadata & Standards Compliance** The software shall support international metadata standards, including: a) FGDC CSDGM Metadata b) INSPIRE Metadata Directive c) ISO 19139 Metadata Implementation Specification d) ISO 19139 GML 3.2 e) or Indian standards		
6.12	The GIS solution shall be provided strictly as a Commercial-off-the-Shelf (CoTS) platform, with offline imagery basemap available for airports as out of the box with a resolution of up to 0.3 meters for Urban and 0.6 meters for rural areas.		
6.13	The GIS Platform shall provide data layers such as administrative boundaries, demographic data, Buildings, Pin code Boundaries, roads, railway network, water		

	bodies, Hills, India Airport Location, India Airport Boundary, and other India specific layers as CoTS.		
6.14	The OEM shall have learning platform with structured courses, cloud-based training infrastructure, certifications, and continuous training resources for all GIS products offered. Perpetual access to the Courses shall be available for AAI for atleast 25 concurrent trainees.		
6.15	The GIS platform shall support the creation and management of Mosaic Datasets within a centralized database, allowing AAI to build virtual mosaics that reference high-resolution source imagery without duplication. This capability will enable seamless visualization, rapid processing, and efficient publishing of large volumes of airport imagery—facilitating routine tasks such as runway/taxiway inspection, obstacle monitoring, land-use assessment, and continuous aerodrome safeguarding operations.		
6.16	To efficiently onboard and manage the increasing number of new airports across India, the GIS platform shall be capable of being deployed on a microservices-based or similar architecture in the future to support scalability, modular expansion, and containerized deployment options as required.		
6.17	The GIS platform shall provide fully integrated in-built COTS deep learning and AI/ML capabilities that support end-to-end workflows including data preparation, model training, and inferring without requiring external libraries or custom development. It shall natively enable AAI to perform advanced feature extraction, object detection, segmentation, and change detection across imagery, LiDAR, video, and raster data, with scalable processing across desktop, enterprise, and cloud environments, to ease out on daily tasks. Additionally, the platform shall offer in-built pre-trained models, no-code tools, and seamless deployment options for enterprise services and field applications. There shall also be a provision to upgrade installed AI/ML models with latest trained model as and when released; during warranty and AMC period.		
6.18	The GIS platform shall provide secure user management with SSO integration (AD/LDAP/SAML etc.), Multi Factor Authentication along with controlled content sharing and role-based access across all server roles and components, ensuring that airport stakeholders—ATC, CNS, Survey & Carto. Engineering, Operations,		

	Planning, etc. can securely access and share the right geospatial data while maintaining compliance, data integrity, and operational safety across AAI.		
6.19	The GIS platform shall provide built-in connectors for enterprise systems such as Power BI, SAP, Maximo, and IoT streams (example: MQTT, Kafka, REST etc.) through native real-time and big-data ingestion capabilities, enabling AAI to seamlessly integrate operational, maintenance, and sensor data.		
6.20	AAI designated professionals shall be able to use in-built automation tools like Power Automate, make etc. to automate processes using built-in connectors of the COTS GIS platform or to raise alerts, send emails etc., without knowledge of coding.		
6.21	AAI designated admins shall have an option for integration with geographic and query layers across various databases, including Amazon Aurora PostgreSQL, RDS (SQL Server, Oracle, PostgreSQL etc.), Google Cloud SQL, Azure SQL Database, SAP HANA, Oracle Autonomous DB, etc., data warehouses like Amazon Redshift, Google Big Query, and Snowflake, and register Redshift using AWS IAM credentials.		
6.22	AAI designated Admins shall have an option for integration with geographic and query layers across various databases, including Amazon Aurora PostgreSQL, RDS (SQL Server, Oracle, PostgreSQL), Google Cloud SQL, Azure SQL Database, SAP HANA, Oracle Autonomous DB, etc., data warehouses like Amazon Redshift, Google Big Query, and Snowflake, and register Redshift using AWS IAM credentials.		
6.23	AAI designated Admins shall have an option for integration with geographic and query layers across various databases, including Amazon Aurora PostgreSQL, RDS (SQL Server, Oracle, PostgreSQL), Google Cloud SQL, Azure SQL Database, SAP HANA, Oracle Autonomous DB, etc., data warehouses like Amazon Redshift, Google Big Query, and Snowflake, and register Redshift using AWS IAM credentials.		
6.22	. Platform shall have in-built field applications. Admin shall be able to use service-oriented architecture, and SDKs for building native applications across platforms (e.g., Android, iOS, Java, .NET, QT). He shall prevent unauthorized users from accessing cached pages by disabling of caching of service-related information by the web browser for security purposes.		
6.23	The platform shall provide in-built connectors for tools like Power BI and Excel at no additional cost, allowing airport administrators and supervisors to generate		

	role-based reports with ease. Integrated AI assistants shall support day-to-day tasks such as designing survey forms, extracting information from images, and automating routine data workflows—enhancing efficiency across airport operations.		
7	**ENTERPRISE IMAGE SERVER EXTENSION OR GIS ENTERPRISE ADVANCED SERVER**		
7.1	**Imagery Hosting & Dynamic Image Services** The system shall provide enterprise-grade capabilities for hosting, managing, and serving imagery. a) The software shall support **imagery hosting**, enabling authorized organizational users to upload imagery for dynamic serving as imagery layers. b) The platform shall support creation of **dynamic image services**, allowing imagery to be accessed across desktop, web, and mobile applications. c) The system shall serve web-accessible imagery layers with **on-the-fly processing**, enabling: I. Dynamic rendering II. Real-time analysis III. Visualization without extensive preprocessing d) The solution shall allow users to interact with imagery layers and perform analysis without storing intermediate datasets.		
7.2	**Raster Analytics & Geoprocessing** The platform shall support scalable raster analytics and advanced geoprocessing workflows. a) The software shall provide **geoprocessing tools** for efficient processing and persistent storage of large imagery and raster datasets. b) Users shall be able to: I. Build customized raster analysis workflows II. Publish geoprocessing services III. Generate tailored information products c) The system shall enable publication of **multiple image products** from a single source dataset without requiring preprocessing or storage of intermediate results, optimizing computational efficiency and resource utilization. d) The platform shall define and control the **number of image sections processed before restarting worker processes**, ensuring system stability during long-running raster operations.		
7.3	**Standards-Based Interoperability** The system shall ensure compliance with international geospatial interoperability standards. a) Provide seamless access to OGC-compliant services, including: I. Web Map Service (WMS) II. Web Coverage Service (WCS) III. Web Map Tile Service (WMTS) IV. Keyhole Markup Language (KML) b) Support integration of imagery services into external GIS, web portals, analytics platforms, and enterprise systems.		
7.4	**Security, Access Control & Cloud Performance** The imagery platform shall operate within a secure, high-performance cloud environment.		

	a) The system shall provide **granular access control**, enabling administrators to: I. Assign user group permissions II. Control publishing rights III. Restrict editing and analysis capabilities b) The platform shall maintain a **secure and high-performing cloud environment** optimized for: I. Hosting imagery II. Raster analytics III. Streaming large datasets IV. Integration into enterprise workflows c) The solution shall ensure performance scalability to support increasing imagery volumes and concurrent users.		
8	**ENTERPRISE AVIATION CHARTING EXTENSION FOR GIS ENTERPRISE ADVANCED SERVER**		
8.1	**Aviation-Enabled Server Extension** The platform shall include an aviation-enabled server extension designed to support aeronautical data workflows and chart production. a) Enable publishing and sharing of **map services and geoprocessing services** that leverage aviation-specific data models. b) Support server-based processing to centralize and standardize aeronautical chart production workflows. c) Allow multiple departments (AIS, ATC planning, obstacle management, and cartography teams) to access aviation data services securely.		
8.2	**Aeronautical Data Exchange & Standards Compliance** The system shall support standardized aeronautical data exchange. a) Enable import, export, and exchange of aeronautical data using **AIXM 5.1 message formats**. b) Ensure compliance with international aviation data standards for interoperability and regulatory reporting. c) Support integration of aeronautical datasets into enterprise geodatabases for centralized management.		
8.3	**Obstacle Data Integration** The platform shall support ingestion and management of obstacle datasets relevant to aviation safety. a) Enable import and processing of **FAA Digital Obstacle File (DOF)** data. b) Allow validation, storage, and analysis of obstacle information within aviation data models. c) Support integration of obstacle datasets into chart production and obstacle limitation surface analysis workflows.		
8.4	**Automated Chart Production via Geoprocessing Services** The system shall support automation of aeronautical chart production. a) Enable publishing of **geoprocessing tools as services** to automate repetitive chart production tasks. b) Support server-based execution of cartographic and aviation data processing workflows. c) Ensure standardized and repeatable production of navigational products.		
9	**ENTERPRISE AVIATION AIRPORT EXTENSION FOR GIS ENTERPRISE ADVANCED SERVER**		
9.1	**Airfield-Enabled Server Extension**		

	The platform shall include an airport-focused server extension designed to support airfield data management and analysis. a) Enable publishing and sharing of **map services and geoprocessing services** that leverage airfield data models. b) Support centralized access to runway, taxiway, apron, and obstacle-related datasets. c) Allow secure web-based access to airfield information for planning, safety assessment, and operational workflows.		
9.2	**Obstacle Identification Surface (OIS) Management** The system shall support creation, visualization, and sharing of Obstacle Identification Surfaces. a) Enable creation of **Obstacle Identification Surfaces (OIS)** based on runway geometry and regulatory parameters. b) Allow OIS to be shared as: I. 2D web maps II. 3D web scenes c) Support interactive visualization of OIS in both plan and volumetric perspectives for operational review and compliance monitoring.		
9.3	**Web-Based Obstacle Analysis & Assessment** The platform shall support automated obstacle assessment workflows. a) Enable publishing of **geoprocessing tools** that analyze obstacles for intersection with defined OIS features. b) Support web-based execution of obstacle penetration analysis. c) Provide outputs indicating: I. Intersection status II. Degree of penetration III. Clearance distances d) Ensure results can be accessed and reviewed through web applications by authorized users.		
10	**ENTERPRISE WORKFLOW MANAGEMENT SERVER EXTENSION FOR GIS ENTERPRISE ADVANCED SERVER**		
10.1	**Job Creation & External System Integration** The system shall support automated job creation and integration with external systems. a) The software shall enable **creation of jobs through incoming webhooks**, supporting advanced payload handling. b) The system shall allow webhook payloads to be stored as **job attachments** for auditability and traceability. c) The platform shall support **retry logic in Send Web Request steps**, automatically retrying requests based on predefined conditions to ensure workflow reliability. d) The software shall support centralized and secure references to external data sources using secure expressions.		
10.2	**Expression Language & Dynamic Property Management** The system shall provide flexible and secure mechanisms for dynamically managing job properties. a) The software shall support a **portable, lightweight, and secure expression language** to: I. Dynamically set job properties II. Control workflow behaviour III. Manage external data dependencies b) The system shall support **dynamic drop-down lists** of valid properties in workflow steps such as:		

	I. Update Job Properties II. Update 1–M Job Properties c) The platform shall ensure centralized control of property definitions to maintain consistency across workflows.		
10.3	**Job Search, Filtering & Batch Management** The system shall provide advanced tools for job monitoring and administration. a) The software shall support editing and management of **predefined shared searches** within the Custom Search tool. b) The system shall automatically refresh filtered job search results upon re-selection in the work panel. c) The platform shall enable **batch job actions** from the Manage Jobs interface, including: I. Closing multiple jobs II. Deleting jobs III. Upgrading jobs		
10.4	**4. Workflow Configuration & User Guidance** The platform shall enhance workflow usability and governance. a) The software shall support defining **step-specific help links** within workflow templates. b) The system shall allow configuration of **warning modals** in step templates to alert users before critical actions. c) The platform shall ensure structured guidance to improve compliance with organizational workflow standards.		
10.5	**Data Integrity & Replication** The system shall maintain data governance throughout workflow execution. a) The software shall retain **attribute rules** when creating data replicas during workflow processes. b) The system shall ensure that replicated datasets preserve: I. Data validation rules II. Constraints III. Calculation logic		
10.6	The system shall support advanced job orchestration and workflow management, including webhook-based job creation with secure payload processing and attachment storage; a lightweight, secure expression language for dynamic property resolution, centralized data references, and external dependency management; configurable retry mechanisms for outbound web requests; centralized management of shared searches and dynamic property validation in workflow steps; batch job operations and automatic refresh of filtered job views; step-level contextual help and warning controls; and preservation of attribute rules during data replication within workflows.		
11	**GIS MONITOR**		
11.1	**Web-Based System Monitoring & Administration** The system shall provide a centralized, web-based monitoring and administration interface for enterprise GIS infrastructure. a) The software shall include a **web-based monitoring tool** that enables administrators to: I. Monitor overall system health II. Track service status and availability III. View real-time performance metrics IV. Identify infrastructure bottlenecks		

	b) The system shall provide a **web application for configuration and management**, allowing administrators to: I. Register and manage servers, services, and data stores II. Configure system resources III. Set up alerts and notifications IV. View and manage incidents Access reported usage data and performance trends		
11.2	**Performance Monitoring & Incident Management** The system shall proactively detect, diagnose, and resolve operational issues to ensure high availability. a) The platform shall minimize performance degradation and downtime through continuous monitoring and analysis. b) The system shall provide automated alerts for: I. Service failures II. Resource overutilization (CPU, memory, storage) III. Network latency issues c) The solution shall support incident tracking and logging to enable rapid troubleshooting and root-cause analysis. d) The system shall provide dashboards displaying: I. Service response times II. Usage statistics **III.** Historical performance trends		
11.3	**Resource Optimization & Scalability** The enterprise GIS platform shall optimize infrastructure utilization to support current and future operational demands. a) The system shall use **usage and performance metrics** to: I. Analyze user load patterns II. Identify peak usage periods III. Detect underutilized resources b) The software shall enable intelligent allocation of resources (compute, storage, services) based on: I. Operational demand II. Forecasted growth III. Critical application priorities c) The platform shall support scalability to ensure continued performance as data volume, user base, and application complexity increase.		
11.4	The system shall provide an integrated, web-based monitoring and analytics framework for AAI NOCAS, enabling continuous monitoring of system health, usage, and performance; configuration and registration of NOCAS resources; alerting and incident management; visualization of operational metrics, usage trends, and performance data; proactive detection and resolution of issues to minimize downtime; and optimization of NOCAS system resources based on current and projected demand.		
12	**GIS USER TYPE EXTENSION AVIATION CHARTING FOR ENTERPRISE**		
12.1	**. Aviation-Enabled Server Extension** The platform shall include an aviation-enabled server extension designed to support aeronautical data workflows and chart production. a) Enable publishing and sharing of **map services and geoprocessing services** that leverage aviation-specific data models. b) Support server-based processing to centralize and standardize aeronautical chart production workflows.		

	c) Allow multiple departments (AIS, ATC planning, obstacle management, and cartography teams) to access aviation data services securely.		
12.2	**Aeronautical Data Exchange & Standards Compliance** The system shall support standardized aeronautical data exchange. a) Enable import, export, and exchange of aeronautical data using **AIXM 5.1 or equivalent message formats**. b) Ensure compliance with international aviation data standards for interoperability and regulatory reporting. c) Support integration of aeronautical datasets into enterprise geodatabases for centralized management.		
12.3	**Obstacle Data Integration** The platform shall support ingestion and management of obstacle datasets relevant to aviation safety. a) Enable import and processing of **FAA Digital Obstacle File (DOF)** data. b) Allow validation, storage, and analysis of obstacle information within aviation data models. c) Support integration of obstacle datasets into chart production and obstacle limitation surface analysis workflows.		
12.4	**Automated Chart Production via Geoprocessing Services** The system shall support automation of aeronautical chart production. a) Enable publishing of **geoprocessing tools as services** to automate repetitive chart production tasks. b) Support server-based execution of cartographic and aviation data processing workflows. c) Ensure standardized and repeatable production of navigational products.		
13	**GIS USER TYPE EXTENSION AVIATION AIRPORTS FOR ENTERPRISE**		
13.1	**Airfield-Enabled Server Extension** The platform shall include an airport-focused server extension designed to support airfield data management and analysis. a) Enable publishing and sharing of **map services and geoprocessing services** that leverage airfield data models. b) Support centralized access to runway, taxiway, apron, and obstacle-related datasets. c) Allow secure web-based access to airfield information for planning, safety assessment, and operational workflows.		
13.2	**Obstacle Identification Surface (OIS) Management** The system shall support creation, visualization, and sharing of Obstacle Identification Surfaces. a) Enable creation of **Obstacle Identification Surfaces (OIS)** based on runway geometry and regulatory parameters. b) Allow OIS to be shared as: I. 2D web maps II. 3D web scenes c) Support interactive visualization of OIS in both plan and volumetric perspectives for operational review and compliance monitoring.		
13.3	**Web-Based Obstacle Analysis & Assessment** The platform shall support automated obstacle assessment workflows. a) Enable publishing of **geoprocessing tools** that analyze obstacles for intersection with defined OIS features. b) Support web-based execution of obstacle penetration analysis. c) Provide outputs indicating:		

	I. Intersection status II. Degree of penetration III. Clearance distances d) Ensure results can be accessed and reviewed through web applications by authorized users.		
14	**GIS DEVELOPER SUBSCRIPTION BUNDLE TERM LICENSE**		
14.1	**Purpose and Positioning** A comprehensive software bundle designed exclusively for **development and testing purposes**, independent of production environments. This solution is ideal for organizations that: a) Need a separate, stand-alone enterprise environment for development b) Want to build custom applications c) Plan to extend existing GIS capabilities with new functionality d) Require a safe testing platform before deploying to production It provides a cost-effective way to support internal development teams without impacting live systems.		
14.2	**What the Bundle Enables** 1. **Dedicated Development Infrastructure** a) Stand-alone enterprise setup for development and QA b) Safe environment to test extensions, configurations, and integrations c) Isolation from production systems 2. **Custom Application Development** a) Build web and desktop applications b) Extend existing GIS capabilities with custom tools and workflows c) Develop innovative, organization-specific geospatial solutions 3. **Comprehensive Geospatial Framework** a) Full suite of software supporting both web and desktop environments b) Role-based user types enabling access to various capabilities and applications c) Support for enterprise-level customization and scalability		
15	**General Requirements –**		
15.1	**Obstacle Free Surfaces (OFS) Compliance** The system shall support automated creation and management of ICAO-compliant OFS surfaces, including Approach, Transitional, Inner Approach, Inner Transitional, and Balked Landing Surfaces as per ICAO Annex 14 (Amendment-18). The system shall identify and flag any obstacle intrusions into OFS surfaces based on parameters such as 4,500 m approach length, 3.33% slope, and transitional surface slope limits of 20%.		
15.2	**Obstacle Evaluation Surfaces (OES) Compliance** The system shall support generation and evaluation of OES, including Horizontal Surface, Precision Approach OES, Straight-in Approach OES, Instrument Departure, and Take-off Climb Surfaces. The system shall automatically detect and report penetrations into OES, including precision OES with 300 m inner edge, 2–2.5% slopes, and ICAO-defined divergences.		

15.3	**Communication, Navigation & Surveillance (CNS) Compliance** The system shall comply with all CNS-related safety and operational requirements as mandated in GSR 770(E). The system shall support monitoring, assessment, and reporting of CNS facility performance, including communication systems, navigational aids, and surveillance sensors. The system shall integrate CNS operational status into aerodrome safety and regulatory compliance workflows as defined in GSR 770(E).		
15.4	**Comprehensive Managed Enterprise GIS Environment Requirements** The solution shall provide a fully managed and secure enterprise GIS environment—including hosting, monitoring, patching, upgrades, and performance tuning—while ensuring high availability and optimized application performance through proactive infrastructure management and continuous health monitoring. It shall maintain a compliance-aligned setup with strong security, ongoing vulnerability management, controlled access governance, and adhere to ISO 27001 standards. The environment shall include 24/7 monitoring with automated alerts and performance insights to identify and resolve issues proactively. GIS operations shall follow ITIL-aligned service practices, including incident, change, and release management.		
16	**Hardware General Requirements and Specifications**		
16.1	**General requirements:** a) Specifications given below are minimum requirements higher specification can be offered. b) Hardware shall be latest and in-production and OEM shall certify the same. c) Sever/Workstation processor shall be of latest generation. d) EOSL: Not less than 5 years (OEM certificate to be submitted) e) Inbuild, Offline OEM Hardware management and troubleshooting software f) Server, Workstation can run 365x24x7 g) Server shall have Rack Mount chassis. h) Workstation shall have Tower chassis.		
16.2	**WEB SERVER –** **CPU:** 32 physical core, latest generation **RAM:** 2x 32 GB DDR4 or better **Storage:** 1,000 GB SSD (TLC Gen4) or better **Power supply**: Dual Power Supply **Processor:** Intel Gold Xeon 3.1 GHz equivalent or higher **GPU:** 32 GB Dedicated 1xNVIDIA **Management:** Advance management ILO/IDRAC or ANY, with 2x fibre port for SAN storage connection		

	4x SFP+ports 10Gbps network connectivity 2x management ports **SATA RI SSD:** 1,000 GB, **IOPS:** min 15k (TLC Gen4) or better **Raid:** 1,5 or 10		
16.3	**PORTAL SERVER – GIS Enterprise Portal** **CPU:** 32 physical core, latest generation **RAM:** 2x 32 GB DDR4 or better **Processor:** Intel Gold Xeon 3.1 GHz equivalent or higher **GPU:** 32 GB Dedicated 1xNVIDIA **Power supply**: Dual Power Supply **Storage:** 1,000 GB SSD (TLC Gen4) or better **Management:** Advance management ILO/IDRAC or ANY, with 2x fibre port for SAN storage connection 4x SFP+ports 10Gbps network connectivity 2x management ports **SATA RI SSD:** 1000 GB **IOPS:** min 15k (TLC Gen4) or better **Raid:** 1,5 or 10		
16.4	**HOSTING SERVER - GIS Enterprise Server Advanced with Aviation Charting & Aviation Airports Extensions** **CPU:** 32 physical core, latest generation **Processor:** Intel Gold Xeon 3.1 GHz equivalent or higher **GPU:** 32 GB Dedicated 1xNVIDIA **RAM:** 2x 32 GB DDR4 or better **Power supply**: Dual Power Supply **Storage:** 1,000 GB SSD (TLC Gen4) or better **Management:** Advance management ILO/IDRAC or ANY, with 2x fibre port for SAN storage connection 4x SFP+ports 10Gbps network connectivity 2x management ports **SATA RI SSD:** 1000 GB **IOPS:** min 15k (TLC Gen4) or better **Raid:** 1,5 or 10		
16.5	**IMAGE SERVER – GIS Enterprise Image Server** **CPU:** 32 physical core, latest generation **RAM:** 2x 32 GB DDR4 or better **Processor:** Intel Gold Xeon 3.1 GHz equivalent or higher **GPU : 32 GB Dedicated 2xNVIDIA/ 64GB** **Power supply**: Dual Power Supply **Storage:** 1,000 GB SSD (TLC Gen4) or better **Management:** Advance management ILO/IDRAC or ANY, with 2x fibre port for SAN storage connection		

	4x SFP+ports 10Gbps network connectivity		
	2x management ports		
	SATA RI SSD: 1000 GB **IOPS:** min 15k (TLC Gen4) or better **Raid:** 1,5 or 10		
16.6	**GIS SERVER – GIS Enterprise Server Advanced** **CPU:** 32 physical core, latest generation		
	Processor: Intel Gold Xeon 3.1 GHz equivalent or higher **GPU:** 32 GB Dedicated 1xNVIDIA		
	RAM: 2x 32 GB DDR4 or better		
	Power supply: Dual Power Supply		
	Storage: 1,000 GB SSD (TLC Gen4) or better		
	Management: Advance management ILO/IDRAC or ANY, with		
	2x fibre port for SAN storage connection		
	4x SFP+ports 10Gbps network connectivity		
	2x management ports		
	SATA RI SSD: 1000 GB **IOPS:** min 15k (TLC Gen4) or better **Raid:** 1,5 or 10		
16.7	**WORKFLOW MANAGER SERVER – GIS Enterprise Workflow Manager Server** **CPU:** 32 physical core, latest generation		
	Processor: Intel Gold Xeon 3.1 GHz equivalent or higher **GPU:** 32 GB Dedicated 1xNVIDIA		
	RAM: 2x 32 GB DDR4 or better		
	Power supply: Dual Power Supply		
	Storage: 1,000 GB SSD (TLC Gen4) or better		
	Management: Advance management ILO/IDRAC or ANY, with		
	2x fibre port for SAN storage connection		
	4x SFP+ports 10Gbps network connectivity		
	2x management ports		
	SATA RI SSD: 1000 GB **IOPS:** min 15k (TLC Gen4) or better **Raid:** 1,5 or 10		
16.8	**GIS DATASTORE – RELATIONAL** **CPU:** 32 physical core, latest generation		
	Processor: Intel Gold Xeon 3.1 GHz equivalent or higher **GPU:** 32 GB Dedicated 1xNVIDIA		
	RAM: 2x 32 GB DDR4 or better		
	Power supply: Dual Power Supply		
	Storage: 1,000 GB SSD (TLC Gen4) or better		
	Management: Advance management ILO/IDRAC or ANY, with		
	2x fibre port for SAN storage connection		
	4x SFP+ports 10Gbps network connectivity		
	2x management ports		

	SATA RI SSD: 1000 GB **IOPS:** min 15k (TLC Gen4) or better **Raid:** 1,5 or 10		
16.9	**GIS DATASTORE – OBJECT STORE** **CPU:** 32 physical core, latest generation **Processor:** Intel Gold Xeon 3.1 GHz equivalent or higher **GPU:** 32 GB Dedicated 1xNVIDIA **RAM:** 2x 32 GB DDR4 or better **Power supply**: Dual Power Supply **Storage:** 1,000 GB SSD (TLC Gen4) or better **Management:** Advance management ILO/IDRAC or ANY, with 2x fibre port for SAN storage connection 4x SFP+ports 10Gbps network connectivity 2x management ports **SATA RI SSD: 1.5 PB** NVMe SSD **IOPS:** min 15k (TLC Gen4) or better **Raid:** 1,5 or 10		
16.10	**ENTERPRISE GEODATABASE – Microsoft SQL Server 2025 (64 bit)** **CPU:** 32 physical core, latest generation **Processor:** Intel Gold Xeon 3.1 GHz equivalent or higher **GPU:** 32 GB Dedicated 1xNVIDIA **RAM:** 2x 32 GB DDR4 or better **Power supply**: Dual Power Supply **Storage:** 5,000 GB SSD (TLC Gen4) or better **Management:** Advance management ILO/IDRAC or ANY, with 2x fibre port for SAN storage connection 4x SFP+ports 10Gbps network connectivity 2x management ports **SATA RI SSD: 5,000 GB** initial size **IOPS:** min 15k (TLC Gen4) or better **Raid:** 1,5 or 10		
16.11	**GIS MONITOR(HARDWARE) – GIS Monitor 2025.x/PortgreSQL 17.x** **CPU:** 32 physical core, latest generation **Processor:** Intel Gold Xeon 3.1 GHz equivalent or higher **GPU:** 32 GB Dedicated 1xNVIDIA **RAM:** 2x 32 GB DDR4 or better **Power supply**: Dual Power Supply **Storage:** 1,000 GB SSD (TLC Gen4) or better **Management:** Advance management ILO/IDRAC or ANY, with 2x fibre port for SAN storage connection 4x SFP+ports 10Gbps network connectivity 2x management ports **SATA RI SSD:** 1,000 GB **IOPS:** min 15k **Raid:** 1,5 or 10		

16.12	**GIS WORKSTATION – GIS Pro Advanced with Aviation Charting & Aviation Airports Extensions.** **CPU:** 32 physical core, latest generation **Processor:** Intel Gold Xeon 3.1 GHz equivalent or higher **RAM:** 2x 32 GB DDR4 or better **GPU :** 2x 32 GB Dedicated NVIDIA **Power supply**: Dual Power Supply **Storage:** 1,000 GB SSD (TLC Gen4) or better **Management:** Advance management ILO/IDRAC or ANY, with 2x fibre port for SAN storage connection 4x SFP+ports 10Gbps network connectivity 2x management ports **SATA RI SSD:** 1,000 GB **IOPS:** min 15k **Raid:** 1,5 or 10		
16.13	**GIS Workstation - For Reality** **CPU:** 32 physical core, latest generation **Processor:** Intel Gold Xeon 3.1 GHz equivalent or higher **RAM:** 256 GB DDR4 **GPU :** 32 GB Dedicated 1xNVIDIA **Power supply**: Dual Power Supply **Storage:** 1,000 GB SSD (TLC Gen4) or better **Management:** Advance management ILO/IDRAC or ANY, with 2x fibre port for SAN storage connection 4x SFP+ports 10Gbps network connectivity 2x management ports **SATA RI SSD:** 1,000 GB **IOPS:** min 15k **Raid:** 1,5 or 10		
16.14	**27 Inch Monitor** Display: Size: 26-27 Inch with IPS technology Resolution: FHD-1920 x 1080 or better Aspect Ratio: 16:9 Adjustability: Height > 145mm, Tilt, Swivel, Pivot Enterprise Grade for working in 10hours a day. Enhanced eye comfort/ Eye-Care Technology etc. Auto sleep Refresh Rate > 95Hz Mount: VESA/ Stand Voltage Rating 100 - 240V		

Scope of Work (Network, Infrastructure & Security)			
S.No.	**Specifications**	**Compliance Yes/No**	**Reference / Remarks**
17.	**Router**		
17.1	Type/Form factor - Shall be 1U / 2U, standard rack mountable hardware appliance with redundant/dual power supply		
17.2	Shall have at least 2 x 10G SFP+ and 8 X 1 GE RJ45 and 1 console & USB port from Day1.		
17.3	Shall have the performance/forwarding throughput equivalent to 25 Gbps or higher		
17.4	Proposed router shall also support IPSEC VPN with throughput of at least 22 Gbps or more with support for 1000 Site to Site IPSec tunnels.		
17.5	The proposed solution shall support HA in Active/Active or Active/Passive mode.		
17.6	Shall support NAT (SNAT and DNAT) with following modes Static, Dynamic, PAT		
17.7	Shall support REST API to integrate with 3rd party tools/ solutions and programmatically configure the system.		
17.8	The solution shall have in-built Security and SDWAN functionality from Day1		
17.9	The Router solution shall support Static Routing & Dynamic routing protocols like: BGP, OSPF and RIP etc.		
17.10	Shall support Link aggregation (IEEE 802.3ad) technology to group multiple physical links into a single logical link of higher bandwidth and link fail over capability. Also, shall support Ethernet bonding functionality for full mesh deployment architecture.		
17.12	Support all SNMP versions and v3.		
17.13	The proposed solution shall support the ability to create QoS policy.		
17.14	Router shall be capable to be managed centrally and shall provide the Role based access as well.		
17.15	The OEM of the offered products shall have a valid ISO-27001. Certificate from OEM shall be attached with the technical bid.		

17.16	Configuration backup and restore on to/from aremote system via GUI/CLI over HTTPS/SSH or equivalent secure mechanism.		
17.17	Router shall support Multicast Routing Protocols like PIM-SM		
17.18	All the licenses shall be for a minimum of 8 years and in the name of Airports Authority of India.		
17.19	OEM shall provide 8 years of warranty, support, updates, and security patches		
19	**Switch**		
19.1	**Form Factor:** 1U rack mount		
19.2	**Ports :**48 Ports/24 Ports		
19.3	**Uplinks:** 6 × 1/10G		
19.4	**Stacking**: Up to 8 devices		
19.5	**Operating Temperature :**0 to 45°C		
19.6	**Storage Temperature:** -40 to +70 °C		
19.7	**Humidity:** 5% to 95% (storage/transport)		
19.8	**VLANs:** 4,094		
19.9	**Security Features: Switch** shall support AAA; 802.1X; RADIUS; TACACS+; SSH; port security; user classification; port isolation; UNI/NNI isolation; DHCP snooping; DAI; ARP check; IP source guard; CPU protection		
19.10	**QoS:** Qos shall be based on port/MAC address/IP address/IP priority/DSCPpriority/TCP or UDP port number/ protocol type.		
19.11	**Reliability: When** it comes to reliability the Switch shall support STP, RSTP, MSTP, PVST;GVRP; Super VLAN; PVLAN; Voice VLAN; Monitor link; BPDU TUNNEL; PPPOE+		
19.12	**Management Features: Console** port, HTTP, Telnet, SSH, SNMP		
19.13	**Congestion Management:** SP, WRR		
19.14	**Congestion Avoidance: RED**, WRED		
19.15	**Network Protocols:** Switch shall support Static router; RIP v1,v2; OSPF		
19.16	**Multicast Protocols: In** case of Multicast Protocols, the Switch shall support IGMPPROXY; IGMP filter; MLD v1/v2; IGMP Snooping; MLD v1/v2 Snooping		
19.17	**Approvals:** TEC, ROHS or equivalent Indian certification		
19.18	Any other protocol necessary for smooth functionality of network.		
20	**Anti-DDoS**		
20.1	Proposed Solution shall have stateless appliances in active/passive architecture. Solution shall support inbuilt Fail-Open and Fail-Closed options for Hardware and Software Bypass feature on all inspection interfaces to achieve faster network convergence in High		

	Availability/Resilient deployment. No external bypass switch will be accepted.		
20.2	Proposed appliance shall be a purpose-built DDoS prevention system and shall be stateless technology without any state limitation such as TCP connections. Proposed appliance shall be a dedicated appliance-based solution (not part of Router, UTM, ADC, IPS, Load Balancer, Proxy-based architecture or any stateful device).		
20.3	System shall have a scalable Clean Throughput License approach for legitimate traffic. System shall support clean throughput license scalability up to 50 Gbps over the next 8 years without changing the appliance. System shall support 5 Gbps from day one with license upgrade scalability. Mitigation/flood prevention capacity of more than 100 Gbps from day one.		
20.4	Proposed appliance shall support more than 70 million packets per second flood prevention rate on the same appliance. This performance shall be mentioned in the public datasheet. Shall support latency less than 90 microseconds, documented in datasheet.		
20.5	System shall support 16 × 10G SFP+ protection ports from day one. All protection ports shall support inbuilt hardware and software bypass with Fail-Open and Fail-Closed options. In case of external bypass, the same OEM switch shall be provided by the bidder.		
20.6	Shall support dual redundant hot-swappable AC power supplies from day one.		
20.7	Solution shall support SNMP v2/v3 MIB and traps, REST API management, and integration with RADIUS and TACACS+. Device shall integrate seamlessly with DC SIEM engines through Syslog messages (CEF, LEEF).		
20.8	System shall integrate with third-party feeds (IOCs) via native STIX/TAXII and its own internal feeds. Appliance shall support blocking more than 3 million combined IOCs and act as a threat intelligence gateway at the extreme perimeter.		
20.8	System shall have a dedicated out-of-band management port. Management interfaces shall be separated from traffic interfaces and shall not switch traffic. Appliance shall have inbuilt GUI-based monitoring, configuration, diagnostics, reporting, and future centralized management capability.		
20.10	System shall support configuration via standard up-to-date web browsers. UI shall be HTML-based. Solution shall support configuration and login audit trails, role-based access control, reporting, and firmware/application upgrade mechanisms.		
20.11	OEM Anti-DDoS solution shall support native ISP clean-pipe integration or OEM cloud scrubbing available in India and globally with at least five scrubbing centers. Auto signaling with at least four Tier-1 ISPs in India shall be supported.		
20.12	Solution shall provide a real-time dashboard displaying total traffic, passed/blocked traffic, top IPs/services/domains, attack types, Geo-IP-based sources, and blocked sources.		

20.13	OEM shall have its own Threat Research Team providing threat intelligence feeds with at least one million in-house IOCs covering emerging threats, DDoS vectors, malware, APTs, botnets, scanning, and brute-force attacks. Feeds shall be auto-updated at configurable intervals.		
20.14	System shall support suspension/dynamic suspension of traffic from offending sources based on signatures, host behavior analysis, malformed packets, and payload expression matching.		
20.15	System shall provide countermeasure and challenge-response mechanisms for immediate mitigation of unknown flood attacks without manual intervention. Shall restrict TOR network traffic and support Geo-location-based blocking with auto-updated feeds.		
20.16	System shall detect and block HTTP/HTTPS GET/POST floods and support: (a) HTTP/HTTPS header regex, (b) HTTP/HTTPS rate limiting, (c) rate-based blocking.		
20.17	Same appliance shall support 4 × 100G fiber bypass interfaces in the future by upgrading/replacing NICs or interfaces.		
20.18	System shall mitigate encrypted attacks with at least 20,000 SSL CPS, TLS 1.3 support, selective decryption, and TLS fingerprinting. Shall protect against SSL/TLS and HTTPS-layer attacks and support DNS flood mitigation including random sub-domain attacks. Supported IOC types: IP, FQDN, URL.		
20.19	Bidder shall propose different OEMs for DDoS prevention than IPS, WAF, and LLB/GSLB to create a multi-layer security architecture.		
20.20	Solution shall have Collaborative Protection Profile certification or Common Criteria EAL-4 certification.		
21	**IPS (Intrusion Prevention System)**		
21.1	**Platform Requirement**		
21.1.1	IPS solution shall be a purpose built dedicated standalone appliance and not a integrated firewall module or UTM appliance.		
21.1.2	Monitoring Interface shall be able to operate at layer 2.		
21.1.13	The appliance shall have real world inspection throughput of 10 Gbps and maximum throughput of 30 Gbps on demand scalable in 1U itself.		
21.1.4	The solution shall support on the box SSL inspection for inline as well as outbound traffic without dropping throughput capacity.		
21.1.5	Solution shall support SSL throughput of 10Gbps with 1,000,000 SSL flow count		
21.1.6	The appliance shall have below port density:- 1. fixed 4-10G copper ports fixed ports with fail open 2. 2-100G ports 3. 4-10G fiber ports with fail open 4. Option to have 40G modules for future scalability		
21.1.7	The appliance shall have separate dedicated 1 (1G / 100M) interface for management console. None of the monitoring ports shall be used for this purpose.		
21.1.8	The proposed appliance shall support 10,000,000 Maximum Concurrent Connections.		

21.1.9	The proposed appliance shall support 450,000 Connections per Second.		
21.1.10	The appliance shall have redundant power supply		
21.2	**Detection Technology**		
21.2.1	NIPS shall support different mode of deployment. a) IDS b) TAP mode c) Inline d) Simulation		
21.2.2	Solution shall accurately detect intrusion attempts and discerns between the various types and risk levels including unauthorized access attempts, pre-attack probes, suspicious activity, DoS, DDoS, vulnerability exploitation, brute force, hybrids, and zero-day attacks.		
21.2.3	IPS Solution shall have built-in SSL decryption Engine for SSL Traffic decryption to support prevention of encrypted attacks - which includes attacks over secured http channel without need to have additional appliances.		
21.2.4	Solution shall support Outbound traffic SSL inspection.		
21.2.5	The IPS Solution shall support Anti-malware protection through various engines as part of solution offerings.		
21.2.6	The IPS Solution shall have real time emulation techniques for embedded malware protection.		
21.2.7	IPS appliance shall provide advanced DoS detection with "self learning" for more accurate and fewer false positives.		
21.2.8	The IPS shall support IPv4 and Ipv6 from day-one and detect attacks inside IPv6 encapsulated packets		
21.2.9	IPS shall provide protection from evasion based attacks		
21.2.10	The solution shall have Anti-spoofing capabilities		
21.2.11	Shall have capability for Host quarantine and rate limiting		
21.2.12	IPS shall support high availability in Active-active and active-passive mode with stateful failover and not only limited to transparent mode.		
21.2.13	IPS shall support protocol tunneling for following:- ■ IPv6 ■ V4-in-V4, V4-in-V6, V6-in-V4, and V6-in-V6 tunnels ■ MPLS ■ GRE ■ Q-in-Q Double VLAN Etc.		
21.2.14	NIPS shall support provide advanced botnet protection using following detection methods:- ■ DNS/DGA Fast flux callback detection ■ DNS sink holing ■ Heuristic bot detection ■ Multiple attack correlation ■ Command and control database Etc.		

21.2.15	Shall protect against DOS/DDOS attacks. Shall have "self-learning" capability to monitor the network traffic and develops a baseline profile. It shall have the ability to constantly update this profile to keep an updated view of the network.:- ■ Threshold and heuristic-based detection ■ Host-based connection limiting ■ Self-learning, profile-based detection Etc.		
21.3	**Advanced Prevention and Response**		
21.3.1	IPS Solution shall have capability to PRIORITIZE risk of threats to you with Campaigns detected and IP addresses that could be exposed		
21.3.2	IPS shall have capability to act as an additional source of threat information for Prioritization and predictive threat hunting solution in a way that it can share the telemetry data for predictive analysis.		
21.3.3	IPS shall have capability to quarantine user endpoint machine if it is communicating with bad vectors		
21.3.4	IPS shall have capability to provide detailed host machine context at central dashboard		
21.3.5	IPS shall support Inbound SSL Inspection detection and prevention using dynamic agent based key for ECDHA cypher suits		
21.3.6	IPS shall have capability to provide outbound SSL inspection.		
21.3.7	IPS shall have multiple signatureless engines on the appliance without degrading the performance.		
21.3.8	Solution shall have dedicated emulation engine to provide protection from advanced attacks.		
21.3.9	IPS shall support on demand throughput scalability by just upgrading software license-Scalable on demand throughput based scalability without changing the hardware		
21.3.10	IPS shall support Advanced Analytics, Heuristics and Machine Learning		
21.3.11	IPS shall provide communication fabric based integration with multiple other existing solution of PNB such as immediately share relevant data between endpoint, gateway, and other security products enabling security intelligence and adaptive security.		
21.3.12	IPS shall have inbuilt network behavioural analysis engine to provide additional context using network flows.		
21.3.13	NIPS shall support High Availability. It shall support stateful HA such that state information is shared between the HA appliance. In case one of the appliances fails state is maintained.		
21.3.14	NIPS shall support Active-Active high availability. The HA shall be out of the box solution and shall not require any third party or additional software for the same		
21.3.15	NIPS shall be able to perform entire packet capture of the traffic and sent to the manager for analysis		
21.4	**Management**		
21.4.1	Solution shall manage the NIPS appliances from a central management console		
21.4.2	Management platform supports policy configuration, command, control, and event management functions for the NIPS appliances		

21.4.3	Management console shall support Radius and LDAP authentication in addition to the local user authentication		
21.4.4	Management console shall have the ability to allow access to specific hosts by enabling GUI Access and defining the list of authorized hosts/networks		
21.4.5	NIPS Management console shall support high availability which shall have Automated failover and fail-back		
21.4.6	NIPS solution shall provide Intelligent security management:- ■ Intelligent alert correlation and prioritization ■ Robust malware investigation dashboards ■ Preconfigured investigation workflows ■ Scalable web-based management		
21.4.7	NIPS Management console shall be capable of producing extensive graphics metric for analysis. Further, users shall be able to drill down into these graphical reports to view pertinent details.		
21.4.8	It shall have memory dashboard details memory utilization by device		
21.5	**OEM Support**		
21.5.1	Bidder shall provide single point of contact for customer management, escalation backed by senior product specialists		
21.5.2	Bidder shall provide 24/7 availability for Severity 1 & 2 issues on all security products being offered		
21.5.3	Bidders shall address Problems in equipment which cause downtime/degradation of services and resolution of which require development of patches, bug fixes etc. shall be treated, by Security products OEM, on priority basis.		
21.5.4	Bidder shall provide Schedules and performs Quarterly on-site visits; completes Protection Analysis and offers best practices recommendations.		
21.5.5	Bidder shall provide Proactive notification of malware threat advisories and product updates		
22	**WAF (Web Application Firewall)**		
21.1	The proposed solution shall be available on Hardware.		
22.2	The proposed solution shall provide different level of user accounts, permissions, and access levels for managing the WAF.		
22.3	The OEM Shall provide timely updates of attack signatures and patterns to detect and prevent new threats. The immediate support like log4J vulnerability shall be supported immediately		
22.4	The proposed solution shall have native feature of generating comprehensive reports on WAF performance, security events, and incidents.		
22.5	The proposed solution shall provide flexibility to build customise report template		
22.6	Shall have option to access appliance via Web Based Management (WBM), using HTTPS.		
22.7	Shall have option to access appliance via Command Line Interface (CLI), via SSH, or Console access.		

22.8	Shall have centralized management application, and complete configuration of appliance		
22.9	Shall have option to access appliance via REST API over HTTPS		
22.10	For access via CLI (console, Telnet, SSH), WBM and Web Services (HTTPS) users can be authenticated via RADIUS/ TACACS+ or via local table of authorized users.		
22.11	The Solution shall have system-wide rate limiting command.		
22.12	Conduct scheduled failover tests to ensure seamless failover in case of primary device failure.		
22.13	Shall Support VRRP based failover		
22.14	The proposed solution shall have the capability to perform regular backups and restore configurations when needed.		
22.15	In consultation with LIC the OEM shall prepare the onboarding template		
22.16	The proposed solution shall support 10 Gbps of WAF throughput with minimum 128GB RAM. In case any OEM/bidder has WAF and load balancer in same appliance then the total L7 throughput shall atleast be200Gbps with minimum 192GB RAM or more. The bidder shall provide evidence of throughput through publicly available documents at OEM websites prior to the date of RFP		
22.17	The solution shall be appliance-based rack mountable and shall be available as Physical appliance.		
22.18	The Proposed WAF shall support 10 Gbps of WAF throughput and minimum 30000 RSA Per SEC (2048 BIT)/ECC.		
22.19	The Proposed WAF shall have dual hot swappable power supply as per India Standard from day one		
22.20	The Proposed WAF shall support the following deployment modes to monitor web application traffic over the network: It shall support both HTTP and HTTPS for all the following modes. Depending on the requirements and use cases LIC may decide to use any of the mode. - Via a SPAN/TAP port sniffing mode - Layer-2 inline bridge mode - Layer 3 Reverse Proxy mode		
22.21	All the WAF appliance shall be centrally managed. It shall provide the following capabilities: - Unified management and administration of federated environments across all WAF - Creation, configuration and distribution of policies system-wide across all WAF - Single point of access to each WAF appliance - Monitoring of solution health for the entire deployment - System wide view of security activities		

22.22	The solution shall support the positive security model approach. A positive security model states what input and behaviour is allowed and everything else that deviates from the positive security model is alerted and/or blocked.		
22.23	The solution shall support the negative security model approach. A negative security model explicitly defines known attack signatures.		
22.24	The solution shall be able to execute the following actions upon detecting an attack or any other unauthorized activity: - Ability to drop requests and responses, - Block the TCP session, - Block the application user - Block the IP address		
22.25	The solution shall be able to block the user or the IP address for a configurable period of time.		
22.26	The solution shall be able to protect both HTTP Web applications and SSL (HTTPS) web applications.		
22.27	The solution shall be able to inspect and protect both HTTP/1.x , HTTP/2 and HTTP/3(Shall support in future) protocols.		
22.28	The solution shall be able to re-encrypt SSL web traffic between WAF and web servers.		
22.29	The solution shall provide the following features and protection. - Web service layer correlated attack validation - HTTP protocol attack signatures - Web service layer customized protection - Cookie signing validation - Anti site scrapping - Web profile protection - Web worm protection - Web application attack signatures - Web application layer customized protection - OCSP protocol validation Etc.		
22.30	The solution shall support the custom signatures definitions		
22.31	The solution shall support regular expressions for the following purposes: - Signatures definition - Sensitive data definition - Parameter type definition - Host names and URL prefixes definition		
22.32	The solution shall support automatic updates to the signature database to ensure complete protection against the latest web application threats.		
22.33	The solution shall have a correlation engine built-in to provide event correlation and automated baselining.		

22.34	The solution's in-built correlation engine shall address complex attacks that are ambiguous in nature. It shall also examine multiple pieces of information at the network, protocol and application levels over time to distinguish between attacks and valid user traffic.		
22.35	The solution shall be able to detect known malicious users who are often responsible for automated and botnet attacks. The source of malicious users include malicious IP addresses, anonymous proxy addresses, and TOR networks.		
22.36	The solution shall be able to identify WebSocket connections.		
22.37	The solution shall be able to perform validation on all types of input, including URLs, forms, cookies, query strings, hidden fields, and parameters, HTTP methods, XML elements and SOAP actions.		
22.38	The solution shall be capable of automatically perform dynamic profiling of web applications.		
22.39	The solution dynamic profiling technology shall be able to detect and protect against threats which are specific to the custom code of the web application. After the dynamic profiling/learning phase, the solution shall be able to understand the structure of each protected URL.		
22.40	The solution shall automatically build/learn the web application profiles and use them to detect deviations and various anomalies (or violations) and block attacks on the custom code of the application.		
22.41	The solution shall be able to automatically learn the web usage and application structure and elements and expected user behaviours as soon as the system is installed. The structure and elements include URLs, directories, cookies, form fields and parameters, and HTTP methods.		
22.42	The solution shall allow the re-learning of an application profile on a per-URL or per-page basis. The administrator shall not be required to relearn the entire application when only a few pages have changed.		
22.43	The solution shall support the configuration to allow some pages in a web application to be in protected mode and some pages to be in dynamic profiling learning mode.		
22.44	The solution shall be able to perform dynamic profiling of JSON/XML. HTTP requests in the JSON format shall be learnt by the WAF with the parameters and values.		
22.45	The solution shall be able to protect web applications that include Web services (API) content.		
22.46	The API protection offered by the solution shall be similar to the web application protection provided with automated dynamic profiling/learning capability.		

22.47	The solution shall integrate with web application vulnerability assessment tools (Web application scanners) with leading VAPT OEMs to virtually patch web application vulnerabilities.		
22.48	The solution shall address and mitigate the OWASP Top Ten web application security vulnerabilities.		
22.49	The solution shall be able to provide a threat intelligence feed and service based on source reputation. The feed shall be provided in near-real time for the following known attack sources: - Malicious IP - Anonymous Proxies - TOR IPs - Geo Location Etc.		
22.50	The solution shall have the capability to provide threat intelligence emergency feeds service. This service shall provide the latest set of signatures from the solution vendor to mitigate zero-day vulnerabilities as soon as they are identified.		
22.51	The WAF shall be able to prevent automated Layer 7 DDoS attacks, web scraping and brute force attacks from being directed to the site		
22.52	The solution shall provide "anti-automation" protection which can block the automated attacks using hacking tools, scripts, frame work etc.		
22.53	The solution shall support masking of sensitive data in alerts.		
22.54	The solution shall integrate with SIEM for sending all type of alerts.		
22.55	The solution shall support sending of Syslog messages in JSON or CEF format		
22.56	The solution shall support the creation of custom log messages		
22.57	The solution shall support a flexible set of follow-up actions to be taken in the event of an alert generation.		
22.58	The solution shall provide functionality to assist with security event forensics/Analysis.		
22.59	The solution shall have the functionality that enables the administrator to create custom report templates		
22.60	The solution shall support generation of reports with both tabular views and data analysis graphical views.		
22.61	The solution shall support automatic generation of reports based on a defined schedule.		
22.62	The solution shall come with a web based administration interface and GUI.		
22.63	The solution management appliance shall support centralized management and reporting for multiple WAF appliances.		

22.64	The solution on-premise management appliance shall be able to manage a WAF appliance that is deployed on-premise.		
22.65	The solution shall support high availability.		
22.66	The solution shall support VRRP or proprietary mechanism for High Availability.		
22.67	The OEM shall have a Technical Assistance Center (TAC) India toll free numbers. The OEM shall have Support Centers / Service Center and 24x7x365 TAC support.		
22.68	The solution shall be complete with all hardware and software requirements.		
22.69	The proposed WAF solution shall be enabled with all the modules and features from day one without any additional license dependency.		
22.70	All the custom policy and signature creation shall be done via GUI. There shall not be any need to create any advanced policy from CLI.		
22.71	The solution shall have a GUI based option to create policies to detect and block Double encoding attacks.		
22.72	The WAF solution shall have AI and ML based Anaytics Engine that would correlate and distil thousands of security events into a few distinct readable events.		
22.73	The runtime protection shall also identify weak ciphers being used in the Application.		
22.74	The vendor is responsible to ensure that the solutions and operations comply with information security policies and industry leading standards (such as ISO 27001, etc.) and any applicable laws and regulations (such as IRDAI, DPDP Act etc.).		
22.75	The proposed solution shall not have restrictions on number of rules		
22.76	The proposed hardware shall have Dual Power supply for redundancy as per Indian standard: C13, C14 etc.		
22.77	Proposed solution shall be able to detect and block the latest OWASP top 10 2021 and OWASP Top 10 API		
22.78	Shall be able to provide PCI DSS compliance and reporting		

22.79	System shall protects against the following threats: • SQL injection • Cross-site scripting (XSS) • Cross-Site-Request-Forgery (CSRF) • Parameter tampering • Hidden-field manipulation • Session manipulation • Cookie poisoning • Cookie protection • Remote file inclusion • Buffer overflow • Stealth commanding • Backdoor and debug options • Application-buffer-overflow attacks • Brute-force attacks • Data encoding • Unauthorized navigation • SOAP- and Web-services manipulation • Web Scraping Etc.		
22.80	System supports enforcing policies regardless of character encoding in order to combat evasion techniques, such as: • URL-decoding (for example, %XX) • Self-referencing paths (that is,. use of /./ and encoded equivalents) • Path back-references (that is, use of /../ and encoded equivalents) • Mixed case • Excessive use of whitespace • Comment removal (for example, convert DELETE/**/FROM to DELETE FROM) • Conversion of (Windows-supported) backslash characters into forward slash characters. • Conversion of IIS-specific Unicode encoding (%uXXYY) • IIS extended Unicode • Virtual directory route—positive folder enforcement • Base64 Encoding • Etc.		
22.81	Device shall able to control BOT traffic and It shall able to block known bad bots and fake search engine requests		
22.82	Shall support XML Application protection		
22.83	Shall be able to provide PCI DSS compliance and reporting		
22.84	The solution shall provide full support for HTML5, AJAX and JSON.		
22.85	Clause Deleted		
22.86	Shall have Geo-IP Blocking capability		

22.87	Solution shall be able to provide User Defined Customized Reporting		
22.88	Shall support frequent signature updates to protect against known and potential application security threats.		
22.89	Ability to define different policies for different applications		
22.90	Ability to create custom attack signatures or events		
22.91	Ability to combine detection and prevention		
22.92	The solutions shall protect certain hidden form fields.		
22.93	Shall provide ability to allow or deny a specific URL access.		
22.94	WAF shall continue to provide protection even while in learning mode with ability to configure few signatures in blocking mode while in learning mode for other signatures.		
22.95	The proposed solution shall be integrate with NTP solutions provided by LIC		
22.96	< Left intentionally Blank >		
22.97	The solution shall be able to block even the most advanced bots that try to emulate standard client behavior and pretend to be web browsers.		
22.98	The solution shall be fully integrated with the On Prem WAF system from the same vendor.		
22.99	The solution shall protect against typical risks associated with automated traffic, in particular: · scraping - automatic processing of page content · spamming - sending large amounts of data to applications · screwing - disruption of statistics · DDoS - application overloading · Denial of Inventory - bulk purchases Carding, Card Cracking - payment card fraud.		
22.100	The solution shall be able to perform client identification, i.e., acquire data about the browser's runtime environment by injecting JavaScript code into the browser to analyze that environment. The acquired data shall detail browser parameters in the form of at least 150 attributes, including being able to detect various anomalies like: · presence of automation · unusual screen resolution · unusual user behavior (such as mouse movements) · unusual drivers		
22.101	The client component (JavaScript) shall be resistant to reverse-engineering techniques through advanced code obfuscation techniques and frequent script changes (at least once every 10 minutes).		

22.102	The client component (JavaScript) shall be downloaded from the same domain as the application (first party). It is not allowed to use external locations to upload the script.		
22.103	Identification shall be implemented with the accuracy of the web browser. The result of the identification shall be the establishment of a session with the browser, which will authorize further communication.		
22.104	The solution shall allow the definition of specific endpoints which are crucial for the application, which will be accessible only after previous identification and application of policies. Sending a request to such an endpoint without prior identification shall result in immediate block of the request and redirecting the client to the website which will initiate the identification.		
22.105	The solution shall include machine-learning or behavioral analysis mechanisms. They shall detect anomalies in the behavior of application clients and classify bots based on similar behavioral patterns.		
22.106	The solution shall also provide protection for APIs that are consumed by browsers. Interfaces can then be accessible depending on the presence of a valid session key assigned at identification time.		
22.107	The system shall provide the ability to apply the following actions against traffic classified as BOT: · blocking · monitoring · displaying a captcha · identify · delay		
22.108	The manufacturer shall manage some of the conditions (lists) that can be easily placed in the policy, including: · Social Media Bots · Search Engines bots · Aggregator User Agents CSPs (expected lack of client traffic) like AWS, Google, Azure.		
22.109	The system shall have a number of predefined conditions/rules that are most commonly used. It shall also be possible to freely define conditions based on logical operators and analysis of attributes acquired during identification.		

22.110	Part of the product shall be a flexible reporting system that can generate detailed views, including: · Applied actions on the timeline · Number of solved/unsolved captcha · The performance of ML models · The incidence of customer anomalies · Ratio of bad bot/good bot/human traffic · Endpoints with the highest number of requests.		
22.111	The vendor shall include the service of a dedicated analyst who has extensive knowledge and experience in fighting bots. His task will be to analyze the current traffic and assisting in adjusting the configuration to be as effective as possible in the face of ever-changing bot usage techniques and constant changes in the protected application. The analyst shall devote a minimum of 5 hours per month to carry out the forementioned activities.		
22.112	The proposed WAF shall have high availability in both layer 3 and layer 2 deployment.		
22.113	The solution shall have inbuilt bypass segments to ensure that fail open in case of hardware failure		
22.114	The proposed WAF appliance SHALL NOT USE Hypervisors. The appliance shall be a purpose built WAF with its own custom specialised hardened OS integrated with the hardware. It shall not have any Virtualisation components in the hardware.		
23	**Server Load Balancer**		
23.1	VIRTUALIZATION: The proposed device shall have Hypervisor (shall not use Open Source) based virtualization that virtualizes CPU, memory, network and acceleration resources. Hypervisor shall be purpose-built (not XEN, VMware, KVM etc.) with public reference link. Each Virtual Instance shall have separate Resources, Configurations, Management and Operating System. Device shall support 5 Virtual Instances from Day 1 and up to 25 Virtual Instances on same hardware. No 3rd party or open-source software allowed. Appliance shall support Standalone and Virtualized mode.		
23.2	The proposed solution shall be EAL2 certified.		
23.3	The proposed device shall support health checks: Link, TCP, UDP, ICMP, HTTP/HTTPS, TCP/UDP DNS, FTP, POP3, RADIUS, SSL HELLO, WAP Gateway, LDAP/LDAPS, SIP, Virtual Wire, DSSP, Script-based and Cluster-based Health Checks.		
23.4	The proposed device shall support following Load Balancing topologies: Virtual Matrix Architecture, Client NAT (Proxy IP), Mapping Ports, Direct Server Return, One-Arm Topology, Direct Access Mode, Multiple IP assignment, Immediate and Delayed Binding.		
23.5	The proposed device shall support standard VRRP (RFC 2338) for High Availability (No proprietary protocol).		

23.6	The proposed device shall support SSL offload for protocols: HTTPS, Generic SSL, SIP, SMTP (STARTTLS), IMAP (STARTTLS), POP3 (STARTTLS), LDAP (STARTTLS), FTPS.		
23.7	Solution shall support native Kubernetes integration with controller/connector/plugin running inside Kubernetes cluster for automatic LB service creation including VIPs, Nodes/Real Servers, Farms/Groups and SSL binding.		
23.8	Controller/Connector/Plugin shall include: Controller (service discovery), Aggregator (input aggregation), Configurator (generates and pushes LB configuration).		
23.9	Elastic Licensing Model supporting shared throughput across physical and virtual ADCs (on-prem & cloud), automated ADC deployment and license reallocation from decommissioned instances.		
23.10	Automatic SSL certificate renewal via integration with 3rd-party Certification Authority such as Let's Encrypt.		
23.11	Content-Intelligent Cache Redirection support: URL-based, HTTP header-based, Browser-based, URL hashing, RTSP streaming cache redirection.		
23.12	Centralized management providing Application Dashboard, Application Analytics, SLA breakdown, SSL statistics, SSL CPS, System Dashboard, Network Dashboard, L4 Events, Transaction Events and SSL Events.		
23.13	Limit HTTP Requests Per Second (RPS) per application without scripting. Automation engine based on Ansible and Python.		
23.14	Support Content-Intelligent Server Load Balancing and Advanced Content Modification via GUI and CLI without scripting.		
23.15	Traffic Ports: 6×10G SFP+ and 6×1G Copper populated from Day-1, expandable with additional 6×10G SFP+ and 6×1G Copper. L4 Throughput: 40 Gbps scalable to 90 Gbps. L4 CPS: 1M. L7 RPS: 2.5M. SSL Throughput: 20 Gbps. Memory: 32 GB scalable to 128 GB. Storage: 500 GB scalable to 2 TB (SSD).		
23.16	Device shall have 2×RJ45 dedicated management ports and 1×RJ45 serial console port.		
23.17	Bidder shall propose centralized management and reporting from Day-1. SLB, WAF, DDoS and SSL Off loader shall be managed from the same platform.		
23.18	Device shall support Active, Bypass and Passive deployment modes.		
23.19	Device shall support known attack type protection.		
23.20	Device shall support Zero-Day attack blocking.		
23.21	Device shall support Security Filter Auto Policy Generation (Full auto, Auto-enabled, Auto refinements).		
23.22	Device shall protect against mimicking user behavior, dynamic IPs, anonymity, scraping, clickjacking etc.		
23.23	Device shall support Server-Side Request Forgery (SSRF) protection via redirection validation.		
23.24	Device shall protect against Parameters Tampering, Cookie Poisoning, SQL Injection, Session Hijacking, Web Services Manipulation, Stealth Commands, Debug Options, Backdoors, Infrastructure Vulnerabilities, 3rd-party misconfiguration, Buffer Overflow, Data Encoding, Protocol Piggyback, XSS, Brute Force, OS Command Injection, CSRF, Information		

	Leakage, Directory Traversal, Malicious File Uploads and Directory Listing.		
23.25	WAF and DDoS solutions shall integrate with each other using a messaging mechanism to share attack intelligence for perimeter mitigation.		
23.26	OEM shall be Parent Technology OEM only (no white-label, co-branding, reseller, open-source or third-party technology).		
24	**Link Load Balancer**		
24.1	The proposed appliance shall be a dedicated Load Balancing appliance with dual power supply, it shall not be part of any Firewall or UTM. The appliance shall not allow to run 3rd party software or other OEM software on same hardware.		
24.2	**Traffic Ports supported: 4 X 10G SFP+ & 8 X 1G Copper Ports** (without use of Breakout Cables), **Device L4 Throughput:** 10 Gbps scalable to 40 Gbps **Layer 4 connections per second:** 1M CPS **Layer 7 requests per second:** 1.5M RPS Memory: 32 GB. The Proposed device shall have 2 x RJ45 dedicated management port and 1 x RJ45 Serial console port.		
24.3	**Link Selection Metrics:** The following metrics shall be available for inbound and outbound link load balancing: • leastconns • roundrobin • response • availability • qos • minimizes • hash • persistence • geographical, etc		
24.4	**Proposed Device shall have Following Functionality:** • Virtual Matrix Architecture • Client Network Address Translation (Proxy IP) • Mapping Ports • Direct Server Return • One Arm Topology Application • Direct Access Mode • Assigning Multiple IP Addresses • Immediate and Delayed Binding		

24.5	A framework for customizing application delivery shall be provided using user-written scripts, that provides the flexibility to control application flows and fully meet business requirements in a fast and agile manner. **<u>The proposed framework shall enables to:</u>** • Extend Server Load Balancer Fabric services with delivery of new applications • Quickly deploy new services • Mitigate application problems without changing the application • Preserve infrastructure investment by adding new capabilities without additional equipment investment		
24.6	DNSSEC based Global Load Balancing shall be supported in the proposed device from Day 1.OEM shall be Make in INDIA compliant as per Government MII Guidelines & subsequent amendments.		
24.7	The proposed Link Load Balancer shall support: 1. Static NAT 2. Dynamic NAT 3. No-NAT		
24.8	**LLB shall support the following mechanisms:** IPv6/IPv4 Gateway Outbound IP Gateway Inbound IP Gateway		
24.9	The proposed Device shall support static and dynamic routing protocols like OSPF, RIP1, RIP2, BGP, etc. from Day 1.		
24.10	The proposed device shall support standard VRRP (RFC - 2338) for High Availability purpose (No Proprietary protocol). OEM shall be Make in INDIA compliant as per Government MII Guidelines & subsequent amendments		
24.11	System shall be capable to handle IPv4 to IPv6 translation and shall be IPv6 ready.		

24.12	The proposed Appliance shall supports the following health check types: • Link Health Checks, • TCP Health Checks, • UDP Health Checks, • ICMP Health Checks, • HTTP/S Health Checks, • FTP Server Health Checks, • POP3 Server Health Checks, • SMTP Server Health Checks, • NNTP Server Health Checks, • WAP Gateway Health Checks, • LDAP/LDAPS Health Checks, • Windows Terminal Server Health Checks, • ARP Health Checks, • DHCP Health Checks, • Virtual Wire Health Checks, • DSSP Health Checks, • Script-Based Health Checks, • Cluster-based Health Checks		
24.13	Device shall be accessed through the below: • Using the CLI • Using SNMP • REST API • Using the Web Based Management		
24.14	The Proposed solution shall be EAL2 certified.		
24.15	The Proposed Appliance shall support QUIC Protocol.		
24.16	The Solution shall support native integration with Kubernetes Platforms and controller/connecter/plugin shall operate within Kubernetes Cluster to automatically create service on Load Balancer. The controller/connecter/plugin shall also support automatic creation, edition and deletion of service like VIP creation, Node/Real Sever Creation, Farms/Group Creation, SSL Binding etc.		
24.17	Bidder shall propose Centralized Management & Reporting Solution from Day 1. Proposed DDoS, LLB, SLB, SSL Offloader and WAF shall be managed via same centralized management solution.		
24.18	**VIRTUALIZATION:** The proposed device shall have Hypervisor (shall not use Open Source) Based Virtualization feature that virtualizes the Device resources— including CPU, memory, network, and acceleration resources. The Hypervisor used to virtualize the hardware shall be a specialized purpose build hypervisor and NOT a commercially available hypervisor (like XEN, VMware, KVM etc.). (Public Available Reference Link shall be shared) **Each Virtual Instance contains a complete and separated environment of the Following:** a) Resources, b) Configurations,		

	c) Management, **d) Operating System** The proposed device shall support 5 Virtual Instance from Day 1 and support upto 10 Virtual Instances for future Scalability on the same hardware. It shall NOT use/allow 3rd party or open source software to be deployed as network functions on the same hardware. The Proposed Appliance shall support Standalone as well as Virtualized Mode (Bidder may be asked to demonstrate this feature during Technical Evaluation).		
24.19	Support for HTTP/2 & HTTP/3 Gateway.		
24.20	The proposed Device shall support Proximity based LLB for both Inbound and Outbound Link Load Balancing capabilities in the LLB Module.		
24.21	The proposed Device shall have the Proximity based LLB which monitors 24/7 Full-path transaction completion through Application-aware full-path Health Monitoring module and automatically measures the real-time status of two-way routes between the network and the remote user or servers on the internet based on multiple parameters including latency, packet loss, Cost and load time of the link.		
25	**Firewall**		
25.1	Solution shall be a hardware based dedicated appliance with threat defense features like, Application control, IPS, Web Filtering, Anti-Malware protection integrated in the same appliance.		
25.2	Type/Form factor - Shall be NGFW and 1U/Desktop form factor. Shall provide necessary accessories to fit for network rack		
25.3	Shall have at least **16 X GE RJ45, 4 X 10G SFP+ and dedicated RJ45 console port** from Day1.		
25.4	Next Generation Firewall (NGFW) throughput of **3 Gbps** with the security features enabled i.e. Firewall, IPS and App-ID/App Control/AVC OR Next Generation Threat Prevention/Protection throughput of **2.8 Gbps** with Firewall, App-ID/App Control/AVC, IPS and Anti-virus/Anti-malware protection enabled.		
25.5	Application Control/Appmix/App-ID/Application Visibility & Control throughput shall be **6.5 Gbps.**		
25.6	Concurrent connection of **3 million** or above and new connection / Sec of **125K** or above. The data shall be available on OEM Website/Datasheet and shall be relatable to the same appliance & OS/Software combination as proposed for the bid.		
25.7	The solution shall have **3 Gbps** of SSL/TLS Inspection/Decryption throughput. OR Concurrent SSL/TLS Inspection/Decryption sessions **300K** or above.		
25.8	IPSEC VPN throughput of atleast **30 Gbps** or more with support for 200 Site to Site Ipsec tunnels.		
25.9	The proposed solution shall support HA in Active/Active and Active/Passive mode. The Firewall in HA shall support stateful failover.		
25.10	Shall support NAT with following modes Static, Dynamic, PAT, Nat 64 (IPv6-to-IPv4), DNS64 & DHCPv6 functionality.		

25.11	Firewall appliance shall have at least **10 virtual firewall** domains/instants/context/systems/VRF or equivalent (active from day-1) with each firewall domains/instances/context/systems/VRF having a separate administrative control OR equivalent, Security zones and VLAN. Associated Licenses, Software and Hardware towards Virtual domains / Virtual Firewalls/ Virtual instances shall be provided from day 1		
25.12	Firewall shall have a hardened OEM operating system and shall be EAL 4 or above certified.		
25.13	The Firewall solution shall support Static Routing, Policy based Routing, BGP, OSPF, VXLAN Inspection & Multicast routing including Protocol Independent Multicast with dense, sparse mode.		
25.14	It shall support the application aware routing of traffic and shall support the visibility and control of atleast 5000 Applications signatures		
25.15	The NGFW shall also be able to safeguard internal servers and applications for many known vulnerabilities and exploits using the IPS function. It shall have a reach database of 10000 or more signatures.		
25.16	Shall support bi-directional integration with Anti- APT/SANDBOX for sharing threat intelligence and automated mitigation of zero day attacks. The Firewall shall support integration of on-prem sandbox of same OEM if required in future.		
25.17	Firewall policy shall facilitate IP, Network, Port, Protocol, User, Application and Zone and shall facilitate to apply features like IPS, Web & application Content filtering, Anti-Malware, IPS, DOS/DDoS prevention, Traffic Shaping on any firewall policy for a specific time/Date/Period. Firewall policy shall also have an option of configuring exceptions to any specific features.		
25.18	The proposed system shall be able to operate on either Transparent (bridge/L2/virtual wire) mode or NAT/Route/L3 mode. Both modes can also be available concurrently using Virtual Contexts.		
25.19	Shall support Link aggregation (IEEE 802.3ad) technology to group multiple physical links into a single logical link of higher bandwidth and link fail over capability. Also, shall support Ethernet bonding functionality for full mesh deployment architecture.		
25.20	Support all SNMP versions support v3.		
25.21	Shall support various form of user Authentication methods simultaneously, like: Local Database, LDAP server, RADIUS server and PKI methods.		
25.22	The proposed firewall shall have provision to be able to create custom application and IPS signatures and profile.		
25.23	The proposed firewall shall delineate different parts of the application such as allowing Facebook chat but blocking its file-transfer capability inside the chat application based on the content.		
25.24	The firewall shall have the capability to create DOS prevention policy to prevent against DOS attacks on per zone/interface basis (outbound to inbound, inbound to outbound) and ability to create and define DOS policy based on attacks like UDP Flood, ICMP Flood, SYN Flood, IP Address Sweeps, ICMP sweeps, IP Address Spoofs, Port Scan etc.		
25.25	Shall be able to perform Anti-malware scans for HTTP, SMTP, IMAP, POP3, and FTP traffic.		

25.26	Shall detect and prevent malicious DNS request from inside hosts to outside bad domains, communication attempts to C&C domain list, OEM known C&C IP address database. It should also enable to enforce a DNS safe searching option for users to help avoid explicit and inappropriate results in the search engines like: Google, Bing, and YouTube search engines.		
25.27	The NGFW shall support the DNS over TLS (DoT), DNS over HTTPS (DoH) to inspect the DNS traffic.		
25.28	Solution shall be ready for the post-quantum threats to include Post Quantum Cryptography with NIST-approved algorithms like ML-KEM and emerging algorithms like BIKE, HQC, and Frodo to protect against emerging threats , including harvest-now, decrypt-later attacks.		
25.29	Shall be able to call 3rd party threat intelligence data on malicious IPs, Domains, URLs and Hashes etc. to the same firewall policy to block those malicious attributes and list shall get updated dynamically with latest data.		
25.30	The proposed system shall have integrated Traffic Shaping/ QoS/Bandwidth Rate Limits or equivalent functionality to rate limit, restrict the applications, destination etc.		
25.31	Shall support for SIEM log integration. The solution shall be capable of sending logs to a SIEM system via syslog.		
25.32	Configuration backup and restore on to/from a remote system via GUI/CLI over HTTPS/SSH or equivalent secure mechanism.		
25.33	Shall support IPv6 traffic and certified for USGv6/IPv6.		
25.34	The solution shall be quoted with **8 years** support with all necessary licenses for IPS, Advanced Malware Protection, Application Control, URL, DNS Filtering & Antispam signatures. The support shall include hardware warranty and 24x7 technical support from OEM.		
26	**Firewall Management System (FMS)**		
26.1	FMS solution to be proposed with central dedicated management solution with capability to manage at least **30 NGFW** from Day1.		
26.2	The Centralized Firewall Management System (FMS) can be Physical appliance, or Software based device on dedicated Hardware. In case of a software option, the OS and hardware needs to be bundled along by the Bidder.		
26.3	FMS shall have the feature of implementing global policies and Global objects, to be distributed among all Security feature of Edge devices		
26.4	It shall support downloading Essential updates from day 1 (Application Signature Updates) & Security Updates in future (Antivirus definition updates, IPS updates, Geo DB Updates, IP Reputation updates and Web Filtering updates) and supply them to the NGFW appliances		
26.5	Shall support HTML based Web UI as well as CLI (SSH) restricted to Trusted Host(s) only		
26.6	The FMS solution shall be from the same OEM as that of the UTMs		
26.7	The FMS Shall be able to push firewall policy centrally to all. selected UTMs in one go.		
26.8	The FMS shall be able to push list of IPs, URLs and hashes to all/Selected UTMs in one go.		

26.9	The proposed solution shall allow for offline updates of all the UTM's signature. The signature will be downloaded to an Internet connected machine, these signature files will be placed into the FMS using pen drive or other such mechanism for updating the UTMs.		
26.10	Shall be capable of enabling log forwarding to SIEM solution in common log formats like syslog, CEF.		
26.11	Central Solution can be dedicated hardware appliance or VM. If VM is provided necessary licenses and hardware server to be provided by bidder. The quoted hardware/server shall have at least **4TB of usable storage** post RAID Configuration.		
26.12	The offered device/server shall have at least 4 X 1G standard RJ45 interface from Day 1.		
26.13	All quoted hardware shall be standard rack mountable devices/servers with dual power supply.		
27	**Network Visibility and Threat Analytics**		
27.1	All required licenses to enable all the features shall be provided in each probe from day one.		
27.2	Solution shall be able to capture and process traffic 4 Gbps (24x7x365 Capturing) of packet data in DC at real time with the average packet size of 800 – 1000 Byte. Proposed solution shall be dedicated purpose built appliance that shall provide full Detection, Network Visibility, Investigation & Forensic capability / Back in Time investigation, through high speed packet capture & analysis functions for a network traffic capture for 4 Gbps . Shall store pcap like data for 2 days.		
27.3	Network packet broker : 1 No. which shall have up to 16 line-rate ports (16 x1/10 GbE). The Packet broker shall support > aggregation, > replication, > filtering, > load balancing, and > source port tagging		
27.4	Solution shall provide back in time investigation & troubleshooting and shall have packet like data for minimum period of last 2 days and shall be able to perform session analysis, host analysis, TCP analysis etc and Solution shall have capability to store at least 6 months of high-level performance data, trend, issues, and events.		
27.5	Shall have minimum 2 x 1 GbE management port and at least 4 X 10G monitoring/Visibility interfaces for traffic capture in each probe. For packet data solution shall use the SAS drives.		
27.6	Network Visibility and Network threat Analytics solution shall be capable of decrypting SSL and TLS traffic with provided certificates and private keys		
27.7	PCI- DSS: CHD / SAD related information shall not be stored and displayed on user console /dashboard (as it will monitor unencrypted traffic). The network traffic capture include sensitive and confidential data within the application like user specific information (user name/password), confidential financial information, project information		

	etc. The solution shall note store such sensitive/confidential application content data to avoid any misuse by NOC/SOC engineer working on the solution. However, solution shall capture and store relevant information required for troubleshooting e.g. host information, session information, TCP values, errors/exceptions etc.		
27.8	Solution shall provide support for passive and active Visibility of network traffic and Solution shall be able to monitor end-user network traffic via network devices and/or packet data at the unfilment without additional components / agent on the endpoint or server. Solution shall be able to capture the entire packet, Slicing the size of packet, Packet Truncation, Exclude specific packets and Capture only headers and also it shall have User Defined criteria customized capture.		
27.9	Dashboard shall have analytical capabilities for assisting in identifying the root cause through a multitude of dashboards and reports. The solution shall also simplify the operations Visibility process significantly by helping define the correct team to address the problem. E.g., network, application, server, middleware or database teams. The objective is to reduce Mean Time to Identify (MTTI) and Mean Time to Resolve (MTTR)		
27.10	The Visibility system shall not use a "sampling" approach when collecting packets, which means it shall collect & analyze all the packets to characterize data and Solution shall provide intelligent deep packet capture and analysis capabilities for long-term storage and retrieval of network packets and statistics.		
27.11	Solution shall be able to monitor various latencies/Response time involved in between client and server while accessing the application. For example – TCP RTT, Application response time, Client connect time and server connect time etc.		
27.12	Solution shall be able to monitor peak active session for any application for any server (Where application is hosted) for any time duration along with the details of %age of successful transaction. Solution shall be able to monitor errors if there are any and %age of failed transaction for any application for any server (Where application is hosted) for any time duration along with the details of error code messages for the same to get the root cause of that failure.		
27.13	The dashboard shall be able to provide different widgets for different components as online analysis to automatically identify which widget/component or tier is contributing to slowness of the monitored transaction. And the dashboard shall show relevant performance or error messages within the captured packets that are associated with problems for root-cause analysis.		

27.14	Dashboard shall be able to provide complete Visibility of network activities, end user experience, and application traffic and network performance. It shall also provide summarized analysis, breaking down application response time into following components: a) Client/Server response b) Network bandwidth c) Network latency d) Network congestion/retransmission e) Network protocol (e.g., TCP)		
27.15	Dashboard shall provide information to identify and isolate to determine whether end-user experience of slowness in accessing of the information is due to a network or an application issue. It shall be able to calculate response times for all relevant applications and determine the impact on user experience.		
27.16	Solution shall support below protocols Visibility using DPI (Deep Packet Inspection) and also Solution shall provide detailed packet decode and analysis for the same. 1. Web protocols: HTTP, HTTPS 2. Core Services: SNMPv1-3, AD, DNS, DHCP, NTP, LDAP, FTP, SFTP, SMB v1/v2, SCP 3. Email and Desktop: Secure POP3, Secure SMTP, IMAP, MS ActiveSync, NNTP_SSL, Notes, PoP3 etc. 4. Voice: SIP, H232, RTSP, RTP, SCCP 5. Multimedia application: SIP, SIP Conference, SCCP, RTP, RTCP, MSRP and Video: H.323 etc. 6. Various MQ Protocols (MSMQ, IBM MQ Protocol etc.) 7. Remote Desktop: Microsoft Remote Desktop, Citrix ICA, VMWare and Citrix Channel 8. Along with Citrix ICA solution shall support Citrix channel Visibility 9. Database: Oracle DB, MySQL, Microsoft Access, DB2, DBASE, MSSQL, MSSQLMON, ORACLE_SRV, ORACLESQL, SQL_SRV, SQLNET 10. Routing and others: Syslog, OSPF, BGP, Ipsec, GRE		
27.17	Solution shall be able to provide in-depth Visibility of various databases and shall have dedicated monitor for the same: a. Shall provide Visibility for latency, requests and failures for DB Connect, DB Query, DB Modification, DB Create/Drop. b. Solution shall provide latency variation over time with database application usage. To get the idea of how latency varies if Usage (bps) varies for DB Connect, DB Query, DB Modification, DB Create/Drop. c. Solution shall provide performance variation over Latency. To get an idea on numbers of request, FAST, Degraded, Slow and timeouts with application latency if any. d. Solution shall provide failure %over time with total request, to get an idea on failure trend on database application. e. Solution shall provide error code graph distribution for defined period for DB Connect, DB Query and DB Modification, to get a detailed idea on error message which are getting generated in between specific client-Server communication transaction.		

27.18	Solution shall have in-depth Visibility for front end application like HTTP, HTTPS and shall have dedicated monitor for the same: a. Solution shall provide error code distribution for certain period for GET, PUT and POST, to get a detailed idea on error message which are getting generated in between specific client-Server communication. b. Shall provide Visibility for latency, requests and failures for GET, HEAD and PUT/POST c. Solution shall provide latency variation over time with application usage. To get the idea of how latency varies if application usage varies d. Solution shall provide performance variation over Latency. To get an idea on numbers of request, FAST, Degraded, Slow and timeouts with application latency if any e. Solution shall provide failure %over time with total request, to get an idea on failure trend		
27.19	Solution shall have in-depth Visibility for MQ protocol (For example MSMQ, IBM MQ) and shall have dedicated monitor for the same: a. Shall provide Visibility for Latency, Requests and Failures for MQ Messages for example open/close, put/get and Put 1. b. Solution shall provide latency variation over time with application usage. To get the idea of how latency varies if application usage vary. c. Solution shall provide performance variation over Latency. To get an idea on numbers of request, FAST, Degraded, Slow and timeouts with application latency if any. d. Solution shall provide failure %over time with total request, to get an idea on failure trend and also shall know which message (open/close, put/get and Put 1) is falling and the reason of the failure. e. Solution shall provide error code distribution for certain period for open/close, put/get and Put 1, To get a detailed idea on error message which are getting generated in between specific client-Server communication.		
27.20	Solution shall have DNS Visibility features and shall have dedicated monitor for the same: a. Solution shall provide Visibility for A-AAAA, PTR-NAPTR and PUT/POST queries. b. Solution shall provide latency Variation over time with DNS application usage. It will give idea of how latency varies if DNS query varies c. Solution shall provide performance variation over Latency. To get an idea on numbers of request, FAST, Degraded, Slow and timeouts with DNS application latency if any d. Solution shall provide DNS application failures overview for accessing the DNS application health e. Solution shall provide error code distribution for defined period for A-AAAA, PTR-NAPTR and SRV, to get a detailed idea on error message which are getting generated in between specific client-server communication transaction		

27.21	Solution shall have Active Directory, LDAP and Radius Visibility and shall have dedicated monitor for the same: a. Ability to give latency, requests and failures for Authentication, Search & Compare, Modify and Others. b. Latency Variation over time with application usage. It will give idea of how latency varies based on usage for Authentication, Modify etc. c. Performance variation over Latency. (Gives idea on numbers of request, FAST, Degraded, Slow and timeouts with transaction count and latency). d. Failure %over time with total requests, gives idea on failure trend and which are being failed for ex: Authentication, modify etc. and transaction count with %Failed. e. Error code distribution gives detailed error message which is getting generated in between specific client-Server communication with error code count with failed transaction.		
27.22	Solution shall have DHCP Visibility and shall have dedicated monitor for the same: a. Ability to give latency, requests and failures for DISCOVER, REQUEST, RENEW and Other b. Latency Variation over time with application usage. It will give idea of how latency varies based on usage for DISCOVER, REQUEST, RENEW etc. c. Performance variation over Latency. (Gives idea on numbers of request, FAST, Degraded, Slow and timeouts with transaction count and latency) d. Failure %over time with requests, gives idea on failure trend and which are being failed, for example DISCOVER, REQUEST, RENEW and requests with %Failed e. Error code distribution, gives detailed error message which is getting generated in between specific client-Server communication with error code count with failed transaction		
27.23	Solution shall have Certificate Visibility and shall have dedicated monitor for the same: a. Shall provide Visibility on the certificates which are installed on the specific servers. b. It shall also provide Visibility whether certificate is self-signed, or third party signed certificate. c. Certificate Visibility shall provide server Name along with count of certificate with details of certificate for example if certificate is ok, if there are any warning or in critical stage. d. It shall also provide us expiry days for certificate. e. Solution shall provide functionalities of setting alerts for the certificate expiry days.		
27.24	Solution shall have Unified communication environment Visibility and shall have dedicated monitor for the same: a. Solution shall provide Visibility in unified communication user plane (SIP etc.) protocol as well as data plane (media – RTP, RTCP etc.) protocols		

	b. Solution Shall provide Visibility for latency, requests and failures in Registration and Call Setup c. Solution shall provide performance variation over Latency. To get an idea on performance of number of requests affected with application latency. d. Solution shall provide failures over time with total calls, to get an idea on failure trend on session related protocols. e. Solution shall provide error code distribution for defined period for call registration and Call setup, to get a detailed information on error messages which are getting generated in between specific node and unified communication server. f. Solution shall provide detailed session analysis for user plane protocol to get detailed information (for example – server name, client name, calling party, called party, CODEC, Avg RT (ms), Start Time, Duration with status) for troubleshooting purposes. g. Solution shall provide Visibility on network problem in Unified Communication (i.e. Audio Video packets) like Packet Loss, Jitter, Round Trip Delay and packets Out of Sequence along with stream counters over time to monitor QoS Mismatch. h. Solution shall provide detailed information about source and destination (For example – QoS, Codec, SSRC, Packet loss and Jitter i. Solution shall be able to provide issues in between called party and calling party with the details like Packet loss, Voice Jitter, Voice Pkt Loss and also solution shall provide media Streams details like Average active, Completed and deviation from QoS j. Solution shall provide call search option based on IP address and Extension to search the specific call to troubleshoot the issues in between called party and calling party.		
27.25	On-premise, easy-to-manage, clientless platform that deploys quickly and involves minimal or no dependency on customization and management. The solution shall preferably be proposed as physical appliance. Packet analysis shall be done near to the source itself (at probe) not requiring packet to be sent over the network to a central server/dashboard. Only meta data shall be sent to the centralize dashboard.		
27.26	The solution shall support Network Behavior Anomaly detection using full Packet data including L3 / L4 and L7 headers. System shall have continuous learning of the traffic baseline and detecting any anomaly for the learned baseline with respect to traffic volume, traffic directionality, protocol usage and unseen application or any specific host / endpoint / user behaving differently		
27.27	Perform deep packet inspection, meta data extraction, meta- indexing, anomaly detection and data enrichment into Antimalware / Dynamic Analysis and various threat intelligence.		
27.28	Solution shall be able to proactively build a picture of the attack surface from the network perspective (e.g., networks, front end servers, backend databases, users etc.) that need to be continuously monitored and analysed for security vulnerabilities and unauthorized services and can feed this this information to the SIEM.		

27.29	Solution shall have Risk assessment analysis; it shall have on attack surface analysis to focused on the risk not just the threat and shall look for potential risks in the organization. For example, known insecure application such as Rlogin, telnet, expired or self-signed certificates etc.		
27.30	Able to detect multiple infection vectors (Network, Malware, https, http) as a dedicated purpose-built platform deployed independently without any functional reliance on existing layers of security like NGFW, NGIPS, Proxy etc. adhering to defence in depth architecture, where, If any of the layers of core underlying security get replaced or non-functional, the proposed solution shall be capable to function on its own.		
27.31	Detect zero-day, multi-stage, file-less and other evasive advanced attacks using behaviour analytics and signature-less analysis,. The solution shall be sized appropriately by the bidder including all other costs required for performance, scalability and efficiency.		
27.32	The Internal Network Analysis solution shall also be able to detect malicious post-exploitation activities such as attacker lateral movements between various zone like user workstation & servers. The solution shall detect lateral movement indicating source & destination IP addresses along with underlying protocols and perform Deep Packet Inspection		
27.33	Capable of protection against advanced attacks and malware types that are difficult to detect via signatures like web shell uploads, existing web shells, ransomware etc. the preventive mechanism may be achieved through inbuilt or through integration with SOAR or Firewalls or other preventive devices proposed by bidder		
27.34	Provide visibility to various types of network anomalies and suspicious activity such as Data Exfiltration, Beaconing, etc. and their victim attacker graphical representation at one place		
27.35	Solution shall be able to detect malicious traffic in encrypted communication through Behaviour Analysis and IoC's matching		
27.36	Capable to provide complete packet-by-packet details pertaining to one or more session of interest including Session replay, Packet analysis, Packet decoding, Web & FTP session reconstruction, artefact & raw packet extractions. Or achieved through Session replay and Packet analysis		
27.37	Network traffic inspection to detect suspicious activities such as different malware family used by Threat Actor groups, TTPs used for malicious activities and lateral movements or The solution shall detect and respond to threats based on MITRE ATTACK tactics and techniques and report the appropriate MITRE ATTACK tactic and /or technique in the platform user interface.		

27.38	Provide Automated processes to identify data theft, using highly trained and proven breach response analysis algorithms to diagnose potentially anomalous network behaviour or The solution shall support some of the following/ full compliant data science methods such as: ● Supervised / Unsupervised machine learning / Mathematical Modelling / Statistical Analysis ● Defining Micro segmentation and detecting violation ● Deterministic Behaviour Analytics ● Inbuilt IoC's ● Integration with third party Threat Intelligence Platform on STIX / TAXI		
27.39	Detect Suspicious traffic to an Unknown Country: Meta shall provide all details in terms of Country name, Business context, IP - From and To Information. Analyst shall be able to isolate such traffic swiftly and investigate the payload for any malicious egress or ingress.		
27.40	Solution shall have Deep Packet Inspection (DPI) to provide visibility in all layers of the OSI stack (Layer 2-7) including application payload data. The solution shall provide network traffic insight by a. Classifying protocols and applications b. Reconstructed file such as a Word document, image or packet decode c. Deep-packet inspection d. Cross correlation for Analysis & Aggregation e. Reconstruct sessions and analyze artifacts f. Preview artifacts and file names		
27.41	Network traffic inspection to detect exploitation of vulnerabilities (both known and Zero-days) using signatures, patterns and Behaviour Analytics also Network traffic inspection to detect suspicious activities which are not limited to as DGA, Use of Remote access software tools, Adware, Trojans etc.		
27.42	Solution shall be able to quickly identify reconnaissance, back in time within minutes through a detailed history of both good and nefarious activity and contact trace where the network traffic came from.		
27.43	The solutions shall be able to detect different threats like zero day exploitation, lateral movement, CnC communication, presence of malicious file and advanced malware, data exfiltration monitoring and analysis; organization policy compliance and security assurance, etc. Need supporting reference and architecture		
27.44	The Solution shall detect common events like D-DOS / DOS in East /West and North / South traffic, Scanning, Worms, Unexpected application services. (e.g., tunneled protocols, backdoors, use of forbidden application Protocols), Policy violations, etc. The solution shall profile traffic by TCP and UDP Port.		
27.45	Support SNMP/syslog etc. for integration with all leading SIEM/SOC solutions. The Solution components shall also be providing access over REST API's with detailed OEM documentation. The Solution shall only be accessible via web UI and shall not require any plugins or thick client requirements for Admins and Analysts access.		

27.46	Bidders shall propose different OEM for SIEM and NTA for multi-layer security architecture. However, both shall be integrated for holistic view and investigations		
27.47	Security Certification: The offered Packet Capture Application Platform/Product series shall have obtained Certificate of Common Criteria.		
27.48	The overall software solution shall come from the same provider, including components such as the packet broker and packet capture for smooth traffic processing. For hardware, bidders may propose the provider's own products or third-party options, provided they have been tested or qualified by the solution provider.		
27.49	Solution shall provide two different dashboards (Security overview and network performance troubleshooting)		
28	**DNS Security**		
28.1	**General Requirement**		
28.1.1	DNS System shall be a Virtual Appliance based solution providing with defined features & capacity from single vendor.		
28.1.2	DNS System shall provide integrated support for high availability configurations without the requirement for licensing of additional third - software components.		
28.1.3	DNS System shall support System logs forwarding/redirection of logs to a defined syslog host.		
28.1.4	DNS system shall support monitoring using SNMPv3		
28.1.5	DNS system shall support NTP time synchronization (client-mode) to multiple servers.		
28.1.6	DNS system shall integrate with multiple pass-through authentication options including RADIUS, LDAP, Active Directory		
28.1.7	DNS Solution shall support GUI & CLI based configuration.		
	DNS Specific Requirements		
28.2	**Internal DNS & DHCP Server**		
28.2.1	The Solution shall support 6,000 DNS QPS as DNS Server.		
28.2.2	System shall act as DHCP server and Internal Cache, Recursive and Authoritative DNS Server		
28.2.3	DNS System proposed shall be deployed 2 Qty as dedicated Internal Authoritative, Cache & Recursive DNS Server. Same Server shall also act as DHCP server.		
28.2.4	System shall be able to support the following common resource record types namely A, AAAA, DNAME, CNAME, MX, HINFO, PTR, SOA, NX		
28.2.5	System shall be deployed on-premise & shall not be a Cloud based solution.		
28.2.6	System shall regularly monitor its cache contents and automatically purge / remove records that are old		
28.2.7	System shall have a built-in RPZ functionality and does not require additional licences to enable such feature		
28.2.8	System RPZ shall support action as Block, walled redirection, no response		
28.2.9	System shall support Access Control based on Source IP for Allow Query, Allow Query Cache.		

28.2.10	System shall Support DNSSEC		
28.2.11	System shall support Anycast for DNS with BGP, IS-IS and OSPF		
28.2.12	System shall support audit log.		
28.2.13	System shall support granular rights administration limiting the function and rights to user and record level		
28.2.14	System shall support sending logs to external Syslog server		
28.2.15	The solution shall be both IPv4 and IPv6 compatible.		
28.3	**IPAM & Central Management**		
28.3.1	The IPAM Solution shall support 20000 IP Address Management for both IPv4 & IPv6 together of 2 Qty to be deployed in HA with Auto Failover.		
28.3.2	The solution shall NOT use software agents or thick clients		
28.3.3	The solution shall provide appropriate automated failover without any manual intervention.		
28.3.4	The solution shall be flexible to allow the creation of custom fields for objects in IPAM. This shall be configurable via the Web GUI.		
28.3.5	The solution shall include an application programming interface (API) in order to interface with network and/or asset management systems, a configuration management database (CMDB) solution or other applications.		
28.3.6	The IPAM solution shall be able to create its own widget to display customized subnet reports, free IP, used IP.		
28.3.7	The IPAM solution shall have the ability to locate the available subnets inside a Supernet. This is to provide assistance to users when creating subnets inside an aggregated Network.		
28.3.8	DDI IPAM user interface shall be web-based without specific browser vendor requirements		
28.3.9	DDI IPAM system shall support VLSM (Variable Length Subnet Masks)		
28.3.10	DDI IPAM system shall be able to export reports in PDF, CSV format		
28.3.11	DDI IPAM system shall have support for workflow process for various administrator roles and shall include a change approval oversight capability.		
28.3.12	DDI audit records shall contain a timestamp, username and record modified.		
28.3.13	DDI Reporting engine shall include audit reports.		
28.3.14	DDI system shall support granular rights administration limiting the function and rights to user and Subnet level		
28.3.15	The tool shall have the capability to find free address space across a range		
29	**DAM (Database Activity Monitoring)**		
29.1	The DAM solution is required to support the monitoring of 208 database servers across two locations: 104 servers in the Data Center (DC) and 104 servers in the Disaster Recovery (DR) site		
29.2	The DAM solution shall encompass the complete lifecycle of database security, including automated discovery of relevant servers, ongoing monitoring of their activity, and the implementation of protective measures.		

29.3	The DAM solution shall integrate with SIEM systems, Zammad ticketing, and PAM solutions for correlated event generation, change management, and privileged access control enforcement.		
29.4	For reliable and detailed monitoring, the DAM solution is required to employ agents installed on the database servers as the primary method of data acquisition, rather than depending on the inherent logging capabilities of the databases themselves.		
29.5	The DAM solution shall ensure that security policy evaluation for malicious activity detection operates independently of specific audit policy configurations. The system shall be capable of identifying and alerting on potential threats based on traffic content and behaviour, regardless of whether explicit auditing rules are defined for the involved users or actions. This ensures comprehensive threat detection without requiring prior definition of all potentially malicious user activities within audit policies.		
29.6	Each Gateway/Collector of the DAM solution shall consistently support a high throughput of at least 20,000 Transactions Per Second (TPS) for *all* database queries, including those involving sensitive objects and privileged users, without any performance degradation or differentiation based on the nature or privilege level of the SQL activity.		
29.7	**Data Discovery and Classification:**		
29.8	The Database Activity Monitoring (DAM) solution shall include an automated service discovery capability that can identify all active database servers within the organization's defined network ranges or segments without requiring manual input.		
29.9	Upon discovery, the DAM solution shall automatically populate and maintain a comprehensive inventory of the identified database servers. This inventory shall include essential details such as server names, IP addresses, port numbers, etc. The solution shall provide a mechanism to review and manage this inventory through a centralized console.		
29.10	The service discovery feature shall offer the option for scheduled and continuous scanning to ensure that new or modified database servers are automatically detected and added to the inventory in a timely manner.		
29.11	The DAM solution shall provide comprehensive data classification capabilities for automatic and manual identification and categorization of sensitive data across monitored databases, with flexible and customizable rules and management.		
29.12	The DAM solution shall allow creation and management of reusable Scan Profiles to precisely define and identify sensitive data types, including GDPR-relevant PII, using predefined and custom categories based on patterns, keywords, or algorithms.		
29.13	The DAM solution's Scan Profiles shall allow for precise definition of the scan scope. This includes the ability to explicitly include and exclude specific databases, schemas, tables, and individual columns.		
29.14	The solution shall provide a user-friendly interface for managing these inclusion and exclusion rules within the Scan Profiles.		

29.15	The DAM solution shall provide options within the Scan Profiles to configure data sampling methods, including the ability to enable random sampling.		
29.16	The DAM solution shall offer configurable throttle settings within the Scan Profiles to manage the performance impact of data classification scans on the monitored database systems. These settings shall include the ability to define delays between queries and to limit the number of concurrent database connections utilized by the scan process.		
29.17	The DAM solution shall provide options within the Scan Profiles to enhance data classification accuracy through linguistic analysis. This includes the ability to consider defined synonyms and to leverage database views during the scanning process.		
29.18	The DAM solution shall allow the option within Scan Profiles to securely save representative data samples identified by classification scans. This feature shall enable authorized users to review these samples for validating classification accuracy, refining rules, and minimizing false positives/negatives.		
29.19	The DAM solution shall provide the capability to create custom data profiles for data classification. This functionality shall allow administrators to define specific patterns and regular expressions (regex) to identify sensitive data formats unique to the organization or relevant to specific regulations.		
29.20	**Vulnerabilities and User Rights Assessment:**		
29.21	The DAM solution shall provide automated and customizable vulnerability assessment capabilities for identified database assets.		
29.22	The DAM solution shall provide a centralized interface for creating, viewing, editing, and managing assessment policies directly correlated to regulatory benchmarks, including CIS, DISA STIGs, FISMA, HIPAA, and PCI DSS.		
29.23	The DAM solution shall offer flexible vulnerability assessment capabilities through both policy-based and tag-based scanning methodologies.		
29.24	Policy-based scans shall allow administrators to define and apply predefined or custom security policies to assess database configurations and identify vulnerabilities based on established benchmarks and rules.		
29.25	Tag-based scans shall enable the association of user-defined tags with database assets, allowing for targeted vulnerability assessments based on specific criteria, business units, or risk profiles defined by these tags.		
29.26	Vulnerability assessment reports shall include a "Recommended Fix" section with specific, actionable remediation guidance, steps, scripts/commands, and links to vendor advisories.		
29.27	The DAM solution shall provide a risk scoring mechanism for each identified vulnerability, leveraging industry standards such as CVSS (Common Vulnerability Scoring System) to prioritize remediation efforts based on the severity and potential impact of the vulnerability.		

29.28	The DAM solution shall provide the capability to define and execute Custom Assessment Tests. This feature shall allow administrators to create custom scripts or queries (e.g., SQL, OS commands) to perform specific security checks beyond the standard vulnerability assessments.		
29.29	The DAM solution shall provide comprehensive visibility into and monitoring of user rights and privileges across monitored database environments.		
29.30	The DAM solution shall provide a centralized view displaying a summary of user entitlements across monitored databases, showing the count of users with specific object-level privileges. This view shall enable a quick assessment of user access rights.		
29.31	The solution shall offer detailed information on user privileges, breaking down permissions by object type (e.g., Tables, Views, Procedures) and the specific actions allowed (e.g., SELECT, INSERT, UPDATE, EXECUTE) for each user.		
29.32	The DAM solution shall be capable of calculating and displaying the effective permissions for each user, taking into account both direct grants and privileges inherited through roles. This shall provide a clear understanding of a user's actual access rights within the database.		
29.33	The solution shall include features for analyzing role-based access control, including visualizing role memberships and providing insights into the privileges associated with each role.		
29.34	The DAM solution shall allow for viewing all privileges associated with a specific user, providing a comprehensive understanding of their access rights across different database objects within the monitored environment.		
29.35	**Monitoring and Auditing:**		
29.36	The DAM solution shall support the creation and enforcement of audit policies aligned with specific compliance requirements (e.g., GDPR, HIPAA, PCI DSS)		
29.37	The solution shall provide a library of out-of-the-box audit policies for common security and compliance use cases.		
29.38	DAM solution shall be capable of capturing and analyzing all database activity originating from both application users and privileged users, providing a detailed audit trail encompassing the "Who, What, When, Where, and How" of each transaction.		
29.39	Audit policies shall allow for defining granular match criteria based on database users, applications, source IPs, database objects (tables, views, procedures, etc.), client hostnames, operating system users, authentication types, and specific SQL commands or keywords.		
29.40	The DAM solution shall be capable of monitoring and auditing DDL (Data Definition Language), DML (Data Manipulation Language), and DCL (Data Control Language) statements.		
29.41	The DAM solution shall track and audit successful and failed database login and logout attempts, as well as session terminations.		

29.42	Audit policies shall allow for defining actions to be taken upon a policy match, including logging the event.		
29.43	Audit policies shall support the monitoring of privileged user activities and their specific commands.		
29.44	The DAM solution shall be capable of monitoring and auditing database activity based on specific SQL Commands or Keywords, Database Names and Schemas, and Tables being accessed or modified.		
29.45	The DAM solution shall be capable of monitoring and auditing database activity based on specific Columns being accessed or modified, as well as Privileged Operations being performed.		
29.46	The DAM solution shall be capable of monitoring and auditing database activity based on Query Response Size and Query Response Time exceeding defined thresholds.		
29.47	The DAM solution shall be capable of monitoring and auditing database activity related to when Sensitive Data is Accessed and based on keywords or patterns found within a Sensitive Dictionary Search.		
29.48	The DAM solution shall be capable of monitoring and auditing the execution of specific Stored Procedures, allowing for the definition of policies that trigger on the invocation of designated procedures.		
29.49	The DAM solution shall allow for the creation of audit policies that can differentiate between successful and failed executions of Stored Procedures, enabling focused monitoring on errors or unexpected outcomes.		
29.50	The DAM solution dashboard shall provide a real-time or visual summary of key audit data, including traffic overview, session breakdowns by various criteria (e.g., day, hour), top SQL commands, and security-related events.		
29.51	The DAM solution shall provide a detailed and searchable view of raw audit logs, displaying comprehensive information for each database event, including timestamp, user, application, source, database, object, action, and the full SQL statement executed.		
29.52	The DAM solution shall provide an analysis view identifying and ranking the most frequently executed SQL commands, along with details such as execution counts and associated users or applications.		
29.53	The DAM solution shall provide a dedicated analysis view for failed login attempts, detailing the number of failures, associated users, source IPs, and the reasons for the failures.		
29.54	The DAM solution shall provide an analysis view tracking and displaying changes to database object permissions (e.g., grants, revokes), including the object affected, the user or role involved, the type of permission change, and the timestamp.		
29.55	The DAM solution shall provide an overview of privileged operations performed, including the types of privileged commands executed, the users or roles performing them, and their frequency.		
29.56	**Security and Threat Detection:**		

29.57	The DAM solution shall provide a robust and comprehensive Security Policy framework to proactively detect, alert on, and potentially prevent a wide range of database threats and vulnerabilities, ensuring the integrity and security of sensitive data.		
29.58	The DAM solution shall provide various types of security policies, including stream signatures, protocol validation, and database service correlated policies.		
29.59	The solution shall include out-of-the-box security policies recommended for general and database applications.		
29.60	The DAM solution shall possess out-of-the-box capabilities for deep SQL payload inspection. This involves the real-time analysis of the content and structure of SQL queries being sent to the database to identify potentially malicious patterns and syntax indicative of SQL injection attempts.		
29.61	The solution shall leverage a regularly updated signature database and heuristic analysis techniques to accurately detect various forms of SQL injection, including but not limited to classic SQL injection, blind SQL injection, and time-based SQL injection, without requiring extensive manual configuration.		
29.62	The solution shall include policies to detect other database-specific attacks, such as protocol violations and anomalous behavior.		
29.63	The DAM solution shall automatically receive and apply regular updates to its attack signatures.		
29.64	The solution shall allow for the creation of custom security policies based on various match criteria (e.g., user, application, SQL command).		
29.65	The DAM solution shall provide out-of-the-box security policies specifically designed to detect and alert on brute-force attacks against database credentials by analyzing login patterns and failure rates.		
29.66	Security policies shall allow for the establishment of dynamic baselines of normal database activity and the configuration of thresholds to detect anomalous behaviour that may indicate a security compromise or insider threat.		
29.67	he DAM solution shall generate alerts in real-time or near real-time upon the detection of security policy violations or suspicious database activity.		
29.68	The DAM solution shall be capable of correlating multiple related events into a single, more informative alert, reducing alert fatigue and providing a clearer picture of an attack or issue.		
29.69	Each alert shall provide comprehensive details about the event, including the time of occurrence, the affected database server, the user and application involved, the specific policy that was violated, a description of the alert, and potentially the SQL statement or activity that triggered it		
29.70	Beyond out-of-the-box policies, the solution shall allow for the creation and customization of alert rules with specific thresholds (e.g., number of failed logins within a timeframe) to trigger alerts based on organization-specific risk indicators.		

29.71	The DAM solution shall support the configuration of "Followed Action", which define the automated responses to triggered alerts. These shall include the ability to forward alert notifications to various destinations, including but not limited to:		
29.72	Email		
29.73	Executing OS Commands or Shell Scripts		
29.74	Forwarding to SIEM systems via Syslog (in various formats like CEF, LEEF, JSON)		
29.75	Sending SNMP Traps		
29.76	Creating or Assigning Tasks within the DAM system		
29.77	Remedy Incident Management integration (Create/Assign Incident)		
29.78	**Agents:**		
29.79	The DAM agent shall support both inline deployment (sitting in the network path of database traffic) and out-of-band deployment (passively monitoring network traffic).		
29.80	The agent shall provide blocking capabilities in both inline mode (actively preventing malicious traffic) and out-of-band mode (e.g., terminating sessions or triggering firewall rules based on detected threats).		
29.81	The agent shall include features for capping CPU and memory usage to minimize performance impact on the monitored database servers.		
29.82	Agents shall be centrally managed through the Imperva DAM console for configuration, updates, and monitoring. They shall capture all relevant database activity logs without relying on sampling to ensure complete visibility.		
29.83	The agent shall provide real-time performance metrics and graphs within the Imperva DAM console, displaying key indicators such as SQL Hits, TCP Connections, Throughput, and agent resource utilization.		
29.84	**Risk Analytics**		
29.85	The solution shall include a dedicated risk analytics component for the automated detection of suspicious data-related activities.		
29.86	This Risk Anaytics shall use machine learning and peer analysis to automatically detect unusual data access events, helping identify compromised, careless, and malicious users.		
29.87	It shall establish a comprehensive baseline of typical data access behavior, considering various contextual factors beyond just users and data objects.		
29.88	By analyzing activity over time and comparing users to their peers, it shall reduce false positives and negatives, providing prioritized alerts for potential risks		
29.89	The risk analytics solution shall analyze key contextual elements to enhance risk assessment, including:		
29.90	Account Classification: Automatically identify database account types (e.g., service, user) to differentiate risk.		

29.91	Data Sensitivity Indicators: Identify potential data sensitivity by analyzing access to tables with names/schemas suggesting sensitive information and detecting anomalous access patterns to those tables.		
29.92	Behavioral Baselines: Establish and monitor typical data access (e.g., user/application work hours, data volume, access frequency) to detect deviations.		
29.93	The risk analytics component shall be able to determine a user's risk score based on a comparison of their suspicious actions against organizational averages and through peer group analysis.		
29.94	The risk analytics solution shall provide automated detection of a range of abnormal and potentially malicious data access behaviors, including but not limited to:		
29.95	Abuse of Database Service Accounts		
29.96	Excessive Access to Database Records		
29.97	Indicators of Potential Machine Takeover		
29.98	Suspicious Scans of Sensitive System Tables		
29.99	Uncharacteristic Access to Application Data		
29.100	Potentially Malicious Database Command Execution		
29.101	Discovery of Sensitive Data Elements		
29.102	Changes to Critical Database Objects		
29.103	Suspicious Data Masking or Unmasking Events		
29.104	Changes to Database User Permissions		
29.105	Attempts to Bypass Security Controls		
29.106	Activity Indicating Potential SQL Injection		
29.107	Suspicious Data Export or Import Operations		
29.108	Anomalous Activity Related to Data Backup or Restore Operations		
29.109	Detection of Audit Log Manipulation		
29.110	Identification of Potential Malware Introduction		
29.111	The risk analytics solution shall possess the ability to identify and detect the following baseline characteristics to enhance anomaly detection: Standard Access Sources: The system shall establish and monitor the typical endpoint information (e.g., hostnames, IP addresses) from which users and applications regularly access databases. Usual Data Interaction Methods: The solution shall learn and track typical database access patterns, including the specific tables, data objects, and types of queries or operations commonly performed by users and applications.		

29.112	The risk analytics solution shall enrich its analysis by incorporating user information from Active Directory, presenting this context through the following widgets: a) Employee Details: Displaying relevant user attributes such as email address, phone numbers, and office location. b) Incidents: Presenting a graphical visualization of the employee's historical security incidents, categorized by severity level. c) Anomalies: Showing a graphical representation of the employee's detected anomalous activities, scaled from Low to High risk. d) Endpoints Activity: Detailing the number of distinct endpoints utilized by the employee to access monitored resources. e) Databases Activity: Illustrating the number of unique databases accessed by the employee.		
29.113	The solution shall detect suspicious data reconnaissance activities, including scans aimed at identifying sensitive and valuable information.		
29.114	For effective incident investigation, the risk analytics solution shall provide comprehensive details for each identified anomaly, including: a) Description: A clear and concise explanation of the suspicious activity. b) Severity Influencing Reasons: The factors and analysis that contributed to the assigned risk level. c) Client and Server Details: Relevant information about the originating client (e.g., hostname, IP address) and the target server (e.g., database instance). d) Incident Details: Specific technical information and logs related to the anomalous event. e) Typical Behavior: A baseline view of the involved user or entity's regular activity patterns for comparison.		
29.115	The risk analytics solution shall automatically assign a granular Risk Score (on a scale of 1-100, or a similar detailed range) to each detected anomaly or incident. This score shall be dynamically calculated based on a combination of factors, including the severity of the triggering behavior, the sensitivity and value of the affected data, the context of the user and their peer group activity, the deviation from established baselines, and any indicators of active threat tactics. This detailed scoring mechanism will enable precise prioritization and classification of security events for efficient response.		
29.116	The risk analytics solution shall provide a dedicated and intuitive dashboard, distinct from any DAM interface, offering a clear, informative, and drill-down capable overview through the following key widgets:		
29.117	Issues: A summary panel displaying the total number of security issues, visually categorized by severity (e.g., Critical, High, Medium, Low).		
29.118	Security Events Over Time: Line graphs visualizing the trends of security incidents and anomalies detected over a selected time period.		
29.119	Protected Assets: A summary indicating the number of protected data assets (e.g., Databases).		
29.120	System Health Status: An overview of the operational status of various components of the analytics solution.		
29.121	Entities With Most Severe Issues: A section listing and potentially ranking users, sources, and destinations associated with the highest number or severity of security issues.		

29.122	Events Analyzed: A graph showing the volume of events analyzed over time.		
29.123	The risk analytics solution shall provide a granular rule-based system for defining and managing exceptions to its anomaly detection engine, allowing security teams to whitelist specific data access behaviors and patterns deemed legitimate or authorized. This system shall enable the creation of allow list rules based on a combination of contextual attributes, including:		
29.124	Rule Name and Description: The ability to define a unique name and provide a detailed description for each allow list rule for clarity and auditability.		
29.125	Rule Status: Options to enable or disable individual allow list rules, providing control over their active application.		
29.126	Object Conditions: The capability to specify conditions based on the affected database objects, such as specific database names, schemas, or table names, allowing for targeted whitelisting at the data level.		
29.127	Subject Conditions: The ability to define conditions based on the user or application performing the action, including specific usernames, application names, or other relevant identifiers.		
29.128	Database Operation Conditions: The option to specify the types of database operations to be whitelisted, such as SELECT, INSERT, UPDATE, DELETE, or specific stored procedures.		
29.129	Time Constraints: The ability to define specific time windows or schedules during which the allow list rule is active, allowing for temporary or recurring exceptions.		
29.130	Network Conditions: The capability to specify the source IP addresses or hostname patterns from which the whitelisted behaviour originates.		
29.131	Advanced Conditions: Support for more complex rule definitions, potentially including combinations of the above attributes and other specific event characteristics.		
29.132	Rule History and Audit: A log of all created, modified, and deleted allow list rules, including timestamps and the users responsible for the changes, ensuring proper governance and accountability.		
29.133	Testing and Validation: Functionality to test the effectiveness of newly created allow list rules against historical or live data to ensure they function as intended without inadvertently suppressing legitimate alerts.		
29.134	The risk analytics solution shall provide a tiered approach to identifying and managing suspicious data-related activities, categorized as follows:		
29.135	Anomalies: These are statistically significant deviations from established baselines of user and application behavior regarding data access. Anomalies encompass unusual activities across dimensions like accessed objects, access times, data volume, and query types, acting as initial indicators of potential risk.		

29.136	Incidents: These are formed by correlating and analyzing individual anomalies, often enriched with threat intelligence and contextual information, to pinpoint confirmed or highly suspected security violations or policy breaches. Incidents are actionable security events that generate alerts and demand investigation.		
30	**Laptop**		
30.1	Latest 13th generation Intel Core i7 processor with Minimum 10 cores, 12 MB cache, supported processor turbo frequency 5.40 GHz or higher / AMD Ryzen 7 5000 processor / Equivalent.		
30.2	Minimum 16 GB (2x8 GB) DDR5 5200 MHz or Higher.		
30.3	Chipset compatible with the processor and Integrated TPM 2.0 or higher security module. Equipped with Hardware Diagnostics software in the BIOS.		
30.4	1 TB M.2 PCIe NVMe SSD drive or higher.		
30.5	14.0" FHD+ (1920x1200) Non-Touch, Anti-Glare, 250 nits or higher.		
30.6	Minimum 2x2 AX Wi-Fi 6 with Bluetooth. Hardware shall be compatible with Windows 11 & Linux (Ubuntu / Red Hat / SUSE). Certifications shall be available in the public domain against the quoted Model name.		
30.7	Power on Password, Hard disk password, Supervisor password, Laptop Physical Security Cable Lock Slot.		
30.8	FHD Webcam with Noise Cancelling Microphone.		
30.9	Strong metal / rugged hinges with casing for longer durability and stability. Good quality metal chassis with fingerprint reader.		
30.10	Minimum 1 x HDMI (2.0)/ 1 x Display Port, 2 x USB 3.2 Gen2, 1 x USB Type-C, 1 x RJ45 port, 1 x SD card reader slot, 1 x Universal audio port.		
30.11	Minimum 4 hours backup during normal usage. Minimum 65W or higher adaptor.		
30.12	Built-in microphone and Stereo Sound. Product shall be lightweight, not more than 1.6 kgs.		
30.13	Spill resistant backlit keyboard with touchpad. Comes with backpack.		
30.14	Pre-loaded / Pre-installed Windows 11 Professional Operating System/Linux. Pre-installed with Microsoft Office 2021 or newer with perpetual license/Libre office suite etc.		
31	**Console Table**		
31.1.	The console table setup shall be ergonomically designed to accommodate 24x7 working environment, ensuring comfort and efficiency during extended periods of use.		

31.2.	Each operator position shall be equipped with dual monitor mounts, capable of supporting monitors up to 32 inches in size. Monitors shall be easily adjustable for optimal viewing angles and distances.		
31.3.	The console table shall include integrated, secure compartments for CPU storage, ensuring that each unit is under lock and key. This is to protect sensitive information and prevent unauthorized access to the system hardware.		
31.4.	The console shall provide adequate space for keyboard and mouse for each operator, including cable management solutions to maintain a clean and organized workspace.		
31.5.	The console table and its components shall comply with international ergonomic and safety standards to ensure operator health and safety.		
31.6.	The console table shall be designed with ergonomic considerations to prevent operator fatigue and strain.		
31.7.	The console table height/ergonomics shall be discussed during SDR meeting or Demo console to be approved before construction of consoles.		
31.8.	Secure compartments for CPU storage shall be easily accessible to authorized personnel for maintenance and upgrades, while ensuring that the units remain locked and secure during operation.		
31.9.	The console table shall be constructed of durable materials capable of withstanding the wear and tear of 24x7 operational environments. Surfaces shall be easy to clean and resistant to common spills.		
31.10.	The provided at each console position shall be ergonomically designed, with adjustableheight, back support, and armrests to accommodate various body types and prevent musculoskeletal disorders.		
31.11.	All edges and corners of the console table shall be rounded or cushioned to preventinjury from accidental bumps or contact.		
31.12.	The console table shall support a minimum weight capacity of 150 kg to accommodate the dual monitor setups, CPUs, and additional equipment without risk of structural failure.		
31.13.	The console table design shall account for efficient **heat** dissipation for the enclosed CPU ensuring that ventilation is adequate to prevent overheating during operation.		
31.14.	The manufacturer or supplier shall provide certification of compliance with these standards as part of the proposal documentation.		
32	**Dual monitor 65" OLED**		
32.1	Display Technology**:** 65-inch IPS 4K resolution smart displays, capable of displaying detailed and clear visuals for at-a-glance status monitoring of the SIEM system.		

32.2	Smart Functionality**:** Smart displays shall have built-in network connectivity to directly access the SIEM dashboard without needing an external computer system.		
32.3	Mounting and Installation**:** Smart TVs shall support Ceiling /Floor installation, adaptable to site-specificrequirements in the control center.		
32.4	Interface and Accessibility: The smart displays shallfeature an intuitive interface for easy navigation and control, allowing operators to switch between differentdata feeds.		
32.5	Security and Compliance: Ensure that the smartdisplays comply with cybersecurity standards or have WIFI removed/Off.		
32.6	Monitor shall support HDMI/DP port etc.		
32.7	Shall have IR remote control and accessories		
32.8	Shall have control buttons with scroll button/power etc.		
33	**Network Equipment Rack**		
33.1	42U smart cooling rack with dual power distribution at DC and DR sites.		
33.2	Smaller (Wall or floor mount) network rack equipped with UPS and cooling for DO sites		
34	**Online UPS**		
34.1	Modular, 3 Phase IN /1 Phase out.		
34.2	**40 KVA UPS (N+1**) (03 or more identical hot swappable power Modules in load sharing mode.) **Note: Capacity of UPS may Suitably choose higher to meet system load if required**.		
34.3	**Modular N+1 Configuration**. The UPS consist of suitable number of identical **Hot Swappable Power modules** of double conversion configuration connected in load sharing mode. In the event of failure of anyone module, the UPS shall be capable of taking full load of 40 KVA from remaining serviceable modules without any interruption.		
34.4	True online double conversion UPS with DSP based microprocessor controlled digital technology as relevant Indian standards with advanced IGBT technology and digital microprocessor control in all aspects.		
34.6	Each UPS shall be provided with its own battery bank along with trolley/rack/Stand. Shall have provision of separate supply for Input mains and bypass.		

34.7	**Rectifier section**		
34.7.1	IGBT		
34.7.2	400 VAC (Three Phase,: 3W+N+E) with automatic 3 phase Sequence corrector.		
34.7.3	+15% and - 20%		
34.7.4	50 Hz +/- 10%		
34.7.5	Greater than 0.95 for 100% Load.		
34.7.6	3% typical at 100% Load and 5% typical at 50% Load		
34.7.7	External spike/surge suppressor of appropriate capacity as per UPS rating is required at input (Type-I+II) and output (Type-II) of UPS. The surge suppressor shall be complied with relevant Indian certification standards.		
34.7.8	IP20 or better.		
34.8	**Inverter section**		
34.8.1	IGBT Technology		
34.8.2	220/230/240 VAC Single Phase (L+N+E)		
34.8.3	Output Voltage shall not deviate by +/- 1 % RMS with following condition: a) 0 to 100 % Loading. b) DC Input variation from maximum to minimum. c) Environmental condition variation within the specifications defined.		
34.8.4	50 Hz ± 0.1 Hz		
34.8.5	2% maximum at 100% Linear Load and 5% maximum at 100% Non-linear Load.		
34.8.6	90 % or better at 100% rated load.		
34.8.7	0.9 or better at full rated load capacity		
34.8.8	100 - 110%: 10 Minute or better (with audible alarm before transfer to bypass)		
34.8.9	To be provided as standard at the input of each UPS of suitable rating and shall be of same make/authorized by UPS OEM. (Offered make/model with OEM authorization to be furnished by supplier)		
34.9	**Battery**		
34.9.1	Valve regulated lead acid (VRLA) SMF Battery		
34.9.2	Full technical data sheet to be attached.		
34.9.3	12V		
34.9.4	a) Each UPS shall have individual battery bank & the battery system shall have Capacity to withstand **full load for minimum 30 minutes**.		

	b) The batteries will be installed on a Standard size Battery stand/rack/trolley, covered on top and stand/rack/trolley shall give proper space to batteries for maintenance. c) The calculation Sheet for battery capacity & quantity shall be provided. d) Make, model, No of batteries per Bank, Nominal DC Voltage required by UPS, Total VAH quoted, Charging Voltage and current of batteries shall also be furnished		
34.9.5	At least 1.25 times of full load capacity AH		
34.9.6	To be provided by vendor a) The Batteries rack base shall 2 feet above the ground. b) Battery rack shall accommodate all batteries with enough spacing to facilitate the reading of individual battery. c) Removable fire retardant, non-metallic top cover (Non- perforated) shall be available over battery rack at appropriate height.		
34.9.7	DC disconnect breaker shall be provided by isolating the battery unit from UPS for maintenance purpose.		
34.9.8	The Integral bypass control shall perform an automatic transfer of critical load from inverter to bypass, in the events of overload, over temperature or inverter failure conditions without any load break. To be provided		
34.10	**General**		
34.10.1	>= 90 % at full load Excluding Isolation transformer		
34.10.2	<= 65 dBA		
34.10.3	Pure Sinewave		
34.10.4	LCD/LED display		
34.10.5	Input AC voltage		
	Input AC frequency		
	Output AC voltage		
	Output AC frequency		
	Load on particular UPS		
	Battery bus voltage		
	UPS Status: Normal or Bypass.		
34.10.6	Display a log of status & alarm events to be provided on the front panel display / on the PC.		
34.10.7	UPS shall be housed in rugged enclosure made of M.S sheet 1.2mm (minimum thickness), aesthetically finished, duly pre- treated and powder coated		
34.10.8	SNMP/ suitable protocol shall be provided for control &		

	monitoring of UPS. All UPS metering and alarm with time stamp shall be available through Ethernet port. SNMP card to monitor & store all the data related to UPS. Built in overload. Built in short circuit. Over temperature Mains fail. Low battery. Over load. UPS on bypass. UPS on battery.		
34.10.9	SNMP/ Web management with software for remote monitoring. There shall be a provision of monitoring of status of UPS (Aural and Visual) at a central point. The site monitoring signal processing module shall be built into system logic. Interface via communication ports in an open protocol environment shall be built into UPS or included with the UPS unit To be carried out by supplier.		
34.10.10	**Warranty of 5 years for UPS & Warranty of 5 years Batteries** along with associated system from the date of installation & commissioning, whereas additional warranty period as specified by OEM shall be benefited to AAI.		
	Post warranty Period/CAMC: The UPS along with supplied accessories is to be maintained by the OEM/his authorized vendor through comprehensive AMC (CAMC) for a period of 03 (Three) more years Included replacement of Batteries. Any fault/breakdown in UPS shall be attended within 24 hours of occurrence during warranty and AMC period. CAMC shall also include carrying out the periodic checking and cleaning of the UPS and Batteries on quarterly basis. Advise AAI well in advance about battery replacement in the event of deterioration in performance.		
34.10.11	Shall be provided. Service call shall be attended within 24 hrs. Spares, if required for repair shall be arranged within 24 hours		
34.10.12	Battery Modules are required to replace by bidder after OEM suggested life of battery are complete or **each two year** as per AAI power policy or as and when it is necessary due to malfunction or any other reason to meet system backup whichever comes earlier. The replacement of battery is required during warranty and AMC period.		
34.11.1.	**Power Distribution**		
34.11.2	The bidder shall be responsible for the power distribution from UPS sets to individual subsystems.		

34.11.3	Bidder Shall provide a detailed single line diagram of power distribution for all the four sets of UPS.		
35	**LAN**		
35.1	Industry-standard 1000 Mbps fast Ethernet technology shall be used to interconnect all subsystems via the main LAN and Standby LAN. LAN cables and Switches providing higher speed, bandwidth and performance shall be acceptable to AAI.		
35.2	The system shall use an IP Addressing Schema that is in line with the AAI's plan of unique and coherent IP address implementation on Pan India basis. The same shall be communicated during System Design Review meeting.		
36	**Timing and Synchronization Requirements**		
36.1	*Overview*		
36.1.1	The system shall include a Time Reference System (TRS) which will establish a common time source for all subsystems of DC and DR.		
36.1.2	Dual Global Positioning System (GPS) receivers with NTP servers shall be provided with surge protected antenna and cables. Each GPS receiver and NTP server shall be driven from its own independent antenna.		
36.1.3	DO system shall take time reference form DC, DR.		
36.1.4	GPS antenna shall be supplied using SPD (Surge protection Device)		
36.2	General Timing Requirements		
36.2.1	The TRS solution shall be based on COTS products, and the bidder shall support the GPS receivers with week rollover events.		
36.2.2	All timing system elements shall be designed for continuous operation 24 hours, 365 days a year.		
36.2.3	All time signals shall be IST (Indian standard time).		

36.2.4	The time display format shall be selectable, either 24hour or 12hour with am/pm indication		
36.2.5	The TRS shall be capable of autonomous operation, i.e., operating without external time reference.		
36.2.6.	Accuracy		
36.2.6.1	When synchronized to GPS time, the TRS shall maintain accuracy within 50 ms of UTC. The bidder shall substantiate this claim through relevant documents from the OEM of TRS.		
36.2.6.2	When operating autonomously, the TRS internal clock shall not drift by more than 0.5 second per month.		
36.2.6.3	The TRS shall have the capability to synchronize all subsystems to a common time source with a maximum deviation of 100 milliseconds.		
36.2.7	TRS Failure Alerting		
36.2.7.1	The TRS shall contain self-test capabilities to support failure detection.		
36.2.7.2	The TRS shall provide alarm indications on front panel and also report the alarms to technical M&C positions of DC, DR.		
36.2.7.3	Appropriate colour coded alert indications at technical M&C position of both DC, DR shall be provided for each type of failure, including but not limited to: a. Loss of external synchronization; b. Loss of internal synchronization; c. Failure of the receiving unit; d. Failure of the power supply; e. Failure of the internal oscillator; f. Output failures.		
37	**Manpower Requirement:**		
37.1	Bidder shall deploy manpower for Application Support GIS Expert and Manpower for Infra support.		

37.2	Bidder shall ensure that all manpower are Qualified Engineering graduate (B.E / B. Tech/ MCA/ MSc in Computer Science) in the area of Information Technology/ Computer/ Electronics communication/ AI-ML.		
37.3	Bidder shall provide Trained Manpower in the following area: • Cybersecurity • Networking (CCNA or similar certification) • GIS experts • Database • Microsoft/Linux • Other troubleshooting requirements		
37.4	Bidder shall provide necessary system training and competency certificate to the deputed engineers.		
37.5	Bidder shall produce the competency certificate of each deputed manpower at the time of manpower billings.		
37.6	Bidder shall ensure that each Manpower shall equipped with company provided Laptop and necessary application tools for the system up and running.		
37.7	Bidder shall ensure that each Manpower shall equipped with company provided Mobile phone and shall be reachable for any support.		
37.8	Bidder shall ensure that Manpower shall equipped with necessary tools for infra structure support. Critical tools shall be kept within office premises to reduce turnaround time.		
37.9	Bidder shall provide manpower from completion date of SAT and shall continue assign during warranty period and thereafter AMC period.		
38	**Implementation of New Surfaces as per ICAO and amended GSR (affected date 21 November 2030)**		
38.1	Bidder shall perform necessary changes/upgrade in the software for Implementation of New Surfaces as per ICAO and amended GSR.		
38.2	Effective date is 21 November 2030; Therefore, bidder shall perform successful delivery of changes as per amended GSR one month before effective date.		
38.3	Bidder shall provide necessary training for suitable number of days onsite PAN-India basis and shall complete before 1 month effective date.		
38.4	Bidder shall provide necessary documentation along with user manuals in printed and soft copy.		
38.5	Bidder shall perform necessary changes/upgrade on the effective date.		

Bill of Quantity

Following is detailed BOQ, Bidder shall provide other component on Trunkey basis to meet system requirements given in the scope of supply.

SI No.	Description	Quantity
1	Data Centre (DC) System in Main, Standby and pre-prod configuration: (Web server, Portal Sever, Hosting Sever, Image Server, GIS server, Workflow Manager Server, GIS Datastore-Relational, GIS Data Store-Object store, Enterprise Geodatabase, Rack, Networking devices, etc.)	1 lot
2	Disaster Recovery (DR) System in Main, Standby and pre-prod configuration: (Web server, Portal Sever, Hosting sever, Image Server, GIS server, Workflow Manager Server, GIS Datastore-Relational, GIS Data Store-Object store, Enterprise Geodatabase, Rack, Networking devices, etc.)	1 lot
3	GPS Time server (1 DC, 1 DR)	2
4	Laptop	10
5	Console Tables for Technical activities/monitoring at DR, DC.	2 lot
6	No of concurrent user licenses(active)	>1,000
7	No of total user license (Database)	>1,000,000
8	DAM Database Activity Monitor	3
9	Firewalls with Cyber security monitoring position (at DR, DC)	2 lot
10	Firewalls with Cyber security monitoring position (at DO offices)	1 lot
11	SIEM	1 lot
12	Dual monitor 65" LED (at DR and DC)	2
13	Workstation Requirements at each site with console table, 27-inch Monitor, Keyboard, Mouse and UPS as follows:	
13.1	CHQ, New Delhi (2-AGA, 2-PANS-OPS, 2-CNS, 1- Planning, 1- Carto, 2- Simulation)	10
13.2	DO Office, New Delhi (2-AGA, 1-PANS-OPS, 2-CNS, 1- DO-InCharge)	06
13.3	DO Office, Mumbai (2-AGA, 2-PANS-OPS, 2-CNS, 2- DO-InCharge)	08
13.4	DO Office, Chennai (2-AGA, 1-PANS-OPS, 2-CNS, 1- DO-InCharge)	06
13.5	DO Office, Kolkata (2-AGA, 1-PANS-OPS, 2-CNS, 1- DO-InCharge)	06
13.6	DO Office, Bangalore (2-AGA, 1-PANS-OPS, 2-CNS, 1- DO-InCharge)	06
13.7	DO Office, Guwahati (2-AGA, 1-PANS-OPS, 2-CNS, 1- DO-InCharge)	06
13.8	DO Office, Hyderabad (2-AGA, 1-PANS-OPS, 2-CNS, 1- DO-InCharge)	06

13.9	DO Office, Ahmedabad (2-AGA, 1-PANS-OPS, 2-CNS, 1- DO-InCharge)	06
13.10	DO Office, Nagpur (2-AGA, 1-PANS-OPS, 2-CNS, 1- DO-InCharge)	06
14	Manpower Deployment for Application Maintenance and Support in **General Duty**:	
14.1	Manpower Deployment for Application Support at DC, Delhi: GIS Expert - 01 Cyber security expert – 01 Networking Engineer -01 Linux/Microsoft Engineer -01 System Engineers -03 Hardware and Troubleshooting Engineer -01	08
14.2	Manpower Deployment for Application Support at DR, Mumbai: System Engineers -01 Hardware and Troubleshooting Engineer -01	02
15	Manpower Deployment for System Maintenance and Support in **365x24x7 Duty**:	
15.1	Manpower Deployment for Infra support at DC Delhi: System Engineer -01	04
15.2	Manpower Deployment for Infra support at DR Mumbai: System Engineer -01	04
15	Implementation of New Surfaces as per ICAO and amended GSR (affected date 21 November 2030)	1

	Spares:	
A.	Spares Servers	4
B.	Spare workstations	11
C.	All critical hardware's like (Switch, Router, Firewall, etc. to be kept at DR and DC) as spare.	2 each
D.	All critical hardware's like (Switch, Router, Firewall, etc. to be kept at DO Offices) as spare.	1 each
	Power Supply:	
A.	UPS at DR (UPS1 and UPS2)	2 UPS
B.	UPS at DC (UPS1 and UPS2)	2 UPS
C.	Each DO site UPS Qty: 1 UPS each work position 1 UPS for network rack	1 lot
D.	ATS switch for all equipment's with single power supply at DR, DC.	1 lot

Annexure – II

Name of work: - **EoI (Domestic) for Techno-commercial Proposal for "Implementation of New NOCAS (No Objection Certificate Application System) along with associated accessories to provide nationwide solution**

Details of Firm(s)/Indian Firms(s)

Sl. No.	Particulars	Details
1.	Name of the Bidding Company/Firm:	M/s _____
	Type of business entity (Natural Person/ Private Limited Company/ Public Limited Company/ Sole Proprietorship/ One Person Company/ Partnership firm/ Limited Liability Partnership/ Joint Venture/ Trust/ NGO/or any other type of entity)	
2.	**Beneficial owners** - as defined in the Department of Expenditure Order (Public Procurement No. 1) issued vide No. F.No.6/18/2019-PPD dated 23rd July, 2020 Details of all beneficial owners having ownership more than that prescribed in Para 9 of Department of Expenditure Order (Public Procurement No. 1) issued vide No. F.No.6/18/2019-PPD dated 23rd July, 2020 may be furnished	(i) Mr. _____ (ii) Mr. _____ (iii) Mr. _____
3.	E-mail Address:	
4.	Phone/Fax. No.	
5.	Address of the Registered office	Full Address with PIN code of the firm and with contact person name, telephone number and email Id.
6.	Whether the product offered is manufactured as Original Equipment Manufacturer OR under license from foreign manufacturer who holds Intellectual Property Rights / technology collaboration agreement / transfer of technology agreement with the foreign manufacturer for the products developed abroad with clear phasing of	

Signature of the bidder with seal

	increasing in local content.			
7.	GST No. of bidder			
8.	PAN No. of bidder			
9.	Date of incorporation of the Company (Copy attached/uploaded)			
10.	Is this product supplied to any other ANSPs			
	Details of ATM Automation System contracts completed in last 07 years			
	Sl. No.	Purchase Order Qty and value	Name of ANSP / organization to which the system was supplied	Date of completion of contract
				Pls provide completion certificate and other technical details about the executed project
11.	Number of years of Experience of the firm in this field of "design, development, implementation, and maintenance of large-scale "GIS-based" digital platforms / web-based systems / e-governance systems, in use or used for issuing NOC"			

Remarks: Any additional information may be furnished by the firm, if needed.

All the documents in support of information given above should be uploaded in PDF file format.

Authorized Signature----------

Name of the Signatory----------

Name and Address of the tenderer--------

Annexure-III

To,

The Executive Director (CNS-P)
Airports Authority of India, RG Bhawan,
Safdarjung Airport, New Delhi- 110 003, India

Subject: - Acceptance of Terms and Conditions of EOI No.: - AAI/CNSP-01/2024-25

Name of Work: - ***EoI (Domestic) for Techno-commercial Proposal for "Implementation of New NOCAS (No Objection Certificate Application System) along with associated accessories to provide nationwide solution.***

Dear Sir,

I/We hereby undertake and do affirm that-

1. I/We am/are a company/firm/as per details given in Appendix – B. The EOI document for the works mentioned above have been downloaded from CPP Portal by me/us and I/we hereby certify that I/we have read the entire terms and conditions of the EOI document and, I/we shall abide by the conditions/clauses contained therein.
2. We are OEM/Authorized Representative of OEM having Technical collaboration of foreign firms/Joint Ventures/ Indian Subsidiary Company/Authorized Supplier dealing with the manufacturing / supply for "design, development, implementation, and maintenance of large-scale "GIS-based" digital platforms / web-based systems / e-governance systems, in use or used for issuing NOC", and I/we have executed the similar works as per details given in Annexure – II.
3. I/we have not hidden or suppressed any fact or information required to execute the similar projects.
4. I/we are offering the information sought by the Airports Authority of India, through this EoI and I/we will not claim any type of compensation or relaxation on this account.
5. I/we shall not claim as eligibility for the work by offering information. "Airports Authority of India" has full right to accept or reject the offer at any stage.
6. All the information furnished are true in my/our belief and best of knowledge.
7. That, I/we declare that I/we have not paid and will not pay any bribe to any officer of AAI for awarding this contract at any stage during its execution or at the time of payment of bills, and further if any officer of AAI asks for bribe/gratification, I will immediately report it to the appropriate authority of AAI.
8. I/We undertake that, our firm/our OEM firm or any of the firm's Partners or Directors, have not been blacklisted and no case is pending and no complaint regarding irregularities is pending, in India or abroad, by any global international body like World Bank/International Monetary Fund/World Health Organization, etc. or any Indian State/Central Governments Departments or Public Sector Undertaking of India.

BLACKLISTING CLAUSE

Yours faithfully,

Authorized Signature----------
Name of the Signatory----------
Name and Address of the tenderer--------

Annexure –IV

Price Schedule

Description of requirement	Unit price exclusive of GST (in INR)	Qty required	Total price exclusive of GST (in INR)	GST rate (in %)	Total Price inclusive of GST (in INR)
Cost of Hardware (Hardware includes all kind of hardware of system, sub-systems, Network devices like Routes, switch etc., Displays, etc. and other hardware required for successful implementation of new NOCAS) [cost inclusive of rate, freight, insurance (transit cum storage) and any other charges]	For example 100	1 lot	100	18%	118
Cost of Software (If Software having different modules & licenses based on number of working positions or users than price breakup shall be provided for each modules & licenses)					
Cost of UPS					
Cost of UPS Batteries					
Cost of Console, [cost inclusive of rate, freight, insurance (transit cum storage) and any other charges]					
Cost of Installation material (cable, cable tray, earthing, lighting arrestor etc.), **if required**					
Cost of FAT for • New NOCAS (Hardware & Software) • Consoles • UPS					
Cost for UPS installation					
Cost for Console installation					
Cost for installation of new NOCAS					
Cost Factory & on-site Training (one batch of ATSEP & one batch of ATCOs) for the offered new NOCAS					
Cost for Testing & commissioning of the offered new NOCAS					
Cost for 07yrs software maintenance support (after 3yrs warranty) for the offered new NOCAS • 1st year • 2nd year • 3rd year • 4th year • 5th year					

Signature of the bidder with seal

• 6th year • 7th year					
Cost for 03 yrs CAMC for UPS & its Batteries after expiry of warranty period (after 5yrs warranty) for the offered new NOCAS System • 1st year • 2nd year • 3rd year					
Cost towards any other components, services, tools, accessories, etc., if required for the successful of the project (with breakups)					
Cost towards 10% Hardware as Spares (including Server, Work Station, Printers, Different displays and Network Devices like Switches, Routers and Firewalls, etc. if these are required). Bidder shall submit complete Hardware list (including make & model) so as to verify Spares requirement.					

Note:- Bidder shall submit list of all the Software, hardware & other items (including quantity) that will be supplied under each line item.