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Ref No: LIAL/CO/AERA-MYTP/2023/3 24th March, 2023

To,
The Director (P&S, Tariff),
Airports Economic Regulatory Authority of India,
AERA Building, New Administrative Block,
Safdarjung Airport,
New Delhi- 110003.

Sub: Comments on the Consultation Paper No. 16/2022-23 dated 20th February 2023 in The Matter of Determination of Aeronautical Tariff for Chaudhary Charan Singh International Airport (CCSIA), Lucknow (LKO) for the Third Control Period (01.04.2021 - 31.03.2026)

Dear Sir,

This is in respect to the Consultation Paper No. 16/2022-23 dated 20th February 2023 in The Matter of Determination of Aeronautical Tariff for Chaudhary Charan Singh International Airport (CCSIA), Lucknow (LKO) for the Third Control Period (01.04.2021 - 31.03.2026), we hereby submit our written comments chapter-wise.

We shall be pleased to provide any further information that Authority may require in this regard.

Thanking you

Yours truly,
For Lucknow International Airport Limited,

Manoj Chanduka
Authorized Signatory

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Comments on the Consultation Paper No. 16/2022-23 dated 20th February 2023 in The Matter of Determination of Aeronautical Tariff for Chaudhary Charan Singh International Airport (CCSIA), Lucknow (LKO) for the Third Control Period (01.04.2021 - 31.03.2026)

Disclaimer

This document has been prepared by Lucknow International Airport Limited (LIAL) in response to AERA's Consultation Paper No. 16/2022-23 dated 20th February 2023 in The Matter of Determination of Aeronautical Tariff for Chaudhary Charan Singh International Airport (CCSIA), Lucknow (LKO) for the Third Control Period (01.04.2021 - 31.03.2026)

The purpose of this document is to solely provide a response to the tentative decisions proposed by AERA in Consultation Paper (CP) and should not be referred to and relied upon by any person against LIAL. This document includes statements, which reflect various assumptions and assessments by LIAL and relevant references to various documents. Same do not purport to contain all the information to support our response.

This document may not be appropriate for all persons, and it is not possible for LIAL to consider particular needs of each party who reads or uses this document.

Whilst every effort has been made to ensure the accuracy of the information provided herein, LIAL cannot be held responsible for any errors or omissions. LIAL shall have no liability to any person under any law for any loss, damages, cost, or expense on account of anything contained in this document.

The response set out below to the CP shall not be construed as an acceptance by LIAL of the various assumptions undertaken by the Authority in the CP.

We request the Authority to follow the previous orders passed in case of other airports by AERA, Hon'ble TDSAT and the Hon'ble Supreme Court of India, as well as orders concerning the points raised in the MYTP and this response. It is settled law that juridical discipline requires the Authority and/or courts of law to follow the previous orders to maintain certainty of things. At the same time, the Airport Operator is always entitled to raise / agitate the points which are not in consonance with the relevant guidelines and judicial pronouncements irrespective of previous orders in this regard.

The response is without prejudice to LIAL's rights, submissions, contentions available to it in accordance with applicable laws.

List of Abbreviations:

Abbreviation	Expansion
AAHL	Adani Airport Holdings Limited
AAI	Airport Authority of India
ACI	Airport Council International
ADP / AVP	Airport Driving Permit / Airport Vehicle Permit
AEL	Adani Enterprises Limited
AERA or Authority	Airport Economic Regulatory Authority of India
AO	Airport Operator
AOCC	Airport Operator Control Centre
ATF	Aviation Turbine Fuel
ATM	Air Traffic Movement / Automated Teller Machine
ATP	Annual Tariff Proposal
AUCC	Airport Users Consultative Committee
AVSEC	Aviation Security
BIAL	Bengaluru International Airport Limited
BOQ	Bill of Quantities
CA	Concession Agreement signed between AAI and LIAL as on 14th February 2020
CAPM	Capital Asset Pricing Model
COD	Commercial Operation Date
CoD	Cost of Debt
CoE	Cost of Equity
CP	Consultation Paper No. 10/2022-23 dated 20th October 2022
CPI	Consumer Price Index
CPWD	Central Public Works Department
CWIP	Capital Work in Progress
DGCA	Director General of Civil Aviation
DGM	Deputy General Manager
DIAL	Delhi International Airport Limited
ERP	Equity Risk Premium
EV	Electric Vehicle
FIDS	Flight Information Display System
FRoR	Fair Rate of Return
FTC	Fuel Throughput Charges
FY	Financial Year
GDP	Gross Domestic Product
GHA	Ground Handling Agency
GHIAL / HIAL	GMR Hyderabad International Airport Ltd / Hyderabad international Airport Ltd
GoUP	Government of Uttar Pradesh
GoI	Government of India
GPCB	Gujarat Pollution Control Board
HR	Human Resource
IATA	International Air Travelers Association
ICAO	International Civil Aviation Organization
IDC	Interest during Construction
ILBS	In-Line Baggage System
IMG	Inter-Ministerial Group

Abbreviation	Expansion
LIAL or ALIAL or LKO	Lucknow International Airport Limited
LOA	Letter of Award
LOI	Letter of Intent
MAG	Minimum Annual Guarantee
MCLR	Marginal Cost of Funds based Lending Rate
MIAL	Mumbai International Airport Limited
Mn	Million
MPPA	Million Passenger Per Annum
MYTP	Multi Year Tariff Proposal
NAR	Non-Aeronautical Revenue
NBFC	Non-Banking Financial Company
NCAP	National Civil Aviation Policy,2016
NITB T3	New Integrated Terminal Building Terminal 3
O&M	Operation & Maintenance
ORAT	Operational Readiness and Airport Transfer
PAX	Passengers
R&M	Repairs and Maintenance
RAB	Regulatory Asset Base
RCS	Regional Connectivity Scheme
RFPs/RFQs	Request for Proposals / Request for Quotes
RWH	Rainwater Harvesting
RWY	Runway
SCP	Second Control Period
CCSIA	Chaudhary Charan Singh International Airport
T1	Terminal 1 of Lucknow Airport
T2	Terminal 2 of Lucknow Airport
TCP	Third Control Period
TDSAT or the Appellate Authority	Telecom Disputes Settlement and Appellate Tribunal
TWY	Taxiway
UDF	User Development Fees
VDGS	Visual Docking Guidance System
VFR	Visiting Friends and Relatives
WACC	Weighted Average Cost of Capital
WDV	Written Down Value

Airport Operator or AO or LIAL means same and as has been used interchangeably in this document

In this document, "Authority" where any clause from Concession Agreement is mentioned it refers to Airports Authority of India (AAI) and for rest of the document Authority refers to Airport Economic Regulatory Authority of India (AERA).

In this document, "The AERA Act" refers to The Airports Economic Regulatory Authority of India Act, 2008 (as updated from time to time).

In this document, "The AERA Guidelines" refers to Airports Economic Regulatory Authority of India (Terms and Conditions for Determination of Tariff for Airport Operators) Guidelines, 2011.

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1 Chapter 1 “Comments on Consultation Paper Chapter 4 - True Up of AAI For The Second Control Period From FY 2017 till COD”

1.1 AERA comments as per 4.8.6 Table 23 on page 52 and 53 of CP relating to Repairs and Maintenance of Pre-COD period

Table 23: Adjusted Repairs and Maintenance expense proposed by the Authority for True up of the Pre-COD period

(₹ Crores)

Particulars	Ref.	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21*	Total
Total Aeronautical Repairs & Maintenance expenses *including* Amortisation of runway recarpeting expenses (refer Table 21)	A	10.61	14.10	17.24	16.74	16.19	**74.88**
Amortisation of Runway recarpeting expenses	B	4.42	4.42	4.42	4.42	4.42	**22.10**
Net Aeronautical Repairs & Maintenance expenses *excluding* Amortisation of runway recarpeting expenses	C	6.19	9.68	12.82	12.32	11.77	**52.78**
Opening RAB (refer Table 15)	D	151.73	177.42	173.72	200.20	207.46	

Particulars	Ref.	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21*	Total
Repairs & Maintenance expenses calculated at 6% on Opening RAB	E	9.10	10.65	10.42	12.01	7.26	**49.45**
Amount proposed to be allowed (C or E whichever is lower)	F	6.19	9.68	10.42	12.01	**7.26**	**45.56**
Amount proposed *not* to be allowed (C – F)	**G**	**0.00**	**0.00**	**2.40**	**0.31**	**4.51**	**7.22**
Total Aeronautical Repairs & Maintenance expenses – post rationalization (A – G)	**H**	**10.61**	**14.10**	**14.84**	**16.43**	**11.68**	**67.66**

** Repairs and Maintenance expenses for FY 2020-21 has been derived proportionately for the period up to COD.*

Comments by LIAL:-

1.1.1 In the table 23, AERA has mentioned that "Repairs and Maintenance for FY21-22 has been derived for the period upto COD". However, it is to be noted that amortization of Runway Recarpeting is provided for full financial year FY19-20 of Rs. 4.42 Crs instead of providing it upto COD.

1.1.2 As per Clause 28.11.4 of the Concession Agreement signed between AAI and LIAL, LIAL is responsible to pay True-up till the date of COD.

Extract of clause 28.11.4
*(a) reduced to the extent of over-recoveries, if any, of Aeronautical Revenues by the Authority **until the COD**, that the Regulator would provide for as a downward adjustment while determining Aeronautical Charges for the next Control Period; or*
*(b) increased to the extent of under-recoveries, if any, of Aeronautical Revenues by the Authority **until the COD**, that the Regulator would provide for as an upward adjustment while determining Aeronautical Charges for the next Control Period.*

1.1.3 **We request the Authority to provide amortization of Runway Recarpeting proportionately for the period from 1st Apr 2020 to 02nd November 2020 in true-up calculations of AAI.**

2 Chapter 2 “Comments on Consultation Paper Chapter 5 - True Up of Airport Operator for the Period from COD Till March 31, 2021”

2.1 AERA proposal as per 4.5.10, 4.5.12 and 5.4.3 of CP relating to True up of RAB

4.5.10 Revision of Terminal Building ratio:

• The Common assets based on the Independent Study report have been allocated to Aeronautical and Non-aeronautical assets based on the Terminal Building ratio of 7.5% (Non-aeronautical areas as a percentage of total terminal building area), which was approved by the Authority in the Tariff Order for the Second Control Period for CCSIA.

• Further, the Authority notes that since there has been no major addition to the Terminal Building in the Second Control Period, its impact on the Terminal Building ratio (92.5%: 7.5% considered in the Tariff Order for the Second Control Period) is NIL.

4.5.12

Taking cognizance of the above clauses in the Concession Agreement and based on the outcome of the independent study conducted by the Independent Consultant appointed by AERA on allocation of assets for CCSIA, Lucknow, the Authority has determined the Deemed Initial RAB as on COD, which is as follows:

Table 14: Determination of Deemed Initial RAB by the Authority

(₹ Crores)

Particulars	Ref.	RAB
Total assets of AAI as on November 1, 2020 (Net block) as per True up submission	Table 12	197.82
Adjustments (Financing Allowance and ANS assets excluded from RAB and inclusion of an asset item)		(1.75)
Reclassification of assets	Table 13	(1.95)
Total assets of AAI as on November 1, 2020 (Net block), after reclassification and other adjustments		194.12
Less: assets retained by AAI	Exhibit 3 and Table 14 of *Asset Allocation report*	(10.54)
Add: Buildings for navigational aids/ radar installations (reclassified) *	Annexure 4	4.30
Net assets transferred by AAI to the Airport Operator as on November 2, 2020*		**187.88**

** Reference: Table 14 of the Study on Allocation of assets between Aeronautical and Non-aeronautical assets for CCSIA, Lucknow*

5.4.3 – Reclassification of assets of the Airport Operator (Page 65 of CP)

The asset allocation study reviewed the various asset categories and developed a basis for segregation of various assets into Aeronautical, Non-aeronautical and Common assets. Based on the same, the Authority has reclassified some portion of assets submitted by the AO for true up of the period from COD till March 31, 2021 which has been detailed hereunder:

Various references that Assets have been allocated into Terminal Building as "The same have been reallocated in the ratio of Terminal Building which is in the ratio of 92.5:7.5"

Comments by LIAL :-

2.1.1 The comments on the similar matter are provided at 4.11 below. The same may be referred hereto.

2.2 AERA proposal as per 5.4.3 page 67 of CP relating to Intangible Assets (Pre-COD expenditure)

v. Intangible asset

Details of Asset: Salary cost and consulting fees incurred by Adani-group entities prior to COD on costs related to planning for takeover and management of CCSIA, Lucknow Limited.

Allocation proposed by Airport Operator: Common

a. The Authority notes that as per clause 15.1.2 of the Concession Agreement, the Concessionaire is mandated to achieve COD within 180 days from the date of the Concession Agreement. Further, the Authority takes cognizance of the fact that AAI deputed its staff and management personnel to the Airport during the transition period, including prior to the COD. Additionally, Adani Group also had to depute its own manpower from other group entities. Accordingly, the Authority proposes to consider salary expenses pertaining to such Adani Group entities for the period of six months prior to COD, i.e. from May 1, 2020 to November 1, 2020, for the purpose of tariff determination.

b. Further, on detailed examination of the costs (department-wise) of manpower deputed by the Adani Group for the above-mentioned period of 6 months, the Authority notes that the manpower deputed for certain functions such as Commercial and Legal ought to be excluded. Further, the Authority has rationalized the headcount submitted by the AO for certain other functions such as Cargo, Master Planning, IT, Operations, Security, Techno Commercial, etc. to derive the allowable Intangible asset, as shown in the table 36.

c. The proportion of such Adani group expenses allocable towards CCSIA has been determined in the proportion of Initial RAB and CWIP of CCSIA to the Total RAB and CWIP of all 3 airports (Mangaluru, Lucknow and Ahmedabad), as submitted by AAI at the time of the Letter of Award.

d. The Authority proposes that the bid expenses incurred prior to the date of Letter of Award of CCSIA and expenses incurred between the date of Concession Agreement and COD (other than that specifically considered above), as submitted by the Airport Operator would not be considered for tariff determination.

e. Further, the Authority notes that salary expenses (₹ 1.10 crores) were incurred by CCSIA during the observation period of 60 days (Sep 2020 and Oct 2020) as per clause 16.5 of the Concession Agreement, wherein the new Concessionaire's team had to work along with AAI's team to understand the Airport operations. The aforementioned costs have been considered in the tariff determination process.

f. Based on the above, the total costs pertaining to Salary expenses prior to COD, as allowable for the purpose of true up of CCSIA is determined as follows:

Table 36: Intangible asset proposed by the Authority for the Third Control Period

(₹ Crores)

Entity	Period	Total	% allowable	Amount decided towards Intangible asset
Adani Group	May 1-Nov 1, 2020	10.53	54.88%*	5.78
CCSIA	Sep 1-Oct 31, 2020	1.10	100%	1.10
Total				**6.88**

Note: The allowable % (54.88%) has been derived based on the ratio of assets (Initial RAB + CWIP) of CCSIA, Lucknow on the total assets (Initial RAB + CWIP) of all three Airport SPVs (i.e. Ahmedabad, Lucknow and Mangaluru) as on COD.

The Authority based on the above analysis and considering all the necessary clauses of the Concession Agreement, (including achievement of COD within 6 months from the date of CA), wherein a new Concessionaire has to perform, with involvement of Senior

executives, certain pre-COD functions such as operational readiness, familiarization & training, Trial programs, Airport facility assessment, Capability building & human resource management, observation period, etc., proposes to allow ₹ 6.88 Crores of Intangible asset (as determined in the table above) as part of the O&M expenses

Comments by LIAL:-

2.2.1. It is to be noted that the overall claim of the LIAL included salaries, professional consultancies, and other administrative expenses. However, the Authority has only considered the salaries at a very low threshold and have not provided any reason for disallowing the professional consultancies and other administrative expenses.

2.2.2. The authority has rationalized the manpower salaries deputed by Adani Group and recomputed the allowable intangible expenses as per Table 36. However, the Table 36 does not provide the calculation how the Adani Group manpower has been rationalized. There is no calculation provided by the Authority how it has arrived at cost of Rs. 10.53 Crs as mentioned in the Table 36. **We hereby request Authority to share the calculation details for Rs. 10.53 Crs and the detailed reasoning for reduction of the manpower. We reserve our right to provide further comments on the same once the information is made available to us.**

2.2.3. Notwithstanding the above, we would like to place on records that:-

2.2.3.1. Adani Enterprises Limited (AEL) was announced the successful bidder for Lucknow Airport in Feb-2019. As the Concession agreement was a part of the Bid, AEL was aware of its obligations and responsibilities under the Concession Agreement and activities that were required to be done to achieve the successful Commercial Operations Date (COD). This process was akin to Operational Readiness and Airport Transfer (ORAT) activity which is done when green field facility is commissioned at the Airport. When an old asset is taken over by a new owner with a responsibility to maintain the superior service standards which were not supported by the existing infrastructure and bottlenecks, it is akin to a greenfield asset from the operations perspective.

The Authority in case of Bengaluru International Airport Limited (BIAL) has approved cost of Rs. 46 Crs for **ORAT** during tariff determination of third control period (refer page no. 252 of Order No. 11/2021-22 for BIAL Third Control Period).

2.2.3.2. We had earlier submitted to the Authority that various clauses in the Concession agreement mandated certain activities/obligations to be performed by the Airport Operator prior to COD so that the transition from AAI to AO is smooth. These activities covered many areas like operational readiness, familiarization & training, Trial programs, Airport facility assessment, Capability building & human resource management, observation period, financial closure etc. Being an operating Airport, these were important from the perspective of Airport users and passengers as well. It appears from the CP that the same has not been taken cognizance of by the Authority. Hence, we are reproducing the relevant provisions of the CA for your ready reference:-

Extract of relevant clauses from the Concession Agreement:

Clause 16.5 Observation Period prior to COD:- There was a requirement to have 60 days of observation period before COD whereby Concessionaire's team was to work along with AAI's team to understand the Airport operations. In order to have a dedicated Airport team to be ready for participation in Observation period Concessionaire is required to hire personnel well before the time.

Further As per Clause 5.8 of the CA, Concessionaire is obligated to have trained personnel employed all the time. Before taking over the Airport, the AO is required to hire people who are trained to take care of safe operations of the Airport.

As per Clause 4.1.3 of the CA, as a condition precedent; Concessionaire needs to fulfill the following activities: -

Particular	Details
Submission of PBG within 120 days of signing of CA.	Submission of PBG requires engagement with various Banks, lenders and financial institution. This also requires dedicated finance team to work with various financial institutions.
Procure all the applicable permits	All the necessary applicable permits need to be obtained which encompass all the functions of the Airport: - Operational like CTO, Fire NOCs, Clearance of BoD Financial – GST / PAN / TAN Engineering & Maintenance – Travelators, Weights & Measures, Single Line, HR Compliances – Shops & Establishment / ESI / PSF / CLRA Security – Clearance of Aviation Security Program In order to process and obtain the necessary applicable permits adequate manpower had to be onboarded well before the COD so that necessary applications are made timely, and approvals are obtained.
List of construction works to be undertaken in the first seven concession years	In order to provide list of construction works, Master planning needed to be undertaken which required engagement of master planner, designer, architects, town planners etc. Further under **clause 5.12 of the CA Obligations** relating to aesthetic quality of the Airport it is stated that "The Concessionaire shall engage professional architects and town planners of repute for ensuring that the design of the Airport meets the aforesaid aesthetic standards"
Execution of the escrow agreement as per Schedule M	This requires engagement with banks, lenders, financial institutions to perform the necessary documentation.

Clause 6.4.5 Works In Progress: - Concessionaire is obligated to pay CWIP amounts to AAI. "*The Parties shall constitute a committee comprising representatives of the Concessionaire, Authority and each of the counterparties under such contracts, which committee shall be responsible for: (a) facilitating any discussions and/ or interactions amongst AAI, the Concessionaire and the*

counterparties under such contracts, including in respect of any modifications to the works, and (b) coordinating, facilitating, and monitoring the progress of such works-in-progress."

In order to assess, the works in progress both physical and financials, necessary teams were engaged from master planning, designing, asset health check, vendor management and financial experts.

Clause 10.2 Lease, Access, and Right of Way:- Concessionaire is allowed to take necessary surveys, investigations etc of the property prior to COD to assess various risks associated with the site.

This activity required engagement of various experts and agencies.

Clause 10.3 Procurement of the Site:- Both AAI and Concessionaire need to undertake joint inspection of site, inventory of buildings, structures, roads works etc.

This required dedicated finance, operations and engineering & maintenance team in place to do the joint inspection and asset health check.

Clause 15.1 / 26.1 Commercial Operation Date / Financial Close:- In order to achieve COD, financial close is a mandatory requirement.

To make financial projections necessary studies were required to be undertaken like traffic study, revenue potential study, capex planning based on master planning, estimation of capex, operating cost estimation, engagement of financial consultant, financial modelling etc. This required engagement of consultants and also in-house corporate finance team.

Clause 18.17 Maintenance Programme :- On or before COD, Concessionaire needs to submit detailed Maintenance Programme which shall include: (a) preventive maintenance schedule; (b) arrangements and procedures for carrying out urgent repairs; (c) criteria to be adopted for deciding maintenance needs; (d) intervals and procedures for carrying out inspection of all elements of the Airport; (e) intervals at which the Concessionaire shall carry out periodic maintenance; (f) arrangements and procedures for carrying out safety related measures; and (g) intervals for major maintenance works and the scope thereof.

In order to prepare the Maintenance Programme a dedicated Engineer's team involvement was required. Further this required investigation and detailed health study of the existing assets. The detailed study was conducted by engagement of both in-house team and expert consultants.

Clause 28.1 Collection of Fees by the Concessionaire:- On and from COD and till the Transfer Date, the Concessionaire has the sole and exclusive right to demand, collect and appropriate Fees from the Users for the provision of the Aeronautical Services and Non-Aeronautical Services, including the airlines and passengers, in accordance with the provisions of the Regulatory Framework.

In order to collect the fees from COD onwards necessary IT infrastructure was required to be set up which included SAP, AODB, AOCC, Billing Systems, Passenger Data Collection System. In addition, it required Engagement of Finance team, assessment of existing IT Infrastructure, engagement of IT experts and experts who understood the regulatory framework.

Clause 28.8 Display of Aeronautical Charges:- Website was required to be ready and necessary aeronautical charges needed to be provided on the website. This required creation of websites, domains, engaging IT experts, domain experts, experts from regulatory framework etc.

Clause 30.3 Insurances:- No later than 30 (thirty) days prior to commencement of the Concession Period, the Concessionaire shall by notice furnish to the Authority, in reasonable detail, information in respect of the insurances that it proposes to take.
This required engagement of insurance agents, risk measurement, assessment of asset value, risk mitigation plan etc.

Various other requirements under the CA which entailed onboarding of personnel/consultants: -

- Operational SOPs
- Clause 23 - Readiness of Performance Measurement Plan
- Schedule H - to obtain ACI Membership
- Schedule 1 - Submission of Aerodrome Emergency Plan prior to COD
- 18.15.4 Establishing Airport Safety Management Unit (ASMU)
- Formation of various committees - JCC for CNS ATM, MoU, Capex, Right of Way
- Aeronautical Information Services
- Apron Management Unit

2.2.3.3. From the foregoing submissions, the Authority would appreciate that without having proper manpower and professional support it would not have been possible to achieve transition of airport from AAI to AO as mandated under the CA. These activities were required to be performed prior to COD. Hence, the expenditure incurred by the AO to achieve successful COD are essential, genuine, and legitimate. Accordingly, we request the Authority to at least take into account the expenditure incurred by us under this head, post issue of LOA by AAI till COD i.e. Rs. 37.35 crores against Rs. 39.07 crores claimed by us.

2.3 AERA proposal as per 5.7.1 page 70 onwards of CP relating to Reallocation of O&M Expenses

Manpower expenses – Airport Operator

Observation: The Authority notes that the employee headcount of the AO has been determined in the O&M study report as 40 employees, as against 56 submitted by the AO (refer Table 33 of the Study on Efficient Operation and Maintenance Expenses for CCSIA, Lucknow). The Authority further notes that Security deputed for functions such as Kerb Side Management, Traffic Management, Security System Maintenance etc. had been considered as Non-aeronautical in the O&M Study report. Therefore, the Authority has revisited the employee headcount of the AO determined by the Study and derived the same as 43 employees. Accordingly, the Authority proposes to proportionately revise the total manpower costs of the AO as ₹ 6.30 Crores as against ₹ 8.24 crores (for 56 employees) submitted by AO. Further, the Authority notes that the Airport Operator has apportioned its Manpower expenses in the Employee Head Count ratio of 97:3, which the Authority proposes to re-allocate in the revised Employee Head Count ratio of 84:16 derived by the Authority (refer para 5.3.3.11 and Table 34 of the O&M study report), thus resulting in a downward adjustment of ₹ 2.45 Crores.

Extract from Study of Efficient Operation and Maintenance Expenses

5.3.3.6. It is noted from the above table, that certain other departments such as Security, Human Resource & Admin, Terminal Operations and Engineering & Maintenance already have existing employees of AAI deputed to CCSIA as "Select Employees". However, the Airport Operator has submitted additional employee numbers for the same function / departments over and above the deputed employees, which is found to be on the ***higher side and hence it is proposed to rationalise the Employee Headcount of all the aforementioned departments for the Airport Operator.***

5.3.3.7. Further, in respect of Security department, it is observed that barring few activities such as coordination with CISF, BCAS compliance etc. which are Aeronautical in nature, the remaining activities are Non-aeronautical in nature (i.e., security employees deployed at kerbside, travel management, issuance of pass, etc) and hence it is proposed to be considered as Common as per the Study.

5.3.3.8. The details of the revised employee numbers for the Airport Operator as per the Study are shown in the table below:

Table 33: Department-wise Employee numbers of the Airport Operator as per the Study

Department	Classification – as per AO	Employees – as per AO	Classification – as per the Study	Employees of AO – as per the Study
Chief Airport Office (CAO office)	Aeronautical	2	Aeronautical	2
Techno Commercial (Procurement department)	Common	1	Common	1
Corporate Affairs	Common	1	Common	1
Security (includes Safety employees)	Aeronautical	7	Common	4
Legal	Common	2	Common	2
Quality	Aeronautical	1	Aeronautical	1
Information Technology	Common	3	Common	3
Airside Management	Aeronautical	5	Aeronautical	3
Terminal and Operation	Aeronautical	11	Aeronautical	7
Non-Aeronautical Commercial	Non-Aeronautical	4	Non-Aeronautical	4
Human Resources and Admin	Common	5	Common	2
Finance	Common	2	Common	2
Engineering & Maintenance	Aeronautical	12	Aeronautical	8
Fire fighting	Aeronautical	-	Aeronautical	-
Total		**56**		**40**

Comments by LIAL:-

2.3.1.1 In Respect of Employee Headcount, we would like to submit that the Hon'ble Supreme Court vide its judgement dated 11th July 2022 in respect to tariff appeals of First Control Period of DIAL and MIAL has recognized the importance of employees from both AAI and DIAL to work in tandem in the transition phase. Relevant extract of para 65 of the judgement is reproduced below:

"The principle of economic efficiency incorporated in SSA only means that there should be no extra cost included which does not affect the efficiency of the system. It can hardly be said that the system could have worked in the relevant year without the AAI manpower. No doubt it was a transition phase which required both sets of manpower to work in tandem towards the efficiency levels. The relevant aspect is that as and when AAI started pulling out their manpower, DIAL supplemented the manpower. ***That manpower supplemented may be less or more is not relevant. In the year in question, the presence of both sets of manpower was necessary for the efficient functioning and the manpower of DIAL was in the learning process. This learning curve cannot be excluded on the ground of not being relatable to economic efficiency. It can hardly be called duplication of work even though it may in some sense add to the value of HRAB*** *but that is a natural corollary. The parties to the contract were quite conscious of this ramification as they knew the methodology which would be adopted for the takeover of the airport."*

2.3.1.2 The reason mentioned in the Study conducted by the Authority for rationalization of manpower is that 56 employees by the AO appears to be **high.** LIAL would like to submit that the reasons provided by the Authority lacks consistency with its own Independent Study of O&M conducted for Ahmedabad Airport. As per point 4.5.5 of Study of O&M for Ahmedabad Airport, it is mentioned that *"Based on global benchmarks, the level of staffing for an airport is generally considered to be optimum when the number of passengers per employee is around 15000-17000".* Lucknow Airport had achieved Pre-

COVID traffic of 5.4 million in FY19-20 and based on aforesaid global benchmark it should have at least employees of 360 (5.4 *10^6/15000).

2.3.1.3 We would like to bring to the kind attention the manpower requirements at PPP Airports: Hyderabad Airport in the First Control Period had manpower of over 400 when the traffic for the Airport was 6 mppa (given below the Manpower table extract)

Extract from Hyderabad Airport FCP MYTP Submission

GMR HYDERABAD INTERNATIONAL AIRPORT LIMITED

Form F11(a) : Employees Strength Ref. sectionA.5.5.5

S. No	Particulars with detailed breakup	Actuals 2009-10	Actuals 2010-11	Projected 2011-12	Projected 2012-13	Projected 2013-14	Projected 2014-15	Projected 2015-16
A	**Total 1 (GHIAL)**	**554**	**534**	**587.4**	**587.4**	**587.4**	**646.14**	**646.14**
B	**Total 2 (GADL + GHIAL)**							
1	BCO & MD's off.	4	3	3	3	3	4	4
2	CEO's office	1	5	6	6	6	6	6
3	Commercial	19	22	24	24	24	27	27
4	Corp. Comm.	5	5	6	6	6	6	6
5	CR & Conn.	29	28	31	31	31	34	34
6	Expats	4	2	2	2	2	2	2
7	F & A	36	44	48	48	48	53	53
8	Buss Excellence	0	4	4	4	4	5	5
9	HR	15	15	17	17	17	18	18
10	FMS	9	7	8	8	8	8	8
11	Legal	6	6	7	7	7	7	7
12	Operations	241	226	249	249	249	273	273
13	CPD	2	5	6	6	6	6	6
14	Security	150	132	145	145	145	160	160
15	Aerospace Buss	12	4	4	4	4	5	5
16	Cargo	4	6	7	7	7	7	7
17	SPG	5	6	7	7	7	7	7
18	New ABD	4	4	4	4	4	5	5
19	GMRVF	8	9	10	10	10	11	11
20	Aviation Academy	0	1	1	1	1	1	1
Total	Direct Nos	416	396	436	436	436	479	479
	Indirect Nos	130	132	145	145	145	160	160
21	Technical Services			-	-	-	-	-
22	IT			-	-	-	-	-

Source https://aera.gov.in/uploads/mytp/16572941115078.pdf

2.3.1.4 **Regarding the Authority's proposal to reduce Security Department manpower from 7 to 4,** we would like to place the following facts:

As per clause 18.11.3.e) of the CA, AO shall adhere to the security measures laid down by the BCAS and DGCA. As per clause 19.1.2 of the CA, *"Without prejudice to the generality of this Article 19, the Concessionaire shall ensure that the Aeronautical Assets at all times comply with the regulations relating to the safety and* ***security of the Users, life and property, at the Site****"*

Further, as per Clause 20.3 of the CA,

20.3.1 The Concessionaire shall procure the provision of security at the Airport, including for the prevention of terrorism, hijacking, sabotage and/or similar acts or occurrences, through the Designated GOI Agency, in accordance with the Applicable Laws.

20.3.2 The Concessionaire agrees and undertakes that the practices and procedures to be adopted for the security of the Airport, Users, and persons working at the Airport and other persons or property at the Airport shall be in accordance with the guidelines prescribed by the BCAS or Designated GOI Agency.

Clause 20.6 of the CA also specifies that The Concessionaire agrees and undertakes that it shall, at all times during the Concession Period:

(c) comply with all rules, regulations and guidelines prescribed by BCAS or the Designated GOI Agency, in connection with the security of the Airport and provide and maintain perimeter fencing or other appropriate protection around the Airport;
(d) provide and maintain all the security equipment as may reasonably be required by BCAS or the Designated GOI Agency from time to time
Clause 21.4 of the CA mentions that "The Concessionaire shall, prior to the close of each day, notify the Authority and Designated GOI Agency, by facsimile and e-mail, a report stating accidents and unusual occurrences on the Airport relating to the safety and security of the users and Airport weekly and monthly summary of such reports shall also be sent within 3 (three) days of the closing of each week and month, as the case may be. For the purposes of this Clause 21.4, accidents and unusual occurrences on the Airport shall include:
(n) any incident of breach of security at the Airport

2.3.1.4.1 Apart from the above requirements mentioned in the Concession Agreement, it is to be noted that:

- Lucknow airport is one of the hypersensitive airports and thus to ensure proper safety and security of the premises, LIAL has to deploy manpower in security department to liase / deal with Designated GOI agencies such as BCAS/CISF
- Also, LIAL has to perform the function of pass section for providing entry passes / AEP / temporary AEPs to the airport users including various contractors, airlines/cargo/ground handling staff etc.
- LIAL has also deployed security staff for monitoring the kerbside security for the airport and all compliances relating to AVSEC

2.3.1.4.2 Brief description of the roles of each of the employees under Security department is tabled below:

Designation	Role Description	Head Count #
Chief Security Officer	Heading the Security function to maintain the airport in secured manner. Mandatory requirement to have a CSO for the Airport.	1
Lead - Avsec Audit & Compliance	Managing all aspects of security compliance at airport	1
Lead - Kerbside Traffic Management	Managing the traffic for Kerbside passenger and vehicular movements and ensuring safe and efficient traffic movement.	1
Lead - Security Automation	Ensuring enhanced usage of security solutions at airport with a view to enhance processing capacity with existing space / resources	1
Manager - CISF Liasioning	Responsible to liaise with CISF team to obtain requisite support wherever needed	1
Duty Manager - Landside Security	Managing the security of landside area round-the-clock in shifts	1
Lead Pass Section and AEP	Managing the activities of preparation and issuance of airport entry permits for Airport and its stakeholders	1

2.3.1.4.3 Manpower for security function were essential and should not be rationalized further.

2.3.1.5 **Regarding the Authority's proposal to reduce HR manpower from 5 to 2** we would like to place the following facts:

As per Clause 5.1.2 of the CA, AO is required to reimburse AAI Manpower salaries on monthly basis.

Also, as per clause 6.5, AO is required to make offer to AAI employees within 90 days of COD. In order to perform these mandatory activities, Manpower are exclusively required for the following activity :-

- Reconciliation of monthly Salary statement
- Attendance of AAI manpower on manual basis
- Co-ordination for AAI employee joining formalities, Handling complaints, industrial relations, managing grievance procedures and facilitating counseling
- Engaging with AAI employees, Understanding the current skills
- Organizing town halls.
- Working out suitable compensation package
- Understanding the non-tangible benefits available to AAI employees, studying how the same can be factored in compensation package.
- Preparation of offer letters
- Rolling out joining offers for over 160 employees within time bound manner.

2.3.1.5.1 Further LIAL being a separate entity has to fulfill various statutory obligations relating to PF, ESI, TDS, labor laws etc.

2.3.1.5.2 It would be observed that there was need for large number of HR manpower in the initial stage due to time bound requirements under the CA. Once these activities were performed the HR manpower were gradually reduced in FY 22. Hence the cost of HR manpower in FY 21 cannot be said to be unreasonable.

2.3.1.5.3 Brief description of the roles of each of the employees under Human Resource department is provided below:

Designation	Role Description	Head Count #
Head – HR	Heading the function comprising of various roles to ensure continued availability of human capital	1
Lead - Talent Acquisition	Leading the process for recruiting, tracking and interviewing candidates, and onboarding new employees as per organizational needs	1
Lead - Talent Management	Leading the process of developing and retaining employees throughout	1
Executive - HR Ops	Leading the process for Employee Lifecycle management, implementing new company policies and maintaining internal HR systems	1
Lead - IR	Co-ordination for AAI employee joining formalities, Handling complaints, industrial relations, managing grievance procedures and facilitating counseling	1

2.3.1.6 **Regarding the Authority's proposal to reduce Engineering & Maintenance manpower from 12 to 8** we would like to place the following facts:

2.3.1.6.1 As per Clause 6.5.3 the senior management staff of AAI of the rank of DGM and above would not be available after 3 months from COD.
As per requirement of CA, LIAL made offer to AAI select employee. However, nobody accepted the offer.
It was necessary for LIAL to plan hiring and training for various roles.

2.3.1.6.2 As per Concession Agreement, an airport operator has to comply with following clauses from the Concession Agreement:

5.12 Obligations relating to aesthetic quality of the Airport
The Concessionaire shall maintain a high standard in the appearance and aesthetic quality of the Airport and achieve integration of the Airport with the character of the surrounding landscape through both appropriate design and sensitive management of all visible elements.

As per Clause 18.1.1 of the CA, The obligations of the Concessionaire hereunder shall include but not limited to:
(f) ensuring that the Aeronautical Assets, including Runway, taxiways, aprons and approach areas are maintained and operated in accordance with the provisions contained in Applicable Laws, Applicable Permits and relevant ICAO Documents and Annexes
(g) ensuring that Runway, including the strips, shoulders, stop way and runway end safety area for Runway and strips and shoulders for taxiways and isolation bays are maintained in accordance with the provisions contained in Applicable Laws, Applicable Permits and relevant ICAO Documents and Annexes
(m) maintaining the Airfield Lighting System and the main and standby power supply systems in accordance with the standards prescribed in Applicable Laws and relevant ICAO Documents and Annexes, and DGCA Civil Aviation Requirements, as may be issued or updated from time to time, and relevant codes and standards;
Also, as per clause 18.1.3 of the CA, The Concessionaire shall maintain, in conformity with Good Industry Practice, all stretches of approach roads, over-bridges/ under-bridges, over-passes, under-passes or other structures or utilities situated on the Site.

As per Clause 18.2 of the CA,
The Concessionaire shall at all times comply with Applicable Law in the maintenance of the Airport and will maintain, keep in good operating repair and condition in accordance with Applicable Laws, Applicable Permits, the standards prescribed in the relevant ICAO Documents and Annexes and Good Industry Practice or renew, replace and upgrade to the extent reasonably necessary, the Airport. All maintenance, repair and other works shall be carried out in such a way as to minimize inconvenience to Users of the Airport.

2.3.1.6.3 Brief description of the roles of each of the employees under Engineering & Maintenance department is provided below:

Designation	Role Description	Head Count #
Head - E&M	Heading the Engineering & Maintenance Function and ensure upkeep & maintenance of assets	1
Lead - E&M-Civil	Leading the maintenance and upkeep of Civil Structures, Buildings including follow up and review of outsourced agencies to ensure quality of work	1

Designation	Role Description	Head Count #
Executive - E&M-Civil	Supporting the Lead - E&M-Civil in exercise of duties	2
Lead - E&M-Electrical	Leading the maintenance and upkeep of Electricals including follow up and review of outsourced agencies to ensure quality of work	1
Manager - E&M-Electrical	Supporting the Lead - E&M-Electrical in exercise of duties	1
Lead - E&M-Mechanical	Leading the maintenance and upkeep of Mechanical Instruments including follow up and review of outsourced agencies to ensure quality of work	1
Manager - AGL	Leading the maintenance and upkeep of Airfield Ground Lighting including follow up and review of outsourced agencies to ensure quality of work	1
Manager - E&M - BHS/Airport Systems	Leading the maintenance and upkeep of BHS & Airport Systems including follow up and review of outsourced agencies to ensure quality of work	1
Executive E&M - AutoCAD	Preparation & maintaining records and of various drawings	1
Manager - AGL	Leading the maintenance and upkeep of Airfield Ground Lighting including follow up and review of outsourced agencies to ensure quality of work	1
Manager - E&M-Planning & Scheduling	Planning for Maintenance and Upkeep including preparation of maintenance schedules	1

2.3.1.7 **Regarding the Authority's proposal to reduce Airside Management from 5 to 3** we would like to place the following facts:-

2.3.1.7.1 As per DGCA inspection report it is mentioned that previously Airside Operations were carried out by ATC and not by AAI employees. However, after CoD the Airside Operations becomes responsibility of Airport Operator under the Concession Agreement. Further under the Concession Agreement, Airport operator is responsible to establish Apron Management Service, Airside safety, Aerodrome Safeguarding, Aeronautical Information Services and various Airside activities. Extract from DGCA inspection report dated 16th July 2019 (Pre-COD) which was shared with the Authority on 12th August 2023.

H.5	ANY OTHER OBSERVATION :		Nil	
I	AVAILABILITY & ADEQUACY OF TRAINED MANPOWER FOR AERODROME OPERATIONS :	Doc 7192-AN/857,part E-2		
I.1	AERODROME OPERATIONS :	Doc 7192-AN/857,part E-2	ATS in charge is responsible for air side operation. Presently airside operation is looked after by ATCO	

2.3.1.7.2 Brief description of the roles of each of the employees under Airside Management department is provided below:

Designation	Role Description	Head Count #
Lead Airside Operations	Maintaining and operating Airside including Runway, Taxiways, Apron, Approach Areas etc.	1
Airside Duty Managers	Supporting the Lead Airside Operations in exercise of duties.	1 each per shift (including rotation) (total 3+1=4)

2.3.1.8 **Regarding the Authority's proposal to reduce Terminal Operation from 11 to 7** we would like to place the following facts:-
Brief description of the roles of each of the employees under Terminal Operation department is provided below:

Designation	Role Description	Head Count #
Lead Terminal Ops	Managing Terminal Operations	1
Duty Terminal Managers for Terminal 2	Supporting the Lead Terminal Operations in exercise of duties	1 each per shift (including rotation) (total 3+1=4)
Duty Terminal Managers for Terminal 1	Supporting the Lead Terminal Operations in exercise of duties	1 each per shift (including rotation) (total 3+1=4)
In charge Lost & Found	In charge for Lost & Found items	1
Duty Terminal Officer	Supporting Duty Terminal Managers and facilitating with passengers	1

2.3.1.9 **In light of all above points, we request the Authority to allow the employee cost, the amount which has been actually incurred and paid, during the period from COD till 31st March 2021 without any reduction.**

2.4 AERA proposal as per 5.7.3 page 75 onwards of CP relating to Rationalization of O&M Expenses

a. Corporate Allocation costs

• The Authority notes that the Corporate Allocation costs include ₹ 0.39 Crores pertaining to the costs of In-house Legal department, which is in addition to the salary cost of legal department's staff which has already been considered under the Manpower expenses of the Airport Operator. The Authority is of the view that since the salary costs of the Legal department has already been considered for the 5-month period under Manpower expenses, inclusion of the above costs of In-house Legal department under Corporate Allocation costs is not justified. Hence, the Authority proposes not to allow ₹ 0.39 Crores as part of Corporate Allocation Cost of the AO.

b. Other Operating expenses

• The Authority notes that the AO has claimed ₹ 4.12 Crores towards other operating expenses, which include Mechanised Environmental Support Services (MESS) for upkeep and maintenance of Terminal Building, Environment Support Services (ESS) of ancillary buildings and paved area, support security services for passenger & vehicular management etc. The Authority notes that the above expenses have been allocated by the AO in the Terminal Building ratio of 94.86:5.14, which the Authority proposes to re-allocate in the Terminal Building ratio of 92.5:7.5 as proposed by the Asset Allocation Report. The impact of such re-allocation is a downward adjustment of ₹ 0.04 Crores as shown in the table below. Further, the Authority notes that the Other Operating expenses include ₹ 0.43 crores (after re-allocation in the Terminal Building ratio of 92.5:7.5) towards cost of support security services, which the AO has claimed separately under the expense head Aeronautical Security expenses amounting to ₹ 1.59 Crores. Hence, the Authority proposes to exclude this expense from the Other Operating expenses.

c. Repairs and Maintenance

• The Authority notes that the Repairs and maintenance expenses (₹ 5.35 Crores post re-classification by the Authority) is higher than 6% opening net block (opening RAB), as approved for other similar Airports. The Authority proposes to rationalize the Repairs and Maintenance expenses to the extent of 6% of the opening Net block as on COD i.e., November 2, 2020. The same is presented below:

Comments by LIAL:-

2.4.1 **Regarding the Authority's proposal to exclude cost of legal employees from Corporate Support Services cost**, as Authority has allowed corporate cost allocation for other departments like Operations, Finance, etc. it is logical that corporate cost allocation for legal department should also be allowed.

AERA has mentioned in the CP, example of distinct roles and responsibilities of other functions like Finance, IT etc at Airport Company and at Corporate Level. Likewise Legal department also has different roles and responsibilities at Airport company and Corporate Level

Roles and Responsibilities at Corporate Level

- Providing business and legal perspective and advice on a wide range of strategic, tactical, and operational issues to all Airports teams

- Determination of legal interests and options and counsel to top leadership on legal matters
- Coordinating and giving directions with external counsels
- Participating in the formulation of general management policy as a member of the executive management team
- Developing and leading internal audit and corporate compliance programs

Roles and Responsibilities at Airport Level

- Transaction support, including in relation to contracting and compliance.
- Drafting and vetting of RFP/RFQs,
- Applicability and compliances of local laws applicable to the Airport and maintaining proper corporate interactions with the relevant local, state and federal governmental bodies, legislatures.

2.4.1.1 We would like to take reference from Consultation Paper No. 15/2020-21 for Delhi Airport where Corporate Cost Allocation without any deduction of legal corporate cost is allowed by AERA in tariff order. It is to be noted that DIAL has Legal team employed at Airport Company also and there is no redundancy between the Corporate legal team and Airport Legal team. The extract from DIAL Consultation Paper No. 15/2020-21 is provided as follows:

DIAL Corporate Level Structure

13.6.1 GMR AIRPORTS LIMITED

Table 80Cost Objected allocated from GAL to DIAL

S.NO	DEPARTMENT COST CHARGED	COST TYPE	BASIS OF APPORTIONMENT
1	GCM Office	Fully Chargeable	Weighted Average Ratio of Assets*
2	BCM Office	Fully Chargeable	Weighted Average Ratio of Assets
3	CEO Office	Fully Chargeable	Weighted Average Ratio of Assets
4	Stakeholder Management	Fully Chargeable	Weighted Average Ratio of Assets

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S.NO	DEPARTMENT COST CHARGED	COST TYPE	BASIS OF APPORTIONMENT
5	Commercial and BD	Semi- Chargeable*	Weighted Average Ratio of Assets
6	Legal	Fully Chargeable	Weighted Average Ratio of Assets
7	Sector HR	Semi- Chargeable*	Weighted Average Ratio of Assets
8	Sector IT	Semi- Chargeable*	Weighted Average Ratio of Assets
9	Strategic Planning Group	Fully Chargeable	Weighted Average Ratio of Assets
10	Finance and Accounts	Semi- Chargeable*	Weighted Average Ratio of Assets
11	Regulatory	Fully Chargeable	Weighted Average Ratio of Assets

DIAL Airport Company Structure

Table 42 Manpower Count for DIAL during Second Control Period

S. No	Department	Functions	FY15	FY16	FY17	FY18
1	Operations (DIAL)	Airport Operations	465	437	471	570
2	BCM/CEO Office	Senior Management	12	12	32	60
3	Commercial (Aeronautical & Non-Aeronautical)	Support Functions	88	82	81	89
4	Corporate Communication	Support Functions	12	11	10	14
5	Corporate Relations	Support Functions	24	21	20	21
6	SPG/Business Integration & Planning	Support Functions	20	20	20	20
7	Ethics &Intelligence & GMRVF	Support Functions	26	27	33	37
8	Finance & Accounts	Support Functions	62	69	73	107
9	Human Resources & FMS	Support Functions	34	35	31	73
10	Guest Relations	Support Functions	25	24	23	21
11	IT	Support Functions	19	12	7	6
12	Legal	Support Functions	15	13	13	21
13	MAG	Support Functions	6	5	7	16
14	Project & Engineering	Airport Operations	27	23	21	18
16	Quality, Service & Delivery	Airport Operations	15	14	11	13
17	Baggage Screeners	Airport Operations	438	422	316	319
18	Security	Airport Operations	85	87	91	106
19	Trolley retriever	Airport Operations	215	204	220	226
Total Manpower (Excluding CPD)			**1,588**	**1,518**	**1,480**	**1,737**

2.4.1.2 **Based on above facts, we request the Authority to allow the corporate cost allocation, the amount which has been actually incurred and paid, during the period from COD till 31st March 2021 without any downward adjustment for legal department cost.**

2.4.2 **In respect to Other Operating Expenses of Rs. 0.43 Crs**

2.4.2.1 It was clarified on 05th August 2022 to AERA`s consultant along with sample copy of the invoices that cost classified in the security services is relating to ***security guard services***, whereas cost classified in the Other Operating Expenses of Rs 0.43 Crs is for ***traffic management services***. Traffic management services happens at Kerbside or forecourt, which is an operational area and is used by the passengers and travelers. These are essential activity of Airport operations which are for surrounding areas.
Under the Concession Agreement of Lucknow Airport, Terminal Building has a definition which includes kerbside.

"Terminal Building" means the stand-alone and/ or integrated passenger terminal building with separately identified area for domestic passengers and international passengers on the Site and the land appurtenant thereto, ***including the kerbside and approach roads*** *and including the existing terminal building, as described and demarcated in the perspective plan set out at Annex II of Schedule A, and/ or the Master Plan, as the case may be;*

2.4.2.2 **We request AERA to allow the Other Operating Expenses of Rs 0.43 Crs which are actually spent by LIAL.**

2.4.3 **In respect to R&M Expense:-**

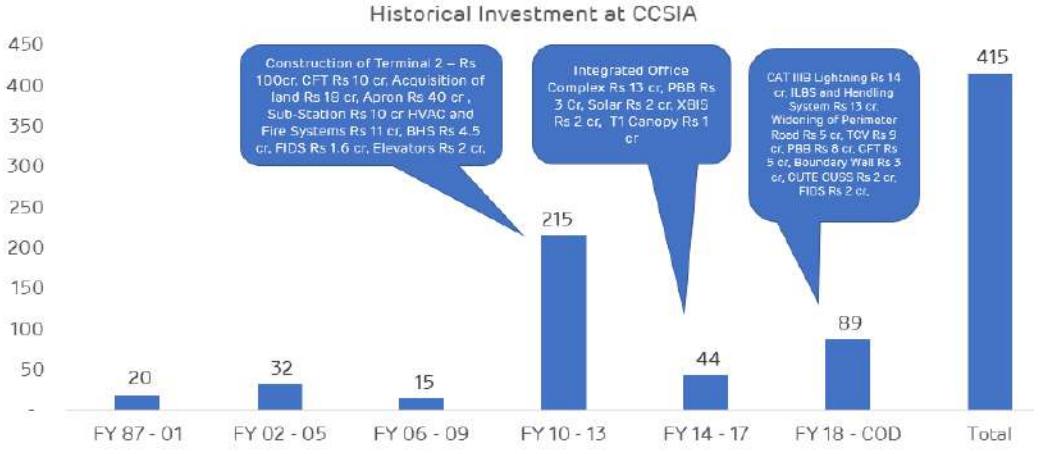
2.4.3.1 AERA has restricted R&M expenses to 6% of the opening RAB without any basis. R&M expenses depend on various factors like age of the existing assets, frequency of the use of assets (single/double/triple shift), local geographic and weather conditions.

RAB is a depreciating building block. RAB amount depreciates each year based on depreciation rate applied. In case R&M is computed as percentage of the RAB, it results in reduction of R&M amount. Whereas in actuals, as the asset gets older the R&M expenditure increases to maintain the efficiency of the operations. This was also explained by AAI during the stakeholder consultation in the presentation provided on 07th March 2023.

In order to understand the issue highlighted above, about ever-increasing Gap between the projected R&M vs notional R&M based on 6% of Opening RAB, the following example may be referred to:-

Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Opening Net Block	100	95	90	85	80	75	70	65	60	55
Dep Rate	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Dep on Gross Block	5	5	5	5	5	5	5	5	5	5
Closing Net Block	95	90	85	80	75	70	65	60	55	50
6% of R&M Exp on Opening Net RAB (as suggested by AERA) (A)	6.00	5.70	5.40	5.10	4.80	4.50	4.20	3.90	3.60	3.30
Projected R&M Cost based on age of asset (B)	6.00	6.00	7.00	7.00	8.00	8.00	9.00	9.00	10.00	10.00
Difference (A - B)	-	(0.30)	(1.60)	(1.90)	(3.20)	(3.50)	(4.80)	(5.10)	(6.40)	(6.70)

2.4.3.2 It is evident from the Joint Fixed Reconciliation signed by AAI and LIAL (refer the graph below) that the last major capital expenditure was incurred by AAI during financial year 12-13. This clearly demonstrates that the Fixed Assets at the Airport are very old, which requires and justifies higher repairs & maintenance cost to achieve efficiency.



In the CP, it is mentioned that
The Authority notes that the Repairs and maintenance expenses (₹ 5.35 Crores post re-classification by the Authority) is higher than 6% opening net block (opening RAB), as approved for other similar Airports.

First and foremost the *"other similar Airports"* mentioned by the Authority are AAI operated Airports and not the PPP Airports. AERA has never used 6% cap in any of PPP Airports. The approach adopted for LIAL lacks consistency. Second, we would like to highlight the operative portion from Tariff orders for other similar Airports.
Calicut Order No. 39/2021-22 dated 11th February 2022 and Pune Order No. 45/2021-22 dated 17th March 2022 mentioned *that "**As most of these assets are newly constructed / installed during the last 5 years and are also covered under warranty clauses.** the same may need only minimum repairs and maintenance. Hence, the Authority decides to allow repairs-and maintenance expenses for the Second Control Period only to the extent of 6% of the RAB (opening net block of the Second Control Period) or the actual expenses whichever is less."*

In case of Calicut/Pune, Authority recognized that most of the assets are newly constructed and hence the Authority has put a cap of 6% of Opening RAB. While in case of LIAL, most of the assets are old or very old, hence LIAL R&M expenses would anyways be higher than 6% of opening RAB.

2.4.3.3 Further, it is observed that while AERA has considered 6% of Net Block in FY22, FY23 and FY24, and for FY25 to FY26 AERA has considered the expenses as per AO filing which were based on different assumptions and were lower than the amount arrived as 6% percentage of opening RAB. Notwithstanding our comments given above on restricting the R&M expenses, we submit that if a principle is applied that should be adhered consistently irrespective whether the value is higher or lower, rather than cherry picking for individual year.

2.4.3.4 **We request AERA to true-up the R&M expenses based on actual cost incurred, without any capping.**

3 Chapter 3 “Comments on Consultation Paper Chapter 6 – Traffic Projections for the Third Control Period”

3.1 AERA proposal as per 6.2.3 page 83 of CP relating to Exempted Traffic

The Authority notes that the Airport Operator has considered only billable ATM, after excluding ATM traffic that are exempted from landing charges. However, the Authority is of the view that RCS scheme is promoted by the GoI with the objective of making regional air connectivity affordable by supporting airline operators through concessions offered by Central Government, State Government and the Airport Operators. As this scheme is promoted to encourage small aircrafts, therefore the flights operating under this scheme are not eligible to be claimed as a passthrough/ exemption. The Authority notes that, as per AO, out of the total exempted traffic (being flights with less than 80-seater capacity), being 3% to 5% of the total domestic ATM, nearly 50% constitutes flights operating under the RCS scheme and the balance pertains to other than RCS schemes. Based on the above factors, the Authority has estimated traffic projections after excluding ATMs that pertain to less than 80-seater capacity flights which fall under non-RCS category and being exempted from landing charges. The Authority, after rationalization has derived the exempted traffic as 4% for FY 2021-22 and has considered the same for determining the billable domestic ATM for FY 2021-22. For the remaining tariff years the Authority has considered the exempt traffic submitted by the AO (refer Table 51). Based on the above factors, the exempt traffic considered by the Authority (after excluding ATMs that pertain to less than 80-seater capacity flights which fall under non-RCS category) for determining billable domestic ATM for the Third Control Period for CCSIA is as follows:

Table 53: Exempt traffic considered by the Authority for determining billable traffic for the Third Control Period for CCSIA

Particulars	FY 21-22*	FY 22-23	FY 23-24	FY 24-25	FY 25-26
Exempt Domestic ATM considered by the Authority	4%	4%	3%	3%	3%

** Actual data has been considered for FY 2021-22.*

Similarly, Government of India has allowed exemption of UDF to certain categories of passengers through Order No. AIC 14/ 2019 read with AIC 20/ 2019. The AO cannot claim any passthrough regarding UDF on such categories and this is followed by AERA across all the Major Airports.

Comments by LIAL:-

3.1.1 We would like to mention that exempted ATM of 3%-4% assumed at the time of MYTP in July 2021 was based on situation at that time. However, the situation has changed considerably over last 18 months. In July 2021, only Alliance Air was operating with ATR for scheduled domestic operation that is for once daily departure to Gorakhpur. Subsequently, Indigo and Alliance Air have increased the routes and today they connect to 9 destinations through ATRs i.e. Jaipur, Delhi, Agra, Indore, Gorakhpur, Nagpur, Dehradun, Prayagraj and Pantnagar. In this regard we had submitted the trend of exempted traffic details to the Authority on 27th January 2023 and 07th February 2023 where it shows that exempted domestic ATMs are approx. 15% of total domestic ATMs. We would like to reproduce the month wise traffic details

Month	Total ATM				Less than 80 seater			% of less than 80 seater flight of Domestic ATM
	Domestic	International	Non-Schedule	Total	Non-RCS Flight	RCS Flight	Total Less than 80 seater	
Nov-20	2,160	359	63	2,582	-	-	-	0%
Dec-20	3,024	425	78	3,527	-	-	-	0%
Jan-21	2,481	413	24	2,918	-	-	-	0%
Feb-21	3,160	535	16	3,711	192	-	192	6%
Mar-21	2,469	386	87	2,942	118	8	126	5%
Apr-21	2,123	366	172	2,661	60	60	120	6%
May-21	1,152	201	69	1,422	103	70	173	15%
Jun-21	1,321	146	-	1,467	2	60	62	5%
Jul-21	1,735	187	-	1,922	-	62	62	4%
Aug-21	1,775	216	-	1,991	5	57	62	3%
Sep-21	2,023	390	-	2,413	162	60	222	11%
Oct-21	2,531	466	-	2,997	181	94	275	11%
Nov-21	2,961	466	-	3,427	137	88	225	8%
Dec-21	3,078	473	-	3,551	138	68	206	7%
Jan-22	2,293	525	-	2,818	172	90	262	11%
Feb-22	2,477	492	-	2,969	178	78	256	10%
Mar-22	2,998	568	-	3,566	283	102	385	13%
Apr-22	2,841	457	-	3,298	296	150	446	16%
May-22	2,916	484	-	3,400	300	150	450	15%
Jun-22	2,677	493	-	3,170	266	154	420	16%
Jul-22	2,596	546	-	3,142	272	154	426	16%
Aug-22	2,946	548	-	3,494	264	154	418	14%
Sep-22	3,158	520	-	3,678	290	142	432	14%
Oct-22	3,305	482	-	3,787	321	160	481	15%
Nov-22	3,442	427	-	3,869	356	152	508	15%
Dec-22	3,476	468	-	3,944	342	156	498	14%

3.1.2 In respect to exempted passenger, we would like to draw the attention of Authority on the Tariff order for Bangalore Airport for Third Control Period order no. 11/2021-22 dated para 4.5.9 onwards.

Transfer passengers at Bangalore Airport

4.5.9 The Authority noted BIAL's submission related to transit/ transfer passengers at Bengaluru airport. The Authority noted from the Second Control Period order for BIAL that the transit/transfer passengers transiting upto 24 hours are exempted from levy of UDF. The relevant extract is produced below:

"Transit/transfer passengers (this exemption may be granted to all the passengers transiting upto 24 hours "A passenger is treated in transit only if onward travel journey is within 24 hours from arrival into airport and is part of the same ticket, in case 2 separate tickets are issued it would not be treated as transit passenger").

4.5.10 The Authority noted that BIAL has revised its projections of the share of the transit/ transfer passenger in the total passenger based on the actual transit/ transfer passenger share of FY21. The same are produced below:

Table 67: Forecast of share of transit/ transfer passenger in total passenger as per BIAL's MYTP for the Third Control Period

% of Exempt passengers	FY2022	FY2023	FY2024	FY2025	FY2026
Domestic Pax	13%	13%	13%	13%	13%
International Pax	5%	5%	5%	5%	5%

Table 68: Forecast of share of transit/ transfer passenger in total passenger as per BIAL's ATP for the Third Control Period

% of Exempt passengers	FY2022	FY2023	FY2024	FY2025	FY2026
Domestic Pax	25.75%	17.45%	17.45%	17.45%	17.45%
International Pax	16.07%	11.11%	11.11%	11.11%	11.11%

4.5.11 The Authority examined the submissions made by BIAL related to the transit passengers in its ATP. The Authority is of the view that the increase in the transit passengers during FY21 is on account of the COVID-19 pandemic and thus, it is a short term trend and not likely to sustain in the future. Further, the Authority will be truing up the aeronautical revenues for the TCP based on actuals which will take into the actual transit passengers at BIAL. Therefore, the Authority decides that the share of transit passengers proposed by BIAL as part of its MYTP seem reasonable for the Third Control Period.

4.6 Authority's decisions regarding traffic projections for the Third Control Period

Based on the material before it and based on its analysis, the Authority has decided the following with regards to traffic projections for the Third Control Period:

4.6.1 To consider the passenger traffic, ATM traffic and cargo traffic as per Table 66 respectively which shall be trued up based on actuals.

4.6.2 To consider the share of transit passengers as per Table 67 for the Third Control Period.

3.1.3 In the Bangalore Tariff order, AERA has accepted the contention that transit passengers are exempted from UDF and the percentage share of transit passenger assumed by Bangalore seems reasonable.

3.1.4 In AERA Order No. 46/2015-16, in respect of Metro Development Fees approval determination of Metro Connectivity Project for Mumbai Airport, AERA has suitably adjusted the billable passengers after deducting the exempted Passengers. The relevant extract from Order is provided as follows: -

Decision 5.b - To estimate the future billable passengers for both domestic and international passengers, as considered in Table 5.

Table 5: Estimated Billable Embarking Passengers for FY 2015-16 to FY 2023-24

Particulars (in millions)	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23	FY 2023-24
Total domestic passengers (A)	27.15	29.25	31.51	33.95	36.57	36.57	36.57	36.57	36.57
Total international passengers (B)	12.20	13.03	13.91	14.86	15.86	15.86	15.86	15.86	15.86

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Embarking Domestic Passengers (C) = (50% of A)	13.58	14.63	15.76	16.98	18.29	18.29	18.29	18.29	18.29
Embarking International Passengers (D) = (50% of B)	6.10	6.52	6.96	7.43	7.93	7.93	7.93	7.93	7.93
Billable domestic passengers (E) = (80% of C)	10.86	11.70	12.60	13.58	14.63	14.63	14.63	14.63	14.63
Billable international passengers (F) = (80% of D)	4.88	5.21	5.57	5.94	6.35	6.35	6.35	6.35	6.35

3.1.5 As can be seen from above, Authority has been consistently recognizing the exempted traffic and its impact in collection.

3.1.6 It is to be noted that AO has done adjustment in ATMs and Passengers to calculate only the billable traffic. The adjustment is necessitated to project the correct Aeronautical revenues.

3.1.7 **We, therefore, request Authority to consider deduction of exempted ATM of 15% and Passenger traffic of 3%, as per latest trends, while determining billable traffic for projection of aeronautical revenues. Accordingly, LIAL has prepared its ATP after considering only billable traffic. If we do not reduce the traffic which is not billable, the same will result in a known under-recovery since inception as projected ARR will not match with correct projected revenue.**

4 Chapter 4 “Comments on Consultation Paper Chapter 7 – Capital Expenditure (Capex), Depreciation and Regulatory Asset Base (RAB) For The Third Control Period”

4.1 AERA proposal as per clause A2 iv on page 109 of CP relating to capitalisation of Phase 1 of Terminal 3

The Authority notes that the construction of Phase I of the T3 project was temporarily suspended by the Contractor during the COVID-19 pandemic. Although the work had resumed in the beginning of the current Control Period, the Authority observes slackness in the pace of execution of work which is attributable to the delays on account of COVID-19 pandemic and the handing-over/ take-over of the Airport by AAI to the AO. Further, the Authority during its visit to the Airport in December 2022 noted that work orders for certain enabling works (such as CUTE, CUSS, Automated Baggage drop etc) have not been issued by the AO.

In the background of the above facts, the Authority is of the view that the Phase I of the construction of T3 may most likely be completed by the end of the FY 2023-24. Even, if the Phase I of the project is completed by the end of FY 2023-24, the Authority feels that there are other enabling works which are necessary for the operational readiness such as Passenger processing system, AOCC, CUTE, CUSS, FIDS, In-line X-Ray screening, other IT related services that needs to be executed by the AO to make the airport available for the usage of the passengers. Considering these factors, the Authority proposes to consider capitalization of the Phase I of this project in the first quarter of FY 2024-25.

Comments by LIAL:-

4.1.1 Please refer below to the photographs of Terminal 3 Phase 1 project progress as on February-2023 vs December-2022 (the same was presented during the stakeholder meeting on 07th March 2023).

Terminal building Air side view

adani

Dec'22 Feb'23

Façade glass and Bull nose ACP work at airside 50% completed.

Terminal building landside view

adani

Dec'22 Feb'23

Façade glass erection started, bull nose structural erection completed and canopy erection started.

Terminal building departure floor landside view

adani

Dec'22 Feb'23

Façade glass erection started, bull nose structural erection completed, and canopy erection started.

Terminal building west side view

adani

Dec'22

Feb'23

Temporary phasing wall partition erection started.

Terminal building departure floor

adani

Dec'22

Feb'23

Departure wall cladding work in progress.

Terminal building Arrival Floor

adani

Dec'22

Feb'23

BHS installation in arrival floor in progress.

Terminal building Departure Floor Landside ATRS Area

adani

Dec'22

Feb'23

ATRS work started at departure level.

Terminal building Rotunda Air side

adani

Dec'22

Feb'23

PBB foundation work in progress.

Terminal building BHS work

adani

BHS work progress at all levels.

In line X-ray Machine Reached at site

IT Hub Room (work-in-progress)

AOCC & SOCC Room (work-in-progress)

4.1.2 AERA has mentioned that various enabling work PO has not been ordered till December-2022. In this respect, please find below the status for the enabling work as raised by the Authority.

Sl No	Particulars	Status as on date	Expected date of delivery at site	Annexure No. for the PO / Invoice/other supporting document
	Airport Systems			
1	BHS	Awarded to Vanderlande	80% material received at site	**Annexure 1**
2	PBB	Awarded	Apr'23	**Annexure 2**
3	Security Equipment's	Awarded to Smiths Detection Systems Pvt Ltd on 12th August 2022	Part supply received at site rest will be received by April'23.	**Annexure 3**
4	Passenger Screening Equipment	Awarded	HHMD and DFMD received at site, ETD in Transit	**Annexure 4**
5	Self Bag Drop	Awarded	Apr'23	**Annexure 5**
6	Hand Baggage Security Equipment	Awarded	Almost 50% material received at site	**Annexure 3**
7	VGDS		In advance stage of award	
8	GPU & PCA	Not Awarded		
9	AOCC	Civil, Electrical and finishes work under progress		
10	ATRS	Awarded	60% material received. Balance will be received by Apr'23	**Annexure 6**

For IT related works

Sl No	System	Revised estimate (Rs in Crs)	Awarded value (Rs in Crs)	Annexure No. for the PO / Invoice/other supporting document
1	MTCS	0.43	0.41	**Annexure 7**
2	DC	2.19	1.70	**Annexure 8**
3	Video Wall (SOCC, AOCC, BHS)	0.84	0.89	**Annexure 9**
4	Immigration CCTV	0.58	0.66	**Annexure 10**
5	FIDS	3.43	3.65	**Annexure 11**
6	CCTV	11.43	10.70	**Annexure 10**
7	ACS	8.68	4.97	**Annexure 12**
8	ACN	37.00	19.84	**Annexure 13**
9	PBX	1.98	1.45	**Annexure 14**
10	Training Room & Meeting Room	0.33	0.57	**Annexure 15**
11	AOCC – Workstation	0.23	-	
12	BHS – Workstation	0.02	-	
13	EPOS	0.81	-	

Sl No	System	Revised estimate (Rs in Crs)	Awarded value (Rs in Crs)	Annexure No. for the PO / Invoice/other supporting document
14	Passenger Processing System	15.44		
15	Interface Cost	1.01	-	
16	Data Center Services	0.95	-	
17	System Integrator	5.00	0.89	**Annexure 16**
18	Soft cost for Desktop & Laptop	0.18	-	
19	Soft cost for FIDS	0.52	-	
20	Soft cost Server	0.12	-	
	Sub-Total (excluding GST)	**91.17**	**45.73**	
	Sub-Total (including GST)	**107.58**	**53.96**	

4.1.3 Above mentioned IT works are in advanced phase of execution, the necessary back-end work like trunking and cabling has achieved substantial completion and front-end IT related equipment's will be delivered by April 2023.

4.1.4 Service yard/ utility building for Terminal 3 is ready for commissioning and is awaiting power supply. We have applied for power connection to Madyanchal Vidyut Vitran Nigam Limited for new terminal. Attaching the copy of the same in **Annexure 17**.

4.1.5 In addition, we would like to submit the status of NCC contract as on Feb'2023. The same can be verified from the letter from NCC (**Annexure 18**)
Manpower Strength – Almost 3,000 people are working at site.

Material Status of Delivery at site

		Delivery at site
A	**Architectural Structure**	
	Water Proofing material, TMT Steel, Structure Steel, Liner Sheet, Top Sheet, Deck Sheet, Kota Stone, Elevated Road Bearing,	Almost 100% complete
	Granite Stone, Façade Glass	More than 60% complete
	Other items are false ceiling, doors and windows, expansion joint	More than 40% complete
B	**MEP**	
	Electrical - DG Sets, DG cooling towers, 33 EV Transformers, 11 EV Transformers, 11 EV Panels, 33 EV Panels, LT Panels, HT & LT Cable, UPS supply	100% delivery completed All except LT panels and lighting fixtures 100% completed. a. LT Panel 67% completed. b. b. Lighting fixtures procurement under progress.
	Fire Fighting Pumps – Pumps, Sprinklers, various MS pipes ranging from 25 mm Dia to 300 mm Dia	100% completed except fire pumps. Expected delivery of fire pumps by April'23.
	HVAC – HWG, Chillers, Cooling Towers, Axial Fans, AHU, HVAC pumps, Twin Pump	95% delivery completed
	Airport IT – PAVA, DAS, Fire Alarm System, Cable Tray	50-100% delivery completed except cables

		Delivery at site
	STP & WTP	100% delivery completed
	VHT	100% delivery completed

Construction completion program

	Finish Date
Issue of Drawings	Apr-2023
Subcontracting of Civil Works, Structural Steel Works, MEP Works	Apr-2023
Procurement of Civil Works, Structural Steel Works, MEP Works	Jun-2023
Construction Phase 1	
T3 Building Major works	Aug-2023
Service yard including WTP, STP and Chiller Plant etc.	Apr-2023
Elevated road	May-2023
Grade level roads	Jun-2023
Wearing coarse and road markings	Jul-2023
External MEP works	Jul-2023
Other miscellaneous works	Aug-2023
ORAT	Sep-2023
Commercial date of Operation of T3	Oct-2023

4.1.6 LIAL has already started planning for ORAT (Operational Readiness and Airport Transfer) seeing the fast-paced construction of New Terminal 3 (T3) and with an objective of operationalizing T3 from Oct'23. In this regard, LIAL has also started stakeholder engagement and designing of operational concept for operationalization of new terminal.
LIAL will perform Basic, Advanced and End User trials for T3 from June'23 till Sep'23 that will include but not limited to individual system testing, integrated trial, transition planning and shifting.

4.1.7 Basis project progress awarded contracts and detailed time schedule; LIAL is confident of operationalizing the terminal in October 2023.

4.1.8 **In light of above, we hereby request the Authority to consider capitalization of Phase 1 of Terminal 3 in October 2023, instead of first quarter of FY 2024-25.**

4.2 AERA proposal as per clause A2 v on page 110 of CP relating to Determination of allowable project costs of T3 by the Authority

The Normative cost approved by the Authority vide its Order No. 07 / 2016-17dated June 6, 2016 for Terminal Buildings is ₹ 65,000/- per Sq.m. The cost of following items of specification have been considered for analysis of the prescribed rate per Sq.m.- cost of terminal building, air conditioning, fire-fighting system, water supply, sanitary, substation equipment for power supply including stand by system, passenger facilities viz FIDS, Furniture, Signages and Security surveillance, airlines related services viz Check-in, CUTE, CUSS and Baggage Reconciliation System, In-line X ray screening, Standalone screening , BHS for arrival and departure, Escalators, Elevators, Travelators and PBB are included. However, the cost of Elevated and other roads connected with the Terminal Building is not part of the Normative rate and has been considered separately. The cost of other items, required for the Terminal Building, but which are not covered in the aforementioned list, will be derived separately and added to the overall cost of the project.

In this respect, the Authority notes that it has considered a normative cost of ₹100,000 per Sq.m in some of the recent tariff orders, based on the superior specifications, processes and the architectural features of modern Terminal Buildings. Further, the Authority feels that as the work on new Terminal Building projected by the Airport Operator would be carried out over the first 4 FYs of the Third Control Period, it would be reasonable and justifiable to derive the project cost based on inflation-adjusted normative cost up to FY 2025-26 (using WPI inflation index) to address the time value of money.

Inflation-adjusted Normative cost of T3 project

The Authority has derived the inflation adjusted normative rates for Terminal Building for the current Control Period by considering the rate of inflation as follows:

FY 2021-22 –The Authority observes that FY 2021-22 was an exceptional year due to COVID -19 pandemic, wherein the inflation rate was 12.97%. However, during the period FY 2016-17 to FY 2020-21, the rate of inflation was in the range of 1.31% to 4.26%. Considering this extraordinary situation, the Authority feels that the inflation rate of FY 2021-22 needs to be rationalized. Hence, instead of considering the inflation rate of 12.97% for FY 2021-22 (as per press release dated April 18, 2022 by Dept. for Promotion of Industry and Internal Trade, Government of India), the Authority has considered the average rate of inflation of FY 2020-21 (1.29%)2 and of FY 2021-22 (12.97%), which works out to 7.14%. The Authority has considered this average rate of inflation for FY 2021-22, in order to smoothen out the volatility in commodity price caused by COVID-19 pandemic and the supply side disruptions.

FY 2022-23 – 10.40% (considered as per 79th Round of Survey of Professional Forecasters on macroeconomic indicators) and

FY 2023-24 to FY 2025-26 – 5.0% (considered as per 79th Round of Survey of Professional Forecasters on macroeconomic indicators). The inflation adjusted normative costs, thus derived is presented in the below table:

Table 64: Details of Inflation-adjusted Normative rates derived by the Authority

Particulars	Inflation adjusted normative rates (in ₹)
FY 2021-22	1,07,140.00
FY 2022-23	1,18,283.00
FY 2023-24	1,24,197.00
FY 2024-25	1,30,407.00
FY 2025-26	1,36,927.00

The built-up area in Phase 1 of the Terminal Building is 1,17,674.69 sqm, and the additional area in Phase 2 is 33,529.88 as per drawings provided by the AO.

Based on the above details, the normative cost of the Terminal Building derived by the Authority is as follows:

Phase 1 of the T3 project (Expected to be completed by end of FY 2023-24 and capitalised in the First Quarter of FY 2024-25):

Inflation adjusted normative cost for FY 2023-24# (A) = ₹ 1,24,197.00 per sqm

Add GST @ 6% (refer Note below) (B) = ₹ 7,452 per sqm

Normative cost including GST (C = A+B) = ₹ 1,31,649.00 per sqm

Cost of terminal building = 1,17,674.69 sqm (terminal area) x ₹ 1,31,649.00 (normative rate per sqm) = ₹ 1,549.18 Crores.

Normative costs** including applicable taxes such as GST (Phase 1) = **₹ 1,549.18 Crores.

The Authority notes that the total cost estimate of the AO without including PMC and other soft costs is ₹ 2,836.50 Crores (considering the revised cost of awarded works to M/s. NCC i.e., ₹ 2,030.50 Crores, refer Table 62). Based on the same, the proportionate cost of Phase I, i.e., for 117,674.69 Sq.m out of total planned area of 151,204.57 Sq.m works out to ₹ 2,207.50 Crores which is much higher than the inflation-adjusted normative cost of ₹ 1,809.18 Crores derived by the Authority (refer Table 65).

Comments by LIAL:

4.2.1 First of all, we would like to mention that AERA has been using Rs 1,00,000 per sq mtr as a Normative Costing based on the study conducted which prescribed range from Rs 95,000 to 1,25,000 sq tr. It is also observed that AERA has never issued the study in the public domain for comments by the stakeholders. The relevant extracts from some of the order are as:-

Extract from Patna Order No. 13/2019-20 dated 24th Oct. 2019

7.2.2.2 The Authority examined the rationale behind the proposed capital expenditure, along with its status. Further, the Authority sought and observed a detailed break-up of the expected costs for this capital expenditure.

7.2.2.3 The Authority has adopted the 'normative approach' towards determination of cost of terminal building. The Authority has considered a normative cost of INR 100,000 per sq. meters. The Authority has given clarification regarding this normative cost in previous tariff orders pertaining to other airports such as Guwahati, Lucknow. The Authority undertook studies for a few major airports for determining the reasonableness of the capital expenditures for their respective terminal buildings. As per these studies, the cost worked out to be in the range of 0.95 to 1.25 lakhs per sq. meter. Accordingly the Authority decided to adopt INR 100,000 per sq. meter for terminal buildings of this design and specifications. This cost is subject to review during the determination of tariff for the 2nd control period.

Extract from Amritsar order No. 56/2020-21 dated 24.12.2020

7.2 Authority's examination regarding Capital Expenditure for the First Control period at Consultation stage

7.2.1 The Authority examined the proposed capital expenditure including its rationale, detailed line item wise breakup, current progress including procurement steps and future planning.

7.2.2 The Authority analyzed the expansion of existing terminal building being proposed including the need and objectives, proposed capital expenditure, and, scope of work. The Authority noted that the CAPEX proposals are in the planning stage and yet to be awarded. Accordingly, the key takeaways noted below.

- As per AAI's submissions, the expansion of existing PTB shall be spread across an area of 16,000 sqm (Ground Level – 8,000 sqm and First Floor– 8,000 sqm) with a cost estimate of INR 243.28 crores. The unit area cost for the expansion of terminal worked out to INR 152,050 per sqm.
- The Authority has adopted the normative approach towards determination of cost of terminal building and has considered a normative cost of INR 100,000 per sq. meters in line with previous tariff orders pertaining to other airports such as Guwahati, Lucknow, Chennai and Patna. The Authority conducted a study of few Major Airports for determining the reasonableness of the capital expenditures for respective terminal buildings. As per these studies, the cost worked out to be in the range of 0.95 to 1.25 lakhs per sqm. Accordingly, the Authority decides to adopt INR 100,000 per sqm for terminal buildings of similar design and specifications.

Without prejudice to the above some of the observations on normative approach are provided below.

4.2.2 In respect to inclusion/exclusion of Service Tax/GST in Normative Cost, we submit that

4.2.2.1 In the AERA Order No. 43/2021-22 dated 15th March 2022 for Kolkata Airport, AAI submitted the Normative Cost benchmarking whereby GST has been

excluded in the calculation. The same was duly noted and acknowledged by the Authority.

6.2.43. The cost per sq.m. for the above terminal building work was submitted by AAI vide an email correspondence dated 09.12.2021 ("Normative cost for Capacity Enhancement at Terminal Building"). The Authority had noted that the normative cost working submitted by AAI did not include the cost of modification works pertaining to cut-out fillings, piling foundation work, and basement work. The details of the same are provided in the table below:

Table 85: Normative cost calculation for capacity enhancement at terminal building submitted by AAI

Description	Amount (in Rs. Cr.)	Area (in sq.m.)	Rate per sq.m.
Cost excluding modification work, consultancy charges, Corporate Environment Responsibility, and GST (A)	80.90	11,774	68,711
Cost per sq. m for piling work (B)	-		10,371
Cost per sq. m. (C = A - B)	-		58,340
Normative Cost benchmark	-		1,21,665

4.2.2.2 Refer the extract from RITES report for Analysis of Capital Expenditure on Expansion of Bangalore International Airport (Terminal Building, Taxiway and Apron) for the second control period (01/04/2016 to 31/03/2021) conducted in Jan-2018, where it is mentioned that in order to compare the project cost against the normative costing, **the project cost without Service tax is analyzed**. ***Extract from RITES REPORT***

"The cost of terminal building is proposed at Rs.1,00,800 per sqm at June 2014 price level as against AERA prescribed norms of Rs. 65,000/sqm. This rate has further been adjusted for cost escalation ***and service tax which*** *works out to Rs. 1,30,745/sqm. Inclusive of ICT costs."*

4.2.2.3 Therefore, the contention of the Authority that Normative Cost includes the erstwhile Service Tax is not correct. Hence, we request the Authority to kindly add GST of 18% instead of adding 6% differential between GST and Service Tax while calculating the Normative Cost benchmark.

4.2.3 In respect of application of WPI index we would like to submit that : -

4.2.3.1 In the recently approved order for Mangalore Airport Order No. 38/2022-23 dated 12th January 2023, the Authority considered the full WPI impact of 12.97% for FY21-22 while analyzing the project costing.

Table 59: WPI Inflation adjusted Contract cost for Construction of Parallel taxi Track Project

Particulars	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21	FY 2021-22
WPI *	100.00	102.96	107.35	109.14	110.57	124.91
AAI awarded Contract Cost (₹ in Crores)	97.71	100.60	104.89	106.64	108.04	122.05

* *Source:* Office of The Economic Adviser, Government of India (https://eaindustry.nic.in)

d. Further, the Authority observed from the detailed BOQ and Deviation Statement submitted by the Airport Operator for the period up to March 2022 that an amount of ₹ 4.71 Crores had already been incurred towards escalation costs and an additional amount of ₹ 2 Crores is anticipated to be incurred by the Airport Operator towards escalation for completion of this project. The Authority proposed to include the total escalation costs of ₹ 6.71 Crores to the inflation adjusted Contract cost of ₹ 122.05 Crores derived by it, thus resulting in the total estimated project cost of ₹ 128.76 Crores.

e. As a result, the Authority noted that the total CAPEX submitted by the Airport Operator (₹ 126 Cores) for this project is within a reasonable range of the inflation adjusted contract cost of ₹ 128.76 Crores derived by it and hence, proposed to allow ₹ 126 Crores for this project.

4.2.3.2 The approach of the Authority to consider average WPI inflation for FY20-21 and FY21-22 while calculating the Normative Costing is inconsistent with recently approved order.

4.2.4 In respect to items which are not part of Normative costing but need to be added separately, we submit that

There are certain items which are excluded from the purview of Normative Costing and hence need to be added over the above the Normative Costing. Such list of items includes but not limited to ATRS, Self Drop Baggage, GPU and PCA, Water Treatment Plant, ORAT, BMS, Art Work, Egates, etc.

4.2.5 In light of above, the total cost as per Normative Costing considered should have been considered as follows:-

Financial Year	WPI	Inflation Adjusted Normative Cost (Rs per sq mtr) (A)	GST 18% (B)	Total Normative Cost (Rs per sq mtr) (A) + (B)
FY20-21		100,000		
FY21-22	12.97%	112,970	20,335	133,305
FY22-23	10.40%	124,719	22,449	147,168
FY23-24	5.00%	130,955	23,572	154,527

Particulars	Unit	Result	Remarks
Applicable Normative Cost for FY23-24	Rs per sq mtr	154,527	As per above table
Phase 1 Area	sq mtr	117,675	Proportionate area of T3 for Phase 1
Normative Cost (Rs Crs)	**Rs Crs**	**1,818**	
Add: Items which are not part of Normative Cost			
Elevated Roads and other roads	Rs Crs	295	AERA has considered this with lower amount. We request authority to kindly consider the full amount which is based on the contract awarded.
ATRS	Rs Crs	23	Normative order does not specify the ATRS as part of the equipment. AERA has allowed ATRS for Cochin Airport separately and not as part of the Normative Costing. Refer below the extract.
Self-Bag Drop	Rs Crs	25	Normative order does not specify the self-bag drop as part of the equipment
Internal Partition, Paneling, Railing and Cladding	Rs Crs	68	
GPU and PCA	Rs Crs	42	Normative order does not specify the GPU and PCA as part of the equipement. Further GPU and PCA are Environment related initiatives which help to reduce usage of conventional method of power. AERA has allowed GPU and PCA for Cochin Airport separately and not as part of the Normative Costing. Refer below the extract.
VDGS	Rs Crs	14	Normative order does not specify the VDGS as part of the equipment.
Water Treatment Plant	Rs Crs	2	This is also not mentioned as part of Normative Costing in the AERA Order.
Aspiration detection system	Rs Crs	5	
ORAT and house keeping	Rs Crs	30	AERA has allowed ORAT of Rs 40 Crs in the recently approved order for Bangalore Airport. Refer below the extract
Art Work	Rs Crs	115	
IP PBX Telephone system	Rs Crs	3	
BMS	Rs Crs	2	
E-Gates	Rs Crs	9	
Total Cost of Phase 1	**Rs Crs**	2,452	

ATRS - Extract from Cochin Airport Order No. 08/2021-22 dated 24th August 2021

Table 134: Capital Expenditure for the Third Control Period considered by the Authority

Reference		Particulars (INR Cr)	As per CIAL	As per Authority		
			Total Capex	Total	Aero	Non-Aero
A	A.1	Construction of import warehouse	52.70	52.70	52.70	0.00
	A.2	Modification of existing warehouse	35.94	35.94	35.94	0.00
	A.3	Mechanisation of export warehouse after modification	10.35	10.35	10.35	0.00
		Cargo facilities (sub-total)	**98.99**	**98.99**	**98.99**	**0.00**
B	B.1	Construction of parking bays phase 2	145.52	156.22	156.22	0.00
	B.2	Development of northern side of T3 pier	189.86	178.79	166.45	12.34
		Pier expansion and parking bays phase 2 (sub-total)	**335.38**	**335.01**	**322.67**	**12.34**
C		Flood control measures in airport area	93.07	93.07	93.07	0.00
D		CISF Quarters	74.01	0.00	0.00	0.00
		IT Systems:				
E	E.1	CCTV Surveillance system	43.81	43.81	43.81	0.00
	E.2	CT based Hand baggage X-BIS T3	29.98	29.98	29.98	0.00
	E.3	CT based Hand baggage X-BIS T1	25.12	25.12	25.12	0.00
	E.4	SOC & NOC for IT	15.92	15.92	15.92	0.00
	E.5	Digi yatra – IT systems	30.69	0.00	0.00*	0.00
	E.6	Perimeter intrusion detection systems	22.35	22.35	22.35	0.00
	E.7	Smart Lane – T1	19.88	19.88	19.88	0.00
	E.8	Smart Lane – T3	22.48	22.48	22.48	0.00
	E.9	Passenger processing IT systems	31.40	31.40	31.40	0.00
		IT Systems (sub-total)	**241.62**	**210.93**	**210.93**	**0.00**

(E.7) Smart Lane - T1

6.2.37. CIAL had submitted that 7 Smart Lane systems integrated with the hand baggage X-BIS are proposed to be implemented in the Third Control Period for fast and efficient passenger, baggage and tray handling at pre-embarkation security checks in the Domestic Terminal (T1). The system would consist of roller trays for automated diversion of security cleared and suspicious baggage based on the security screener's decision and would have automatic tray return feature that will eliminate the need to transport trays manually.

(E.8) Smart Lane – T3

6.2.38. Similar to the implementation in T1, another 7 Smart Lane systems are planned to be installed in the International Terminal (T3).

GPU and PCA - Extract from Cochin Airport Order No. 08/2021-22 dated 24th August 2021

Table 130: Capital expenditure towards GPU and PCA as considered by the Authority

Reference	Particulars	FY of commissioning as per		Cost as per (INR Cr.)	
		CIAL	Authority	CIAL	Authority
I	GPU and PCA South and North of T3	2025	2026	21.51	24.46*

**including adjustment for inflation on account of postponement*

ORAT - Extract from Bangalore Airport Order No. 11/2021-22 dated 28th August 2021

The Authority has examined BIAL's submission to consider the ORAT expenses as part of the capital expenditure instead of operational expenditure so that it is consistent with the Authority's approach for DIAL. The Authority noted that if the ORAT expenses are taken as part of the capital expenditure then the ORAT costs will spread out over a longer period which will lead to lower tariffs. Accordingly, the Authority decides to consider the ORAT expenses as part of the capital expenditure and include it as part of the RAB.

4.2.6 In respect to Actual cost on incurrence Vs Normative Cost, we submit that:-

4.2.6.1 As per AERA Order No. 07/2016-17 on Normative Approach it is mentioned that "11 *iv in case the rates are higher than the ceiling rate approved by the Authority, the justifications, so submitted by the airport operators on* ***actual***

incurrence of the cost shall be examined by a duly constituted Committee of experts to be constituted by Authority and based on their recommendations the final costs will be adopted."

4.2.6.2 AERA in its Order No. 37/2017-18 dated 20th Feb 2018 for Second Control Period of Lucknow Airport has ordered that

".....Authority shall undertake a study on reasonableness of capital expenditure after capitalization of Phase I of Terminal Building and make appropriate adjustments while determining tariffs for third control period; ***Based on the outcome of study and the fairness of the tender procedures followed for selection of contractor, the Authority proposes to true-up capital expenditure at the time of tariff determination for 3rd control period. based on the fairness of the tendering process, it will true-up the necessary cost in the next control period.***"

4.2.6.3 AERA Order No. 03/2018-19 dated 16th April 2018 for determination of tariffs for Chennai Airport for Second Control Period, AERA mentioned that it has done a study of various Airports. As per these studies, the costs work out to approx. Rs. 1,00,000 per sq mtr. It is the first time that AERA applied Normative Cost of Rs. 1,00,000 per sq mtr. ***Also in the said order AERA mentioned that it will undertake a study of technical experts to estimate the reasonable capital expenditure for construction of terminal building and various airside works vis-à-vis normative benchmarks and make appropriate adjustments while determining tariffs for next control period.*** Relevant extracts from the order is as:-

9.54. With respect to AAI's comment on the normative approach, the Authority, in order to avoid delay in determining the tariffs for CIA, decides to undertake the study on reasonableness of capital expenditure of the first phase of construction of terminal building assets and make appropriate adjustments while determining tariffs for third control period. In the Consultation Paper, the Authority had proposed to adopt inflation adjusted normative cost to arrive at the allowable capital expenditure for 2nd control period. AAI has asked for a review of this approach. The Authority has already undertaken studies for a few other major airports for determining the reasonableness of the capital expenditure for their respective terminal buildings. As per these studies, the cost works out to approximately ₹ 100,000 per sq. m. of terminal building assuming glass & steel facade. The Authority is of the view, that this cost reflects a realistic estimate of the capital expenditure. The Authority, therefore, decides to consider capital expenditure towards first phase of the construction of terminal building based on cost per sq. m. benchmark of ₹ 100,000 per sq. m. subject to review, later on.

9.58. The Authority decides to undertake a study by technical experts to estimate the reasonable capital expenditure for construction of terminal building, construction 'N' taxitrack (balance portion) connecting Runway 07-25, construction 'R' taxitrack left out portion connecting Runway 12-30, RET-I and RET25_1 vis-à-vis normative benchmarks and make appropriate adjustments while determining tariffs for third control period.

4.2.6.4 As can be seen above, as provided in the Normative Approach order and various Airport tariff orders, AERA provides for true-up on actual incurrence basis based on study of technical experts. **However, there is no such mention in the subject consultation paper for Lucknow Airport. We request Authority to kindly add the similar statement in the final order.**

4.3 AERA proposal at clause A3 on page 113 of CP relating to Green Initiative (Solar PV 3 MW solar plant)

A3: Green Initiatives:

Solar PV 3 MW solar plant *has been projected by the AO for ₹ 19.92 Crores in FY 2024-25 considering ₹ 7 Crores per MW. However, the Authority has considered a cost of ₹ 4.50 Crores per MW based on cost incurred at other airports (as against ₹ 7 Crores submitted by the AO), and based on the same, the allowable cost estimated is ₹ 13.50 Crores during FY 2024-25. The Authority has determined Aeronautical costs of this project as ₹ 12.15 crores, by apportioning the total allowable costs (₹ 13.50 Crores) in the ratio of Terminal Building of 90:10 (refer para 7.4.3 below).*

Comments by LIAL:-

4.3.1 AERA in its order no 43/2021-22 dated 15th March 2022 in the matter of determination of aeronautical tariff for Netaji Subhash Chandra Bose International Airport Kolkata (CCU) for the Third Control Period (01.04.2021 – 31.03.2026) has trued up Rs 81.84 Crs for 15MW Ground mounted solar plant. The proposal made in the consultation paper has been retained in the final order.

Table 17: Summary of aeronautical capital additions proposed to be considered for true-up of the Second Control Period by the Authority in the Consultation Paper

Ref.	Particulars (in Rs. Cr.)	Approved by the Authority in the SCP Order	Actual Capitalisation by AAI in SCP	Capitalisation proposed to be considered by the Authority for true-up in SCP
I	Approved and commissioned in SCP			
	15 MW Ground mounted solar power plant	81.07	81.84	81.84

4.3.2 Inflation adjusted cost of 15MW Ground mounted solar plant comes to Rs 124.4 Crs i.e. Rs 8.3 Crs per MW.

Year	Inflation Rate	Rs Crs	Cost per MW
2016-17		81.8	5.5
2017-18	2.96%	84.3	5.6
2018-19	4.27%	87.9	5.9
2019-20	1.67%	89.3	6.0
2020-21	1.31%	90.5	6.0
2021-22	12.97%	102.2	6.8
2022-23	10.40%	112.9	7.5
2023-24	5.00%	118.5	7.9
2024-25	5.00%	124.4	8.3

4.3.3 Further AAI has capitalized 500 Kw roof top grid connect solar at Terminal 1 of Lucknow Airport on 1st April 2016 at a cost of Rs 2.30 Crs. Assuming the cost was incurred in 2015-16 as the asset is capitalized on 1st April 2016, the cost per MW considering inflationary impact comes to Rs 7.1 Crs.

Year	Inflation Rate	Rs Crs for 500 KW	Cost per MW (Rs Crs)
2015-16		2.3	4.6
2016-17	1.73%	2.3	4.7

Year	Inflation Rate	Rs Crs for 500 KW	Cost per MW (Rs Crs)
2017-18	2.96%	2.4	4.8
2018-19	4.27%	2.5	5.0
2019-20	1.67%	2.6	5.1
2020-21	1.31%	2.6	5.2
2021-22	12.97%	2.9	5.8
2022-23	10.40%	3.2	6.5
2023-24	5.00%	3.4	6.8
2024-25	5.00%	3.6	7.1

4.3.4 LIAL has prudently estimated Rs 7 Crs per MW for solar plant in FY 2024-25 which is in line with inflation adjusted cost allowed for other AAI Airports. **Thus, LIAL requests the Authority to consider the cost as submitted by LIAL.**

4.4 AERA proposal at clause B1 (a) on page 121 of CP relating to Apron and Taxiway related to T3, Cargo, West Side and East Side

Table 69: WPI Inflation adjusted Normative rate (per Sq.m.) derived by the Authority for Apron and Taxiway Project

Particulars	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23	FY 2023-24	FY 2024-25
WPI *	100.00	101.73	104.74	109.21	111.03	112.49		-	-	-
Inflation %**							7.14%#	10.4 %	5%	5%
Rate Per Sq.m. (in ₹)	4,700	4,781	4,923	5,133	5,218	5,287	5,664	6,254	6,566	6,895
Rate per Sqm incl. GST @ 6% (refer note below Table 64 of para A2 (v)									6,960	7,308

* *Source:* Office of The Economic Adviser, Government of India (https://eaindustry.nic.in)

** *Source:* Reserve Bank of India Publications (https://www.rbi.org.in/Scripts/Publications)

Instead of considering the inflation rate of 12.97% for FY 2021-22 (as per press release dated April 18, 2022 by Dept. for Promotion of Industry and Internal Trade, Government of India), the Authority has considered the average rate of inflation of FY 2020-21 (1.29%) and of FY 2021-22 (12.97%), which works out to 7.14%

Comments by LIAL:-

4.4.1 LIAL would like to submit that AERA in its order no. 38/2022-23 dated 12th January 2023 in the mater of determination of Aeronautical Tariff for Mangaluru International Airport (IXE) for the First Control Period (01.04.2021 – 31.03.2026) has considered normal inflation upto FY 2021-22.

Table 65: WPI Inflation adjusted Normative cost (per Sq.m.) for Construction of Taxiway Project at Consultation stage

Particulars	FY 2015-16	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21	FY 2021-22
WPI *	100.00	101.73	104.74	109.21	111.03	112.49	127.07
Per Sq.m. Cost (in ₹)	4,700	4,781	4,923	5,133	5,218	5,287	5,972

4.4.2 **As already explained in point 4.2 above about the inflation and GST to be considered while computing Normative Cost, we request Authority to kindly revise the calculation of Normative Costing accordingly.**

4.5 AERA proposal at clause B1 (b) on page 123 of CP relating to Development of RESA for Runway 09

Development of RESA for Runway 09 *has been proposed by the Airport Operator for a cost estimate of ₹ 10.90 Crores in FY 2022-23.*

The Authority, based upon the site visit conducted by the Independent Consultant between July 27 to July 29, 2022 notes that, RESA is already available at CCSIA and the projected work has been planned for extension of the RESA. Further, the Authority notes that DGCA in their inspection report have pointed out that the RESA of Runway 27 is not maintained properly and the CBR test report of RESA has not been provided. The Authority has noted through the site visit conducted by the Independent Consultant and the Authority that RESA of Runway 27 is on the West side and RESA of Runway 09 is on the East side where the Runway extension has been planned. The Authority is of the view that CBR can be re-evaluated by the AO. The Authority observes that this project work detailed by the AO is with respect to extension of RESA at the East side. Since the Runway extension is in planning stage and will be executed only in the next Control Period, a RESA for the extended runway can be undertaken by the AO along with runway extension at a later stage. Hence, the Authority proposes to maintain minimum RESA as per standard and shift the balance along with runway extension to the next Control Period. Accordingly, the Authority considers ₹ 3 Crores as reasonable for the immediate requirement and proposes to allow the same for capitalization during the current Control Period.

Comments by LIAL:-

4.5.1 CCSIA has a single runway, 09/27. It measures 2,744 m in length and 45m in width. The existing RESA is as below:

- The existing RESA for RWY 09 is 150m x 90m that needs to be increased to full length RESA of 240m x 90m. This is as per requirement for DGCA compliance and to ensure safety of flight operations. Therefore, upgradation and construction of 21,600 sq.m of RESA is included as part of development.

- The existing size of RESA for RWY 27 is also 150m x 90m that also needs to be extended. In present scenario, the RESA is not possible to be extended to full length of 240m as the airport boundary wall is within this distance. So, depending upon the available distance at site, it has been established to extend the RESA to a length of 182.8m by retaining the width of 90m. Therefore, upgradation and construction of 16,452 sq.m of RESA is planned.

4.5.2 Para 3.5.4 of CAR Sec. 4 Series B Part 1 requires having RESA of at least 240 meters where code number is 3 or 4. It should be noted that LIAL runway is code number 4 as it is more than 1,800 meters. Relevant extract of CAR is as follows:

> 3.5.4 A runway end safety area, as far as practicable, should extend from the end of a runway strip to a distance of at least:
>
> a) 240 m where the code number is 3 or 4; or a reduced length when an arresting system is installed;

Note. — Guidance on determining the aerodrome reference code is given in the Aerodrome Design Manual (Doc 9157), Parts 1 and 2.

Table 1-1. Aerodrome reference code

Code element 1		Code element 2	
Code number	**Aeroplane reference field length**	**Code letter**	**Wing span**
1	Less than 800 m	**A**	Up to but not including 15 m
2	800 m up to but not including 1 200 m	**B**	15 m up to but not including 24m
3	1200 m up to but not including 1800 m	**C**	24 m up to but not including 36m
4	1 800 m and over	**D**	36 m up to but not including 52m
		E	52 m up to but not including 65m
		F	65m up to but not including 80m

4.5.3 The Authority has linked the said project with Runway Extension which LIAL has proposed as a part of Master Plan.
It is to be noted that present land bank, available with LIAL, is not sufficient to carry out runway extension work. LIAL needs additional land of more than 50 acres to carry out runway extension and other works. LIAL is pursuing the land acquisition with the help of relevant stakeholders; however it's a time consuming process. It is not possible to project the accurate timeframe for the acquisition of land as it involves government and private land.

4.5.4 Further safety issue is more important. Thus, it is not prudent for LIAL to wait till acquisition of land and runway extension for rectifying such critical compliance which is related to safety of passengers and aircraft.

4.5.5 **Therefore, LIAL request Authority to allow east side RESA as the same is required for operational, compliance and safety purpose.**

4.6 AERA proposal at clause B1 (e) on page 124 of CP relating to Improving the CBR Value of Basic Strip

e. Improving the CBR Value of Basic Strip *have been projected to be capitalized by the Airport Operator for ₹ 35 Crores distributed over two FYs, namely FY 2022-23 and FY 2023-24.*

The Authority notes that the AO conducted the CBR test at various points on the Basic strip and the results showed the CBR value to be around 6. The Authority notes that since the Runway extension is planned only in the next Control Period and based on the same, this project can be carried-out along with runway extension, in the next Control Period, after proper soil investigation. Hence, the Authority proposes to shift this project to the next Control Period.

Comments by LIAL:-

4.6.1 In respect of CBR Value of Basic Strip, DGCA has observed that : -
Load bearing capacity of declared Runway strip of Runway 09/27 is not assessed as to minimize hazards arising from differences in load bearing capacity to aero-planes which the runway is intended to serve in the event of an airplane running off the runway. Reference Para 3.4.17 of CAR 4B1.

4.6.2 CBR of the basis strip should be around 15-20 as per CAR section-4 series B Part 1 whereas in case of CCSIA the same was assessed and found to be 6. The assessment report and the observation of DGCA was shared with the AERA`s consultant vide email dated 14th September 2022.

4.6.3 Similar to RESA, the Authority has linked the said project with Runway Extension which LIAL has proposed as a part of Master Plan.
We re-iterate that the timing of Runway Extension is dependent on land acquisition of more than 50 acres of land. While LIAL is pursuing for the acquisition of land, since the same is time consuming it would not be advisable to wait for land acquisition and runway extension before taking up the activity for improving the CBR value.

4.6.4 Further LIAL would like to submit that the said project is not related/dependent of runway extension. Existing length of runway is 2,744 mtr. and LIAL would be carrying out work for improving CBR value for the said length of 2,744 mtr of basic strips which will remain unchanged even after runway extension.
We reiterate that after runway extension LIAL is not required to rework for CBR value for the present 2,744 mtr. and needs to carry out work for improving CBR for extended portion only.

4.6.5 **Therefore, LIAL request Authority to allow improving the CBR value of Basic Strip as the same is required for operational, compliance and safety purpose.**

4.7 AERA proposal at clause B4 (b) on page 127 of CP relating to PIDS with CCTV camera

b. PIDS with CCTV camera has been *projected by the AO for ₹ 19.92 Crores in FY 2024-25. The Authority notes that as per BCAS audit observation, the Perimeter Intrusion Detection System (PIDS) is required to be installed at CCSIA. The AO has obtained the quotation for the same from the vendor M/s.Blutronix, based on the which it had estimated the cost of ₹ 19.92 Crores for this item. However, the Authority observes that the Operational Wall is getting realigned for major length after removal of encroachment and getting additional land for runway extension and for Parallel Taxiway and the PIDS can be installed only after completion of the wall, considering the logistics. Hence, the Authority propose to shift this work to the next Control Period.*

Comments by LIAL:-

4.7.1 Authority, in CP, has acknowledged that as per BCAS audit observation LIAL has to install PIDS. Below is the observation from BCAS.

18. PIDS have not been installed by the airport operator to prevent intrusions into the airport through perimeter or any of the perimeter access points.

4.7.2 It is to be noted that LIAL is categorized as hypersensitive airport and BCAS has mandated all the hypersensitive airports vide AVSEC circular no 03/2022 dated 6th June 2022 to install PIDS by 31st December 2023.

4.7.3 Further the Authority has linked the said project with Runway Extension which LIAL has proposed as a part of Master Plan.
As already mentioned in para 4.6.4 above, the land acquisition has no definite time frame and the PIDS project is related to security of Airport, passengers and aircrafts. Hence, we propose not to wait for the land acquisition and runway extension for commencing the said project.

4.7.4 **Therefore, LIAL request Authority to true-up the cost of installing PIDS on actual incurrence basis during the tariff determination of next control period, as the same is required for BCAS compliance and safety purpose.**

4.8 AERA proposal at clause B4 (d) on page 128 of CP relating to Body Scanner

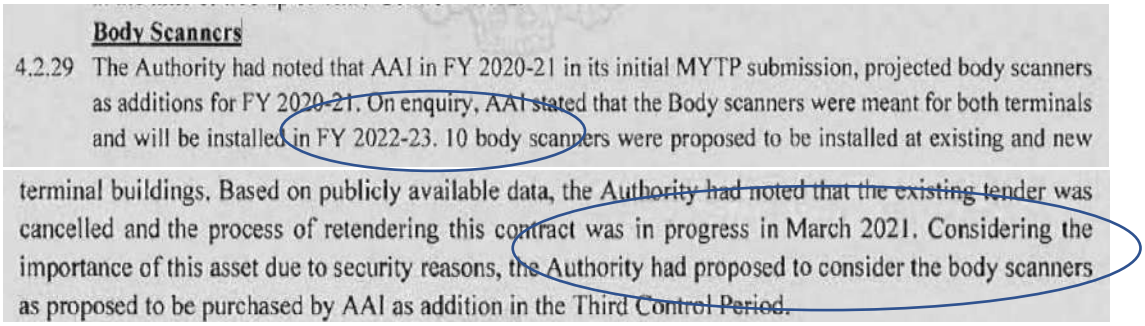
d. Body Scanner *for ₹ 28.46 Crores has been proposed by the AO over two tariff years, i.e., FY 2024-25 and FY 2025-26. The Authority observes that as per BCAS Guidelines, all hypersensitive airports are required to install Body Scanner and CCSIA falls under the above category of hypersensitive airport. However, the Authority on further examination notes that Body Scanner is a relatively new technology and still in its nascent stage. Hence, the Authority feels that the same can be implemented in a phased manner. The Authority notes that the AO has projected 10 Body Scanners at a cost of ₹ 3 Crores per machine, totaling to ₹ 30 Crores and allocated the same to Aeronautical activities, in the ratio of 94.86:5.14. As compared to this, the Authority proposes to allow 5 Body Scanners in the current Control period at a total cost of ₹ 15 Crores and allocate the same to Aeronautical activities in the ratio of 100% (refer para 7.4.2 below).*

Comments by LIAL:-

4.8.1 Authority has acknowledged that as per BCAS guidelines all hypersensitive airports are required to install Body Scanner and CCSIA falls under the above category of hypersensitive airport.

4.8.2 Further the Authority has noted that Body Scanner is a relatively new technology and still in its nascent stage thus the Authority has approved 5 Body Scanners in place of 10 Body Scanner as projected by LIAL.

4.8.3 In the above context LIAL would like to submit that the Authority in its Order No 45/2021-22 dated 17th March 2022 in the matter of determination of aeronautical tariff for Pune International Airport (PNQ) for the Third Control Period (1st April 2021 to 31st March 2026) has allowed capitalization of 10 Body Scanner as sought by Pune International Airport. Extract from Pune Airport order is as follows:-



Body Scanners

4.2.29 The Authority had noted that AAI in FY 2020-21 in its initial MYTP submission, projected body scanners as additions for FY 2020-21. On enquiry, AAI stated that the Body scanners were meant for both terminals and will be installed in FY 2022-23. 10 body scanners were proposed to be installed at existing and new terminal buildings. Based on publicly available data, the Authority had noted that the existing tender was cancelled and the process of retendering this contract was in progress in March 2021. Considering the importance of this asset due to security reasons, the Authority had proposed to consider the body scanners as proposed to be purchased by AAI as addition in the Third Control Period.

4.8.4 Thus, from the above, it may be noted that the Authority has allowed expenses for Body Scanner considering the importance of this assets for security reasons.

4.8.5 **Therefore, LIAL request Authority to allow to capitalize all 10 Body Scanner instead of 5 Body Scanner as approved by AERA for other airports.**

4.9 AERA proposal at clause B5 (e), B5 (f) and B5 (h) on page 129 and 130 of CP relating Cable duct for AGL Cables, Service road between road and boundary wall and Replacement of transformer housing boxes of Runway Edge Light

e. ***Cable duct for AGL cables*** *for ₹ 6.64 Crores has been proposed by the AO across two tariff years i.e., FY 2022-23 and FY 2023-24. The Authority observes that the operational wall is getting realigned. If the estimated cost is spent now, then the expenditure would be infructuous since the realignment work on Operational wall is still ongoing. Further, considering its proposal to shift the project on Runway extension and the Strengthening of basic strip projects to the next Control Period, the Authority proposes to shift this project work as well, to the next Control Period in line with the aforementioned related projects.*

f. ***Service corridor between road and Boundary wall*** *for ₹ 8.54 Crores has been proposed by the AO over two FYs, i.e., FY 2022-23 and FY 2023-24. As already explained in the above para (s.no. 'e'), the operational wall is proposed to be realigned after removal of encroachments and obtaining the land for the extension of the Runway. If the estimated cost is spent now, then the expenditure would be infructuous since the realignment work on Operational wall is still ongoing. The Authority is of the view that, as there is no immediate urgency for taking up this work, the same can be shifted to the next Control Period.*

h. ***Replacement of transformer housing boxes of Runway Edge Light*** *for ₹ 4.74 Crores in two FYs, i.e., FY 2022-23 and FY 2023-24. The Authority notes that the work is for realignment of primary AGL circuits and shifting the transformer housing boxes outside the basic strip, in order to ease the maintenance of AGL, during the operational hours. Since the CAPEX relating to grading and strengthening of basic strip is shifted to the next Control Period, the Authority proposes to shift this work also to the next Control Period in line with the aforementioned works.*

Comments by LIAL:-

4.9.1 Authority has linked above projects with Runway Extension which LIAL has proposed as a part of Master Plan.

4.9.2 Cable duct for AGL cables is proposed around the runway which has no dependency on realignment work of Operational wall and extension of the Runway. The existing AGL cables are laid in ground without any fix alignment or corridor, and it is laid near Runway edge due to which the rectification work is not possible without closure of runway. Being a single operational runway, this is essentially required to carry out preventive/break down maintenance without closer of runway. The existing length of runway 2,744 mtr. and its basic strips will remain unchanged even after extension, hence length of cable duct can be constructed to support existing length of Runway and will get extended while construction of Runway extension.

4.9.3 For service corridor between road and boundary wall, LIAL would like to submit that at present optical fiber cable (OFC) of radar, localizer, DVOR, SMR, and other navaids are laid without any proper corridor. There are no drawings available for tracing this cable. Due to inaccurate location of OFC cables, these are being cut/damaged during any construction work. To prevent operational impact this corridor is essential to implement, the alignment of the corridor will be designed in such a way that even after realignment work of operational wall, the said proposed corridor will not get impacted.

4.9.4 Replacement of transformer housing boxes of Runway Edge Light is interrelated work with Cable duct for AGL cables as stated in 4.9.2

4.9.5 As from above it can be seen that the proposed work are to be taken by LIAL to achieve operational excellence and the said project shall not be impacted due to realignment work of operational wall and extension of the Runway. Hence it would not be proper to delay the aforesaid works and link with land acquisition and runway extension projects.

4.9.6 **Basis above LIAL request Authority to allow the above-mentioned works on actual incurrence basis and true-up the same during the tariff determination of next control period.**

4.10 AERA proposal at clause B5 (i) on page 130 of CP relating to Turning pad for runway 27 & 09

i. Turning pad for runway 27 & 09 *for ₹ 20.87 Crores has been proposed by the AO across two tariff years i.e., FY 2022-23 and FY 2023-24. The Authority observes that there is an existing Turning Pad at both ends of the runway. However, it's size and geometry are not meeting the requirements of Code E aircraft and hence, the DGCA had listed it as non-compliant. At present there is only one Code E operation per day. Further, considering that the Runway extension and re-carpeting works are planned to be carried out in the next Control Period, the Authority is of the view that the Turning Pad at the East side can be carried out in the next Control Period and hence, the allowable cost can be rationalized. Accordingly, the Authority proposes to consider cost of ₹ 5 Crores, as reasonable and justified towards the capitalization of this project. Further, the Authority proposes to distribute the amount of ₹ 5 Crores over two Fys, i.e., ₹ 2 Crores in FY 2022-23 and ₹ 3 Crores in FY 2023-24.*

Comments by LIAL:-

4.10.1 Authority in CP has acknowledged that that the DGCA had listed existing Turning Pad at both ends of the runway as non-compliant as it's size and geometry are not meeting the requirements of Code E aircraft.

4.10.2 Below is the DGCA observation on turning pads

> 3. The turn pad at both end of Runways 09/27 are not incompliance of CAR 4/B/I and the PDC's given in the application is of distant future which is not acceptable to this office (Ref: CAR Sec. 4 Series B Part 1 Para 10.5.2.)

4.10.3 Authority has linked the said project with Runway Extension which LIAL has proposed as a part of Master Plan and has allowed to construct only one Turning pad on the west side.

4.10.4 As explained before, runway extension is dependent on land acquisition which itself is cumbersome and lengthy process.
Further the said project is related to safety of the aircraft and passengers and it is more important than acquisition of land. LIAL need to execute the said project in the interest of safety of its passengers, and the aircraft.

4.10.5 The Authority has allowed Turning Pad on west side (09). However, LIAL requests the Authority to swap the west side (09) Turning Pad with that on the east side (27) since maximum take-offs are happening from Runway 27 i.e. on the east side.

4.10.6 Further the said project is related to safety of the aircraft and passengers and accordingly LIAL believes that it would not be appropriate to delay this project inordinately by linking it to time consuming activity of land acquisition and runway extension.

4.10.7 It is to be noted that LIAL had shared the BOQ and cost estimate for the Turning Pads vide email dated 9th September 2022 to the independent consultant. Wherein cost estimated for construction of Turning Pads for both the ends was estimated to be Rs 22 cr. However, the Authority has reduced the cost of constructing one side Turning Pad (i.e. on west side) to Rs 5 Crs.

4.10.8 **Therefore, LIAL request Authority to allow Turning Pad (27) on east side in place of west side (09) Turning Pad with the cost proposed by LIAL for one turning pad.**

4.11 AERA proposal at clause 7.4.3 on page 153 of CP relating to Terminal Area Ratio at the Airport

7.4.3. The Authority examined the Terminal Area ratio submitted by the AO and observes that the non-aeronautical area allocation considered by the Airport Operator for computation of Terminal Area Ratio was quite low when compared to other PPP airports. The Authority had at the time of determination of tariffs for CCSIA for the Second Control Period decided to consider the Terminal Area Ratio as 92.5:7.5 (aeronautical: non-aeronautical) to encourage growth of non-aeronautical revenues which would cross-subsidize aeronautical charges. The Authority notes that the Airport is yet to achieve such area allocation. Further, in the context of development through PPP mode, it was expected that there would be larger focus on non-aeronautical activities and increased area allocation towards the same. It was observed that the area allocation towards non-aeronautical activities at the other PPP airports such as DIAL, MIAL, BIAL and GHIAL are much higher than 10%. Even the IMG norms on passenger terminals recommend the non-aeronautical area allocation to be between 8-12% for any airport, while for bigger airports, i.e., with passenger traffic exceeding 10 million, commercial area could be up to 20% of the overall area. Hence, the Authority expected the non-aeronautical area allocation at CCSIA to increase in future. Therefore, the Authority proposed to consider the Terminal Area Ratio for CCSIA for the Third Control Period as 90:10 (aeronautical : non-aeronautical).

Comments by LIAL:-

4.11.1 It is observed that as per The AERA Guidelines, 5.2.1 (vi) all the assets which are part of the terminal building shall be considered as part of RAB. Therefore, terminal building as a whole should be considered as RAB / Aeronautical asset and not required to be allocated into Aero and Non-Aero. For quick reference the relevant clause from the guidelines is reproduced as follows as *"Notwithstanding the principles mentioned under points (i) to (v) above, assets with fixed locations inside terminal buildings shall be considered within the scope of RAB"*

4.11.2 Notwithstanding the above, it is submitted that norms of IMG report are not applicable to PPP airports, as per clause no. G of IMG Report. reproduced below:

"In case of airports developed through Public Private Partnerships the project authorities may adopt a case-by-case approach with respect to norms relating to unit area and unit costs. Based on the judicious consideration of international best practices and financial viability, the norms may be specified in each case prior to inviting bids for private participation."

4.11.3 No norms with respect to unit area and costs were mentioned in the bidding documents and Concession Agreement of Lucknow Airport. Concession Agreement do not mention regarding the applicability of the IMG Norms. Therefore, we request AERA not to apply IMG norms in case of Lucknow Airport.

4.11.4 Under the Shared-Till model, 30% of Non-Aeronautical Revenues are accounted for cross subsidizing the ARR. Therefore, there is no need to apply the allocation ratio whereby, capital and operating expenditure is reduced. This act as a dual burden for the Airport Operator. Since the tariff guidelines do not provide for applying the allocation ratio, this anomaly is required to be corrected, failing which Airport Operator will be at disadvantage at all the times.

4.11.5 **In view of the foregoing, we request the Authority to apply the Terminal Building Ratio, wherever it is factored in CP, as 100% Aeronautical which is in line with the Guidelines of 2011.**

4.11.6 Without prejudice to the above and in the alternate, terminal building is built with certain length, breadth and height considering the passenger throughput and service level requirements. The structure of terminal includes façade, ceiling, columns etc. which have no relation with leasable floor area. The commercial activities like retail, food and beverage, etc. require limited works where the cost is much lower than the cost required to build the terminal building. LIAL submits that terminal building allocation ratio should, at best, be based on cost of floor plate of commercial leased area in the terminal vis-à-vis total cost of the terminal building, instead of allocating entire terminal cost based on leasable area.

4.11.7 Without prejudice to the above, it is submitted that the terminal building allocation ratio cannot be a notional number as has been done in the Consultation Paper. The Authority has applied the actual Capital Expenditure and Operating Expenditure for FY21-22 while projecting the expenses for the control period, and it is logical that it should have used the actual terminal building ratio. The terminal building allocation ratio should not be different than actual.

4.12 AERA proposal at clause B3 D on page 127 of CP relating to Open access Fuel Facility

The Authority also observes that the storage capacity for 10 days planned by the AO is not essential, since the airport is not in a remote area. Hence, the Authority is of the view that it would be prudent to construct two storage tanks (of 1,250 KL per tank) in this Control Period and the other two in the next Control Period, whereas the total hydrant system to be constructed in the current Control Period. Thereby, the Authority proposes to rationalise the cost of this facility to ₹ 130 Crores, which it finds to be reasonable and proposes to consider capitalisation of this facility in FY 2023-24.

Comments by LIAL:-

4.12.1 LIAL`s obligations towards providing aircraft fueling services, the Concession Agreement states that: *"The Concessionaire shall provide, or cause to be provided, the infrastructure required for operation of fueling services on equal access basis for all the aircrafts at the Airport in a transparent and non-discriminatory manner. Such infrastructure shall include tank farms and associated facilities in accordance with the provisions of this Agreement, Applicable Laws and Good Industry Practice."*

Under the Concession Agreement, it is responsibility of Airport Operator to provide necessary open access facility for the users.

4.12.2 Based on IATA Guidance Note on assessment of storage requirement (refer **Annexure 19** for IATA guidance note) and past experience of various PPP Airports where Open Access is prevalent, it is proposed to provide open access storage facility equivalent to 8-10 day's throughput. Higher storage requirement is also requested by IOCL who is the largest fuel supplier at Lucknow Airport and is the biggest user of the Open Access facility (refer **Annexure 20** the letter from IOCL which was submitted to the Authority on 10th December 2022).

Assessment of storage days based on IATA Guidance Note

4.12.3 Any open access fuel storage needs to have four tanks, as per details below. This is essentially because of prevailing batch control systems and quality control procedures in Jet Fuel handling: -

- One tank on product receipt
- One tank on delivery
- One tank under product settling.
- One tank as stand-by (to cover, issues like maintenance, periodic tank cleaning, tank sealing for VVIP movement etc).

4.12.4 Any greenfield facility should be developed with minimum 10 years horizon. The reason is that Open Access Fuel Farm is the sole facility at any airport, and it remains operational 24x7. It is serious hazard to carry out construction/fabrication work in such running facility which operates with such high inflammable product. In fact, since in India the growth is robust, the planning is done with 10 years horizon. In Europe, the horizon considered is for up to 25-30 years.

4.12.5 Broad consideration while designing fuel storage

Demand
• To accommodate current demand
• To accommodate future demand growth (for the next 10 years)

• To cater for unexpected demand surge

Supply
• To accommodate normal current supply
• Buffer for supply schedule
• Cover against significant supply interruptions

Stock management
• To allow for day-to-day stock fluctuations
• To allow for seasonal variations in stock
• To provide an appropriate level of redundancy in case part of the infrastructure fails.

Quality Control

• To allow for settling time & quality control checks for recertification
• Maintenance requirements (preventive and breakdown)
• To allow for recirculation and filtering of product from any tank

IATA issued a guideline in 2008 for estimation on fuel storage. It clearly defines that the facility should be able to withstand any abnormality/disruption in any of parameter related to demand, supply, storage and functioning of facility.

The guideline suggests that, while estimation is done, the additional days storage required on account on any normality/disruption which may take place in whole value chain, should be identified. Then, it can be fairly assumed that all the disruption may not take place simultaneously and therefore, the sum of total days of disruptions (for all parameters) needs to be discounted by 15%, and only 85% of same to be considered.

Estimation for LIAL
For LIAL, the various parameters are as listed below: -

Storage and Day-to-day operations

At any given point, facility should have clear (QC cleared and ready to fuel) product for at least two days. This is to cover demand uncertainty (at LKO, there are unplanned heavy movement of non-scheduled operators' flights and also very heavy VVIP movements etc).

Product receipt and settling

One day storage should be considered on this account on normal course. However, there may by a upside by two days, on account of any equipment failure, quality concerns in product received, retesting of products etc.

Product receipt

The majority of product at LIAL fuel farm facility is received from IOCL Refinery Matura/Panipat/Paradip. Although from LKO terminal to Airport, there is pipeline, the movement from refineries the movement takes place by Tank Wagon. Tank Wagon movement has its own uncertainties.

In normal course, the product is received on day-to-day basis. However, as experienced, and well established in Indian downstream Oil & Gas supply chain, there may be complete supply disruption for up to four days. It is on account of various factors like shutdown of refinery, non-availability of rail wagons, disruption in rail routes, breakdowns in offsite oil terminals of OMCs, batch failure in refinery (quality issues), disruption in crude oil supply (like the Suez

Canal blockage few years back). *In case of LKO, the uncertainties are slightly on higher side, as from the refineries there is no pipeline for the downstream movement till LKO and it all depend on rail wagons and as mentioned above rail wagon movement has its own uncertainties. All the refineries are more than 400 kms away from LKO.*

Basis above, all parameters are tabulated below: -

S.no.	Potential Purpose	Average Stock Required for this purpose	Max Stock Required for Worst Case scenario	Difference Between Avg & Max
1	Product readiness, storage	2	2	0
2	Product storage and settling	1	2	1
3	Product receipt, Logistic contingency, OMC's issue	0	4	4
4	Total (Average)	3		
5	Total (Difference)			5
6	85% of Total Difference			4.3
7	Overall Total			7.3
	Recommended ATF Storage Days			**7.3 (say 8 days)**

4.12.6 Examples of storage capacity at various Open Access Facilities in India

Airport	AERA order reference no.	Storage Facility KL	Annual Fuel Throughput KL	Storage days No.	Owners of the facility
Mumbai	Order No. 20/ 2021-22 dated 24th September 2021	47,500	Pre-COVID volume of ~1,400,000	12	Joint venture of MIAL, IOCL, BPCL, HPCL
Bangalore	Order No. 30/ 2021-22 dated 07th December 2021	19,800	Pre-COVID volume of ~7,00,000 - 800,000	9-10	Indian Oil Skytanking
Kannur	Order No. 44/2021-22 dated 15th March 2022	1,000	~45,000	8	Joint Venture of BPCL and Kannur Airport

4.12.7 **In view of the above, we request AERA to consider the storage requirement as requested by LIAL and allow full cost of Open Access Fuel Facility.**

4.13 AERA proposal in point B7 on page 134 to consider 50% of Road No. 6 as Aeronautical

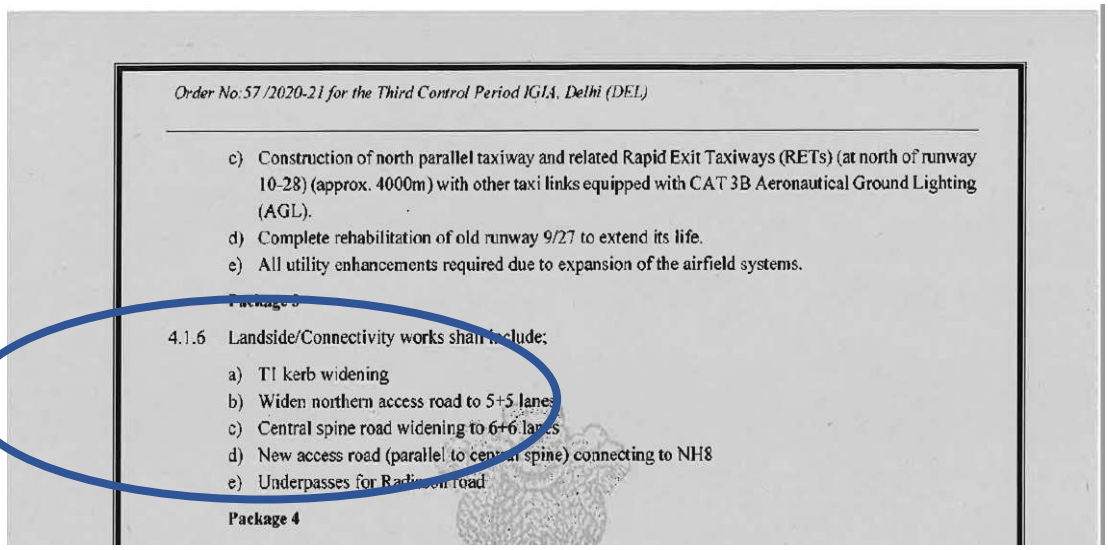
Based on the supporting documents provided by the AO and the visit by the Authority to the site, it is observed that the development of the South side is planned in the next Control Period and hence is of the view that, the road at the South side (Road 7) can be shifted to the next Control Period. The Authority also notes that, Road 6 is currently in use only for the public. However, once the land side developments take place, there is likely usage of the road for Non-aeronautical purposes. In view of this, the Authority proposes to consider 50% of this road (Road 06- Peripheral road) as Aeronautical. Further, the Authority observes that the Road 08 connecting to the Road 01 is designed as 4+4 lanes. The Authority is of the view that as Road 08 is connecting to Road 09 and Road 06B, which are only 3+3 lane and not independently serving any area, the Authority proposes to consider Road 08 as 3+3 lanes.

Comments by LIAL:-

4.13.1 We would like to refer the definition of "Terminal Building" as provided in the CA. Terminal Building" means *the stand-alone and/ or integrated passenger terminal building with separately identified area for domestic passengers and international passengers on the Site and the land appurtenant thereto, **including the kerbside and approach roads** (emphasis provided) and including the existing terminal building, as described and demarcated in the perspective plan set out at Annex II of Schedule A, and/ or the Master Plan, as the case may be;*

As per Concession Agreement, kerbside and approach roads are considered as "Terminal Building"

4.13.2 Kindly refer below the extracts from DIAL Third Control Period Order No. 57/2020-21 Page No. 164, where details of Landside Works are provided which includes kerbside, access road works, central spine road, underpass etc. DIAL has proposed the **same as 100% Aero** which is duly approved by Authority.



Order No.57 /2020-21 for the Third Control Period IGIA, Delhi (DEL)

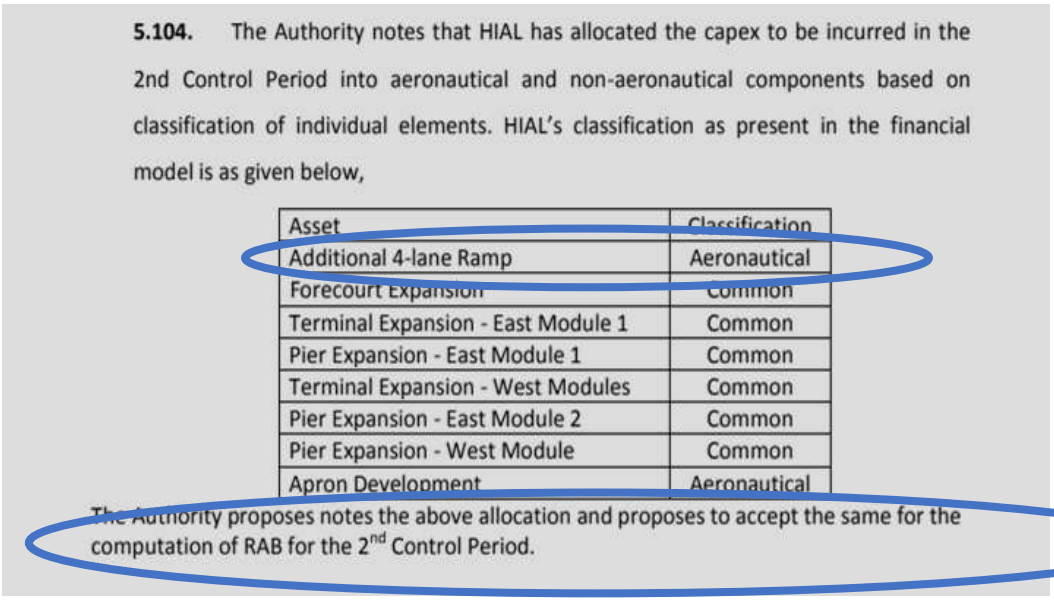
c) Construction of north parallel taxiway and related Rapid Exit Taxiways (RETs) (at north of runway 10-28) (approx. 4000m) with other taxi links equipped with CAT 3B Aeronautical Ground Lighting (AGL).
d) Complete rehabilitation of old runway 9/27 to extend its life.
e) All utility enhancements required due to expansion of the airfield systems.

4.1.6 Landside/Connectivity works shall include:

a) T1 kerb widening
b) Widen northern access road to 5+5 lanes
c) Central spine road widening to 6+6 lanes
d) New access road (parallel to central spine) connecting to NH8
e) Underpasses for Radisson road

Package 4

Hyderabad Airport Second Control Period Consultation Paper No. 30/2017-18 Page No 80 and 84. Additional 4 ramp road are considered 100% Aeronautical The same has been considered in SCP and TCP order.



5.104. The Authority notes that HIAL has allocated the capex to be incurred in the 2nd Control Period into aeronautical and non-aeronautical components based on classification of individual elements. HIAL's classification as present in the financial model is as given below,

Asset	Classification
Additional 4-lane Ramp	Aeronautical
Forecourt Expansion	Common
Terminal Expansion - East Module 1	Common
Pier Expansion - East Module 1	Common
Terminal Expansion - West Modules	Common
Pier Expansion - East Module 2	Common
Pier Expansion - West Module	Common
Apron Development	Aeronautical

The Authority proposes notes the above allocation and proposes to accept the same for the computation of RAB for the 2nd Control Period.

4.13.3 Landside road work has been divided into 50:50 considering it is part of city side. City side is a separate land portion as defined in the Concession Agreement. The roads mentioned here are for passenger movement to and from the Terminal which has no relevance with City Side Development. It is similar to DIAL where landside roads are considered as 100% Aero.

4.13.4 Taking a comprehensive view from the above facts, it is evident that

4.13.4.1 CA considers forecourt / kerbside and access roads as part of the Terminal Building

4.13.4.2 Similar treatment has been considered and approved by AERA as 100% Aeronautical.

4.13.5 The City side development land is a separate earmarked land which has no linkages with forecourt and access roads considered in the projected proposal.

4.13.6 **The treatment of these projects as 50% Aeronautical Assets to LIAL undermines the definition under the CA and is against the already established principles. We hereby request AERA to provide the similar treatment for LIAL as considered for other Airports.**

4.14 AERA proposal at clause B7 b on page 135 of CP relating to Roads

The Authority noted that the AO had submitted the average Unit rate for construction of Roads as ₹ 6,700 per Sq.m, wherein the AO has considered the cost of drainage as 25%. However, the Authority proposes to consider drainage as 12.5%, based on the generally followed practices and various assessments. Accordingly, the Authority has derived the average unit cost as ₹ 6,100 per Sq.m and proposes to allow the project cost as ₹ 67.24 Crores (1,10,235.90 Sq.m x ₹ 6,100 per Sq.m) for capitalization in the current Control Period.

Comments by LIAL:-

4.14.1 LIAL had submitted cost break up of Rs 6,700 per sqm for road to the Independent consultant vide email on 11th July 2022.

4.14.2 Further vide mail dated 12th December 2022 and 23rd January 2023 LIAL informed the Independent Consultant that LIAL has already awarded a portion of road for Rs 24 Crs. The rate per sqm as per the awarded works was approx. Rs 9,200 per sqm.

4.14.3 The Authority while issuing the CP has not considered the actual cost based on awarded value.

4.14.4 **LIAL request the Authority to consider the revise cost of i.e. Rs 9,200 per sqm submitted by LIAL as the said cost is market driven and more realistic.**

4.15 AERA proposal as per 7.3.13 on page 145 of CP relating to Financing Allowance

The Authority examined the AO's claim as well as the justification provided for the same in detail and has summarized its view as shown below:

• The Authority considered that providing return on capital expenditure from the very beginning of construction will significantly lower the risks for an airport operator and may require revisiting the return on equity allowed to airport operators as the investment in the asset class will then be equated to risk free rate of return.

• Further, provision of Financing Allowance will disincentivize the Airport Operators from ensuring timely completion of projects and delivery of services to the users. Therefore, the Authority is of the view that a return should be provided only when the assets are made available to the airport users except in the case of certain costs like IDC that will have to be incurred in case debt is used for funding of projects.

• Furthermore, the future returns from the project should generate adequate returns to cover the cost of equity during the construction stage. The AO is adequately compensated for the risks associated with the equity investments in a construction project once the project is capitalized by means of a reasonable cost of equity.

• Developments at greenfield airports inherently take longer durations to commission and operationalize. Thus, airport operators would have to wait for a considerable duration before getting returns on large capital projects. Keeping this in view, the Authority had earlier provisioned for financing allowance in initial stages to such airports. It may be further noted that the Authority has never provided financing allowance in the case of brownfield airports in its any of the Tariff Orders. Further, financing allowance for greenfield airports of BIAL, HIAL, CIAL etc. was allowed only for the initial stages of their development, after which IDC was permitted on the debt portion of the proposed capital expenditure.

• It is pertinent to note that in case of a greenfield airport, investment in regulatory blocks by the Airport Operator would not make the airport facilities available to the passengers. Brownfield and Greenfield airports can't be equated on this issue. In greenfield airports, the tariff is not applicable and no revenue is available to the Airport Operator till the aeronautical services have been created and put to use. However, in the case of brownfield airports, where the AO brings in additional investments, the airport facilities are mobilized and enabled to other functional parts of the airport, which remains functional and the AO keeps on enjoying the charges from the users. In the case of CCSIA, since new projects have included mobilization of existing operations, the said Airport is ought to be considered as a brownfield airport, which in the opinion of the Authority would not be eligible for an allowance on the equity portion of newly funded capital projects.

• Financing Allowance is a notional allowance and different from interest during construction.

Therefore, the provision of Financing Allowance on the entire capital work in progress would lead to a difference between the projected capitalization and actual cost incurred, especially when the Airport Operator funds the projects through a mix of equity and debt. Further, the Authority opines that only IDC should be provided on the debt borrowings availed for execution of a project.

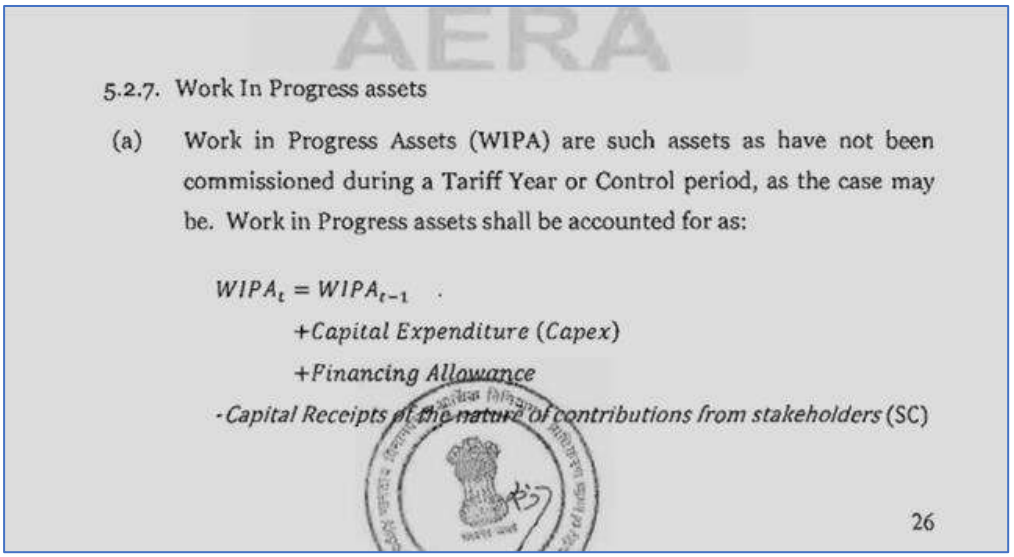
• AERA Guidelines, 2011 does not specifically state that Financing Allowance is to be provided on equity portion of the capital expenditure. The proviso to Section 13 (1) (a) states that "different tariff structures may be determined for different airports having regard to all or any of the above considerations specified at sub-clauses (i) to (vii) of Section 13 (1) (a)".

Comments by LIAL:-

4.15.1 The AERA Act requires AERA to consider "timely investment in improvement of airport facilities" and "economic and viable operation of major airports ".

4.15.2 Further Clause 5 of The AERA Guidelines (which entails the methodology of aeronautical tariff determination) allows Airport operators to be eligible for Financing Allowance as a return on the value invested during the construction phase of an asset including the equity portion, before the asset is put to use. This is a legitimate expectation of investors.

4.15.3 Thus, Clause 5 provides an explicit, detailed elaboration of Financing Allowance. Manner and formulae of computation and addition of the "commissioned assets" into RAB including the financing allowance are elucidated in detail with examples. For your kind reference the relevant extracts from The AERA Guidelines are reproduced below : -



5.2.7. Work In Progress assets

(a) Work in Progress Assets (WIPA) are such assets as have not been commissioned during a Tariff Year or Control period, as the case may be. Work in Progress assets shall be accounted for as:

$$WIPA_t = WIPA_{t-1}$$
$$+Capital\ Expenditure\ (Capex)$$
$$+Financing\ Allowance$$
$$-Capital\ Receipts\ of\ the\ nature\ of\ contributions\ from\ stakeholders\ (SC)$$

26

$-Commissioned\ Assets\ (CA)$

Where:

$WIPA_t$: Work in Progress Assets at the end of Tariff Year t

$WIPA_{t-1}$: Work in Progress Assets at the end of Tariff Year t-1

Capital Expenditure: Expenditure on capital projects and capital items made during Tariff Year t.

The Financing Allowance shall be calculated as follows

$$\text{Financing Allowance} = R_d \times \left(WIPA_{t-1} + \frac{Capex - SC - CA}{2}\right)$$

Where R_d is the cost of debt determined by the Authority according to Clause 5.1.4.

SC are capital receipts of the nature of contribution from stakeholders (including capital grants and subsidies) pertaining to the capital expenditure incurred in Tariff year t.

CA are Commissioned Assets which pertain to the accumulated value of the WIPA attributable to all assets that have been put into effective operation during Tariff Year t.

Illustration 7: The following example illustrates this approach for calculation of Work in progress assets, financing allowance and commissioned assets. The numbers in the illustration have been rounded to the nearest integers.

Forecast Work in Progress Assets

		2010-11	Tariff Year 1	Tariff Year 2	Tariff Year 3	Tariff Year 4	Tariff Year 5
Opening WIP: $WIPA_{t-1}$	OW	-	-	-	558	638	-
Capital Expenditure	CE	-	833	521	-	-	-
Financing Allowance	$FA=R_d \times (OW+(CE-CA-SC)/2)$	-	-	37	80	43	-
Capital Receipts	SC	-	200	-	-	-	-
Commissioned Assets	CA	-	633	-	-	681	-
Closing WIP: $WIPA_t$	CW = OW + CE + FA - SC – CA	-	-	558	638	-	-

- *The cost of debt, R_d, used for calculation of financing allowance, is the cost of debt determined by the Authority under Clause 5.1.4.*
- *The example illustrates that those assets, which have been acquired or commissioned within the same Tariff Year (i.e. Tariff Year 1), have been included both in Capital Expenditure and Commissioned Assets.*
- *The value of commissioned assets, as calculated, shall be used for forecasting RAB for the Control Period.*

4.15.4 Financing allowance is computed on the Work in Progress balance based on capital expenditure ***(irrespective of how it is funded)*** and is capitalized as part of commissioned assets for RAB computation.

4.15.5 The regulatory principles laid down by AERA by means of guidelines provide a fundamental foundation of the regulatory clarity to the stakeholders on the manner in which different components of costs and revenues are treated.

When the airport such as Lucknow is transitioned to a PPP model and handed over to the private operator for operation, management and development, the expectation from the private AO is to invest substantially in enhancing the infrastructure facilities. Having regard to the size of investment being made by AO vis-a-vis the investments made by AAI in the past several years, the proposed investment by AO is akin to development of greenfield airport facilities and financing allowance must be allowed for such projects. *It is similar to Cochin Airport when it did the first significant investment during Second Control Period the Financing Allowance was provided by the Authority. It is important to note that at that time Cochin Airport was already under operations and New Terminal Building was constructed.* Hence the reason provided by the Authority that it has never provided Financing Allowance to brownfield Airport is not correct.

4.15.6 **We therefore request that financing allowance should be computed on the allowable RAB as per formulae prescribed in the AERA Guidelines.**

4.16 AERA proposal as per 7.3.13 on page 146 of CP relating to Interest During Construction

• In respect of IDC, the Authority is inclined to allow the same and accordingly, the Authority has considered IDC to be provided on the debt portion of the value of average CWIP derived on the basis of revised Capitalization schedule proposed by the Authority. Further, the Authority proposes to consider the notional gearing ratio (debt-equity ratio of 48:52) followed for other PPP airports and cost of debt @ 9% (refer Table 89 of Chapter 8) for the Third Control Period for calculating the value of IDC. Based on the same, the Authority has derived an amount of ₹ 161.57 Crores and proposes to allow the same as against ₹ 617.80 Crores (as Financing Allowance and IDC) claimed by the Airport Operator for the Third Control Period.

Comments by LIAL:-

4.16.1 To avoid repetition of comments on Cost of Debt, please refer comments provided in point 5.2.

4.16.2 The amount of Rs 161 Crs for IDC as proposed in the CP appears not to be correct. Based on our calculation (considering the same assumptions as per CP), the IDC of Terminal 3 only comes to Rs 180 Crs (refer calculation in the Table below) as against Rs 161 Crs proposed by the Authority for *entire* capex. It appears that the Authority has considered the significant cash outflow in immediately preceding year of capitalization, rather than considering cash outflows to be distributed over the construction period.

Year	Year wise CWIP	Cumulative CWIP	Aero Portion	Opening CWIP	Closing CWIP	Debt Portion	Interest Rate	IDC
	A	B	C	D	E	F	G	(D+E)/2 *F * G
FY 20-21	444	444	400	400	400	48%	9%	17.27
FY 21-22	295	739	665	400	665	48%	9%	23.00
FY 22-23	533	1,272	1,145	665	1,145	48%	9%	39.09
FY 23-24	681	1,953	1,758	1,145	1,758	48%	9%	62.70
FY 24-25	-	1,953	-	1,758	-	48%	9%	37.97
IDC related to Terminal 3	**1,953***		**1,758**					**180.03**

Note: IDC calculated above is as per the project cost, amounts and assumptions as proposed by the Authority in the CP which is subject to comments/requests raised in this document.

**Rs 1,953 Crs = Project cost of Rs. 1,809 Crs for Phase 1 as per Table 65 of the CP + 8% of Soft Cost as proposed in point 7.3.11 of CP*

4.16.3 **We request the Authority to kindly re-calculate the IDC for *entire* capex proposal considering cash outflow for every year as explained in table above.**

4.16.4 Further it is to be noted that IDC is calculated based on average of opening and closing CWIP and considering certain projected cash outflows. Whereas in actual, the cash outflows could be different.

4.16.5 **Therefore, we request authority to provide necessary true-up for actual IDC at the time of tariff determination of next control period, in addition to recalculation of IDC as requested above.**

4.17 AERA proposal as per 7.3.11 on page 143 of CP relating to Soft Costs claimed towards technical services, PMC, Preliminaries and Pre-operatives, Contingencies, Statutory approvals, Labour cess, Site-preparation, Insurance etc.

In respect of ₹ 523.07 Crores claimed by the AO towards PMC and other costs, the Authority notes that for other PPP airports such as HIAL, BIAL, DIAL etc. the above-mentioned costs had been considered in the past in the range of 8% - 11% of the project costs. The Authority is of the view that 13.50% claimed by the Airport Operator is on the higher side, as compared to other PPP Airports and hence not justified. Accordingly, the Authority proposes to consider the aforementioned costs to the extent of 8% of the Aero CAPEX of the projects allowed by the Authority for the current Control Period. The Authority has thus derived the amount proposed to be allowed towards the aforementioned costs as ₹ 195.76 Crores, as against ₹ 523.07 Crores claimed by the AO.

Comments by LIAL:-

4.17.1 As per recent released CPWD SOP 2022 dated 13.07.2022 https://cpwd.gov.in/Publication/sop2022.pdf, the Project Estimation should take of the following requirements :-

10. Preliminary estimate (PE) is to be prepared on the basis of Plinth Area Rates or length of road etc. worked out on the rate per unit area/length/number, or such other method adopted for ready and rough calculation, so as to give an idea of the approximate cost involved in the proposal.

11. Prevailing Cost Index over the plinth area rates, effect of ESI & EPF leviable (rates as given in Annexure -14, Contingencies and Departmental Charges (if applicable) are to be added in the PE.

As per CPWD norms the various costs to be considered while preparing the preliminary estimates and should include the following components: -

a. Planning Consultancy 4% and Project Management Consultancy 5% (refer below PART 1 as the relevant extract from CPWD SOP2022)
b. Other Technical Services like Preliminary Sketches, Detailed Drawings, Preliminary Estimates, Structural Design, Execution, Audit & Account etc. is ranging between 7% to 24% depending upon size of the project (refer below PART 2 as the relevant extract from CPWD SOP2022)
c. Contingency cost is 3% (refer below PART 3 as the relevant extract from CPWD SOP2022)
d. ESI & EPF ranging between 0.85% to 4.2%, say average of 2% (refer below PART 4 as the relevant extract from CPWD SOP2022)

4.17.2 As per accounting standards (refer extract as PART 5 below) the costs relating to Project Team is required to be capitalized. These costs have been approved by AERA in various orders for PPP and AAI Airports ranging between 2-3% of the project cost (refer below PART 6 for few Airports examples). The same is recognized by AERA in its Guidelines Form F11 (b) (refer below PART 7 as the extract from AERA Guidelines).

The overall Soft Costs based on above point 4.17.1 and 4.17.2 above is minimum 18-20%.

4.17.3 As per "Airport Capital Improvements: A Business Planning and Decision-Making Approach" study conducted by Airport Cooperative Research Program (ACRP), Transport Research Board (sponsored by US Government's Federal Aviation Administration). The

soft costs ranges between 10% to 30%. The extract from Page 48 the report is as follows : -

Soft costs typically range from 10% to 30% of total project costs. These include design fees, permitting fees, utilities, costs associated with inspections and land acquisition, costs associated with the bidding and procurement process, and project administration and management costs.

Full study report is provided as **Annexure 21** - ACRP Report - Airport Capex

4.17.4 **Based on information from reputed agencies from India and Overseas, it is evident that soft costs requested by LIAL is within the reasonable range. We therefore request the Authority to allow the soft cost which is based on best practices subject to true-up on actual incurrence basis.**

PART 1

SOP No. 8/7: Levy of Fees by CPWD for Consultancy Services (Para 8.20)

CPWD handles consultancy works of planning and designing (with or without construction) of various projects including high-rise buildings, housing complexes etc of Public Sector Undertakings and other organizations to undertake construction on turnkey basis, or for Mission's buildings abroad, etc. at negotiated rates. Fee for the Consultancy Services is charged by CPWD as given below.

FEES FOR CONSULTANCY SERVICES

(a) Planning 4%
(b) Construction Management 5%
(c) Visits of CPWD Officers from India 1%

For planning and designing work, the following charges is levied:
(i) Development of Master Plan Rs.10000/- per hectare
(ii) Architectural plans and drawings 3 % for original work ½ % for repetition
(iii) Structural designs and drawings 1% for original work ½ % for repetition

PART 2

ANNEXURE- 5

(Reference Para 3.1.1.4 (1))

RATES OF DEPARTMENTAL CHARGES

Objectives of works	All maintenance works, and minor works costing upto Rs. one lakh	Construction works costing upto Rs. Two Crores	Construction works costing between Rs. Two and five Crores	Construction works costing more than Rs. five crores
1	2	3	4	5
(A) Establishment Charges				
1. Preparation of preliminary sketches	½%	¼%	¼%	¼%
2. Preparation of detailed working drawings	1%	¾%	½%	¼%
3. Preparation of preliminary estimates	¼%	¼%	¼%	¼%
4. Preparation of detailed estimates	½%	¾%	½%	¼%
5. Preparation of structural designs	1%	1%	¾%	¾%
6. Execution	19-¼%	7-¾%	4-¾%	4-¼%
Total Establishment charges	22-½%	10-¾%	7%	6%
(B) T&P (Machinery Equipment)	¾%	¾%	½%	½%
(C) Audit & Account	¼%	¼%	¼%	¼%
(D) Pensionary	¼%	¼%	¼%	¼%
	23-¾%	12%	8%	7%

PART 3

SOP No. ¾: Provision for Contingencies and its Utilization (Refer Para 3.1.1.3 (3))

1. *In addition to the provision for all expenditure which can be foreseen for a work, a provision of contingency is kept as follows : (i) Estimated cost up to Rs. 1 Crore ……. 5% (ii)* ***Estimated cost more than Rs. 1 Crore … 3%, subject to minimum of Rs. 5 Lakh***

PART 4

ANNEXURE- 14

(Refer SOP No. 3/2)

STATEMENT SHOWING THE RATES OF EPF and ESI CHARGES TO BE INCLUDIED IN PRELIMINARY ESTIMATE

Category of work	Component of Labour	EPF @12.5 % of labour Component	ESI @ 4.5 %of labour Component	Total of EPF & ESI
Buildings	25%	3.125%	1.125 %	4.25%
Road Works & pavements in airfields	5%	0.625%	0.225%	0.85%
External sewerage	10%	1.25 %	0.45%	1.70%
External water supply	5%	0.625%	0.225%	0.85%
Bridge/Flyover works	25%	3.125%	1.225%	4.25%
Maintenance works engaging only labour component	100%	12.50 %.	4.50%	17.00 %
Other Maintenance work	70%	8.75%	3.15%	11.9%

PART 5

Indian Accounting Standard (Ind AS) 16 ***Property, Plant and Equipment***

Elements of cost

16 The cost of an item of property, plant and equipment comprises:

(a) its purchase price, including import duties and non-refundable purchase taxes, after deducting trade discounts and rebates.

(b) any costs directly attributable to bringing the asset to the location and condition necessary for it to be capable of operating in the manner intended by management.

(c) the initial estimate of the costs of dismantling and removing the item and restoring the site on which it is located, the obligation for which an entity incurs either when the item is acquired or as a consequence of having used the item during a particular period for purposes other than to produce inventories during that period.

17 Examples of directly attributable costs are:

(a) costs of employee benefits (as defined in Ind AS 19, Employee Benefits) arising directly from the construction or acquisition of the item of property, plant and equipment;

(b) costs of site preparation;

(c) initial delivery and handling costs;

(d) installation and assembly costs;

(e) costs of testing whether the asset is functioning properly, after deducting the net proceeds from selling any items produced while bringing the asset to that location and condition (such as samples produced when testing equipment); and

(f) professional fees.

PART 6

Extract from Chennai Airport Order No. 38/2021-22 for the Third Control Period

Grand Total of Capital Additions Proposed in the Third Control Period				
Grand total of capital additions proposed to be considered	Total	3,882.58	2,139.82	(1,742.66)
	Financing Allowance	51.88	-	(51.88)
	IDC	108.17	21.93	(86.27)
	Project division expenses capitalized (Exp. Cap)	87.07	47.58	(39.57)

Order No. 38/2021-22 for the Third Control Period

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~2.25%

Extract from Pune Airport Order No. 38/2021-22 for the Third Control Period

the control of Pune International Airport or its contracting agency and is properly justified, the same would be considered by the Authority while truing up the actual cost at the time of determination of tariff for the Fourth Control Period. Further, this proposal was applicable to all the projects forecasted to be capitalized in the Third Control Period given in this Consultation Paper. This will ensure timely adherence to the capital expenditure plan proposed in the Third Control Period.

4.2.33 Based on the discussion above, the total capital additions proposed to be considered by the Authority in the Third Control Period was as tabulated below:

4.2.34 Based on the Authority's analysis of capital expenditure deferred from Second Control Period (Para 4.2.9 to Para 4.2.24) and new capital expenditure proposed to be incurred in the Third Control Period (Para 4.2.25 to Para 4.2.31), the Authority considered a total Capital Expenditure of Rs. 52,540.93 lakhs as given below:

Table 83: Capital Expenditure additions for the Third Control Period considered by the Authority

Reference	Project	No.	Particulars	Submitted by AAI	Proposed by the Authority	Difference
				1	2	3=2-1
I	Capital additions deferred from the Second Control Period to the Third Control Period	I.A	New Integrated Terminal Building	44,621.19	43,694.92	-926.27
		I.B	PMC-Expansion of Terminal Building- (Tensile canopy)			
		I.C	PMC-Expansion of Terminal Building-Electrical works (aerobridge)			
		I.D	Baggage Trolley & XBIS	508.47	508.47	-
		I.E	Financing Allowance	3,337.57	-	-3,337.57
		I.F	IDC	2,023.22	2,005.96	-17.26
		I.G	Project division expenses capitalized (Exp. Cap)	1,651.26	1,630.60	-20.66
		I	Sub Total (A+I.B)	52,141.71	47,839.95	-4,301.77

~3.5%

PART 7

Form P11 (b): Payroll Related Expenditure and Provisions (ref: Section A5.5.5)

S.N.	Particulars - with detailed breakup	Last available audited year^	Financial Year before Tariff Year 1*	Tariff Year 1	Tariff Year 2	Tariff Year 3	Tariff Year 4	Tariff Year 5
A	*Salaries and Wages*							
B	*PF Contribution*							
C	*Medical Expenses*							
D	*Overtime*							
E	*Staff Welfare Fund*							
F	.....							
1	Grand Total							
2	Employee expenses capitalised							
3	Net Employee expenses (1)-(2)							

* Projected values to be provided
# Fields in italics are indicative only
^ Information for last financial year for which audited accounts are available

4.18 AERA proposal as per 7.3.12 on page 144 of CP relating to re-adjustment in ARR in case any particular capital project is not completed/capitalised as per the approved capitalisation schedule.

7.3.12. The Authority proposes to reduce 1% of the uncapitalised project cost from the ARR / target revenue as re-adjustment in case any particular capital project is not completed/ capitalized as per the approved capitalisation schedule. It is further proposed that if the delay in completion of the project is beyond the timeline given in the capitalization schedule, due to any reason beyond the control of the Airport Operator or its contracting agency and is properly justified, the same would be considered by the Authority while truing up the actual cost at the time of determination of tariff for the next Control Period. The re-adjustment in the ARR/ Target Revenue is to protect the interest of the stakeholders who are paying for services provided by the AO and is also encouragement for the AO to commission/ capitalize the proposed assets as per the approved CAPEX plan/ schedule.

Comments by LIAL:-

4.18.1 The Authority has proposed to disincentivize the AO by reducing 1% of the project cost in case of delay in implementation of the project. Such a proposal puts LIAL in double jeopardy because any delay in completion of project implies denial of return on such asset and depreciation and added to it will be this reduction in cost. It is abundantly clear that it is in the interest of LIAL to complete the project as per schedule, however there could be delays due to various uncertainties. There may be shortage of manpower, funds, force majeure, and unforeseen event, for any reason including but not limited to the scarcity of raw material, finished goods and manpower due to after effect of Covid-19.

4.18.2 One of the principles for tariff fixation stipulates, incentive for undertaking investment in timely manner. Instead of providing incentive for timely completion of project the Authority is proposing a disincentive due to delay.

4.18.3 **We request the Authority not to include this proposal in the Order.**

4.19 AERA proposal as per 7.5.10 on page 156 of CP relating to Depreciation.

7.5.10. The Authority on perusal of all the above, has summarized its view as under:

Asset class – Building: The Expert has recommended shorter life for False Ceiling, Sanitation works, Glass façade and Flooring works which appear to be integral part of the Airport Terminal Building. Authority's Order No.35 does not provide for reducing the life of assets under Asset class -Buildings. The Authority observes that various components mentioned above are also an integral part of the Terminal Building and should be added to the Terminal Building cost by applying the same rate of depreciation as that of buildings. While the technical report provided by the Airport Operator has determined the shorter life to be adopted, it has not provided sufficient rationale for adopting such shorter useful life. Since these assets are all part of the building, the Authority is of the view that the same rate applicable to building should be applied to these assets and no reduction in life of these assets are called for. Further, the Authority notes that adequate maintenance expenditure is allowed to enable the Airport Operator to maintain the assets in good working condition during its entire life. The Authority has issued Order No.35 as part of its normative approach to various Building Blocks in Economic regulation of Major Airports where it has stated that, "The Authority has been of the considered view, that it would be preferable to have as far as practicable, a broad year to year consistency in what Depreciation is charged by the companies as certified by the relevant statutory auditors and what the Authority would take into account in its process of tariff determination. Issue of a notification will ensure this objective." In view of all the above, the Authority is not inclined to deviate from ensuring this objective and therefore proposes not to consider the shorter useful life of 25 years claimed by the Airport Operator for both the Terminal Building and newly projected Cargo terminal building.

Asset Class -Runways, Taxiways and Aprons: The Expert has recommended adopting a shorter life of 20 years based on useful life followed by certain international associations and regulators, like, Federation Aviation Administration -US Department of Transportation, Civil Aviation Authority – UK, Australian Airports Association – Australia, International Civil Aviation Organization, etc., which the Authority feels does not provide proper justification for adopting a shorter useful life. Therefore, the Authority finds no reason to reduce the life of the Runway which enhances the burden of Airport users by increasing the tariff.

Other Asset Classes: Order No.35 provides for specific determination of life through technical evaluation for specific assets other than those listed in the Order based on specific requirement of the Airport. The Authority finds that none of the asset in these classes where a shorter life has been adopted as specific assets are based on specific requirement of the Airport. Therefore, the Authority finds no merit in reducing the life of such asset for tariff purposes.

Fuel farm facility – The Authority examined the list of items forming part of Fuel facility including assets planned to be purchased from IOCL and observed that there are assets belonging to different asset category, namely Buildings, Roads, Plant and Machinery, Vehicles etc., and based on the same, proposes not to consider the weighted average useful life of 7.5 years claimed by the Airport Operator. Instead, the Authority proposes to adopt the specific depreciation rate prescribed as per Order No.35 for such asset category in line with depreciation rates adopted for similar facility at other airports.

Comments by LIAL:-

4.19.1 In this regard, reference is made to the Useful life of Assets Order No. 35/2017-18 dated 12th January 2018, "... if the period of useful life of assets is considered differently, the Airport Operator shall document and provide the reasons/justification and the basis for the period considered in determining the useful life of assets for the purpose of tariff determination which shall be examined and considered by the Authority."

4.19.2 In furtherance of the same, LIAL had given a detailed technical report providing reasons as to why a shorter lifespan should be considered.

4.19.3 **We request the Authority to kindly allow the depreciation rates as assessed by the technical auditor which is in line with AERA Order.**

5 Chapter 5 “Comments on Consultation Paper Chapter 8 - Fair Rate Of Return (FRoR) For The Third Control Period”

5.1 AERA proposal as 8.2.1 to 8.2.4 on page 162 of CP relating to Cost of Equity

8.2.1. The Authority had commissioned independent studies for the evaluation of cost of capital separately, in case of each PPP Airport, namely DIAL, MIAL, GHIAL, BIAL and CIAL through a premier institute, namely IIM Bangalore and proposes to use these study reports as a basis, to the extent applicable and relevant, to ascertain the Cost of equity of CCSIA for the Third Control Period.

8.2.2. The independent study reports have drawn from the international experience of airports and their conclusions have been evaluated to the extent comparable with CCSIA in terms of hybrid till, ownership structure, size, scale of operations and regulatory framework. The median and average Cost of equity arrived at by the independent study reports are 15.16% and 15.18%, respectively, as shown in the table below:

Table 88: Computation of Cost of equity as per IIM Bangalore independent study reports

Particulars	CIAL	MIAL	BIAL	DIAL	GHIAL	Average
Risk-free rate (A)	7.56%	7.56%	7.56%	7.56%	7.56%	7.56%
Equity beta (B)	0.9427	0.9391	0.9732	0.9296	0.9442	0.94576
Equity risk premium I	8.06%	8.06%	8.06%	8.06%	8.06%	8.06%
Cost of equity $A + B * C$	15.16%	15.13%	15.40%	15.05%	15.17%	**15.18%**
Average Cost of equity						**15.18%**

8.2.3. The above independent study reports have used the Capital Asset Pricing Model (CAPM) and a notional gearing (Debt: Equity) ratio of 48:52 to determine the levered Equity beta and accordingly, derive the Cost of equity.

8.2.4. Based on the above reports, the Authority proposes the Cost of equity of 15.18% for CCSIA for the Third Control Period.

Comments by LIAL:-

5.1.1 As per AERA Guidelines. AERA is expected to estimate cost of equity by using CAPM for each AO subject to consideration of such factor as the Authority may deem fit. However, in the instant CP, AERA has not estimated the cost of equity for LIAL. Rather it has applied the average cost of equity estimated for other Airports. This is not in line with the AERA Guidelines.

5.1.2 Extract from the AERA Guidelines

> *"5.1.3 Cost of Equity*
> *Cost of Equity – The Authority shall estimate the cost of equity, for a Control Period, by using the Capital Asset Pricing Model (CAPM) for each Airport Operator, subject to the consideration of such factors as the Authority may deem fit."*

5.1.3 LIAL had engaged the services of PriceWaterhouse Coopers Services LLP (PwC) to carry out a study on evaluating the applicable Cost of Equity (CoE). Based on this study carried out in March 2021, the AO considered the CoE as 17.30%.

5.1.4 The methodology used to compute the CoE of CCSIA is the Capital Asset Pricing Model (CAPM), as mentioned in AERA Guidelines. The three components to be estimated in the CAPM are (a) the beta of the CCSIA, (b) the risk-free rate and (c) the equity risk premium. Following assumptions related to above three components which appropriately capture the risks of CCSIA have been used to calculate the CoE:

5.1.5 Identification of comparable airports: Various airports were identified which are listed on stock exchanges across the globe or have regulated betas. A set of airports were removed from the list because of either lack of data for the required time period or unreliable data.

5.1.6 Determination of equity and asset beta for the selected airports: Beta is indicative of the systematic risk of the project. In order to calculate this, the analysis regresses the movement of the stock prices (of respective airports) on the movement of an index representing the market portfolio. The beta values pertaining to this regression are called the 'equity' betas. Once the equity beta is calculated, the analysis 'un-levers' the beta (i.e., purges off the effects of the capital structure) by using the Hamada equation. Unlevered beta is called the 'asset' beta for the respective airports.

5.1.7 Computing the proximity scores for each airport and asset beta of CCSIA: Once the asset betas have been computed, quantifiable assessment has been undertaken for identified airports to determine the proximity/ relevance scores. All the airports have been compared with Lucknow airport based on the following airport characteristics:

- Regulatory Environment
- Operational Structure
- Payment Structure
- Ownership Structure

5.1.8 Numeric values of 1 to 3 have been assigned to each factor wherein lower the score, more comparable is the airport to CCSIA. Furthermore, an inverse of the proximity scores are used to calculate the 'asset' beta of CCSIA

5.1.8.1 ***Re-lever the asset beta to obtain the equity beta:*** *The asset beta of the CCSIA is relevered using the Hamada equation to obtain the equity (re-levered) beta. As the re-levered beta is a function of D/E or gearing ratio, the beta value changes whenever the D/E or gearing ratio changes. A gearing ratio of 48:52 is considered. This has been derived from the gearing ratios set by the regulators at different comparable international airports.*

5.1.8.2 ***Risk Free Rate:*** *An average of daily yield for 10 years of the 10-year Government of India security has been considered as the risk-free rate.*

5.1.8.3 ***Equity Risk Premium:*** *To avoid any bias, an average of equity risk premiums computed by a list of studies and standard market indices are taken for the analysis. The list of the same is provided as follows:*

- Prof Damodaran's estimate of ERP as of January 2021 based on ratings of sovereign bonds.
- Prof Damodaran's estimate of ERP as of January 2021 based on ratings of sovereign bonds.

- Forward looking ERP of India as estimated in a study conducted in April 2019 by Grant Thornton
- ERP published by Incwert Valuation Chronicles in June 2020
- ERP computed based on Nifty 50
- ERP computed based on Sensex.

5.1.9 As is clear from above, a well-defined systematic approach which appropriately captures the risks specific to CCSIA has been used for computing reasonable rate of CoE for CCSIA.

5.1.10 Further we would like to point that IIM B study considered 12 airports, out of which only two airports belong to developing countries. Airports in developing markets are exposed to each of these risks differently when compared to developed markets. Following are the risks which the airports in developing market have to face:

5.1.10.1 ***Demand Risk*** *– Apart from the economic conditions which affect demand, demand for air travel is also highly elastic with respect to air fare in India and other developing economies. Any increase or decrease in air fare due to fuel prices or other input costs results in relatively higher traffic volatility.*

5.1.10.2 ***Counterparty Risk*** *– Airports in developing countries typically derive a major part of their revenue from aeronautical services, as against the developed markers where non-aeronautical revenue is higher.*

5.1.10.3 ***Regulatory Risk*** *– Regulations in developing countries are still evolving and are not stable.*

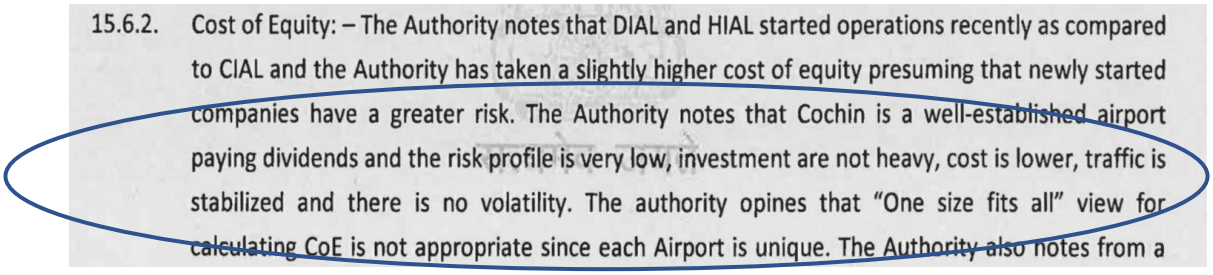
5.1.11 Asset beta of airports in developing countries is consistently higher than the asset beta of airports in developed economies. This can be demonstrated by the data provided in the IIM B study in which the asset beta for Sydney airport is 0.40 whereas the asset beta for Airport of Thailand is 0.86. This shows the quantum of variation in risk perception between developed and developing countries.

5.1.12 Study done by PwC includes airports from both developed economies like France, Spain and Switzerland and developing economies like Mexico, Malaysia, Thailand. Following are the asset betas of various airports as per study:

S.No	Airport Operator	5-year asset beta on 5 year average DER	5-year asset beta on latest DER
1.	Sydney Airport Holdings Private Limited	0.692	0.719
2.	Auckland International Airport Limited	1.030	1.052
3.	Flughafen Zurich	0.865	0.838
4.	Groupe Aeroports De Paris	0.922	0.922
5.	Aena	0.102	0.121
6.	Asur (Aeroporte Del Sureste)	1.338	1.340
7.	Københavns Lufthavne	0.423	0.416
8.	Grupo Aeroportuario Del Centro Norte S.A.B. De C.V. Adr	0.960	1.020
9.	Grupo Aeroportuario Del Pacífico, S.A.B. De C.V	1.430	1.428
10.	Aeroporto Guglielmo Marconi Di Bologna S.P.A	0.642	0.649
11.	Fraport Ag	0.686	0.669
12.	Airport Of Thailand Public Limited Company	0.984	1.002
13.	Malaysia Airport Holdings Berhad	0.846	0.893
14.	Flughafen Wien Ag	0.527	0.610
15.	Gruppo Toscana Aeroporti	0.457	0.455

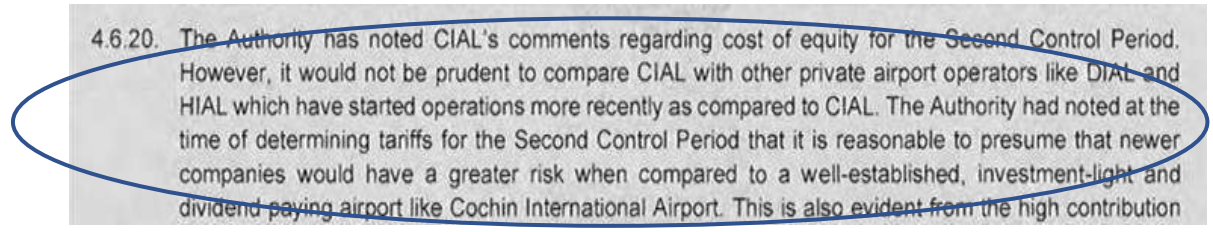
5.1.13 As is evident from table above, asset betas of airports in Mexico like Grupo Aeroportuario Del Centro Norte, Grupo Aeroportuario Del Pacifico, in Thailand like Airport of Thailand have asset betas of more than 1.

5.1.14 Further, we would like to give reference to para 15.6.2 of the Cochin Airport's Second Control Period Tariff Order No.7/ 2017-18 wherein Authority has taken the stance that newer airports which have higher risks need to be **adequately compensated by higher cost of equity and one size does not fit all**. Contents of the order are reproduced below



15.6.2. Cost of Equity: – The Authority notes that DIAL and HIAL started operations recently as compared to CIAL and the Authority has taken a slightly higher cost of equity presuming that newly started companies have a greater risk. The Authority notes that Cochin is a well-established airport paying dividends and the risk profile is very low, investment are not heavy, cost is lower, traffic is stabilized and there is no volatility. The authority opines that "One size fits all" view for calculating CoE is not appropriate since each Airport is unique. The Authority also notes from a

5.1.15 The same point is again acknowledged by the Authority in Tariff Order No 08/2021-22 for CIAL for the Third Control Period. The relevant extract is provided as : -



4.6.20. The Authority has noted CIAL's comments regarding cost of equity for the Second Control Period. However, it would not be prudent to compare CIAL with other private airport operators like DIAL and HIAL which have started operations more recently as compared to CIAL. The Authority had noted at the time of determining tariffs for the Second Control Period that it is reasonable to presume that newer companies would have a greater risk when compared to a well-established, investment-light and dividend paying airport like Cochin International Airport. This is also evident from the high contribution

5.1.16 **We hereby request AERA to accept the CoE as submitted by LIAL in the MYTP supported by an in-depth study conducted by an independent consultant PwC as per CAPM methodology prescribed under AERA Guidelines.**

5.2 AERA proposal as 8.2.5 to 8.2.9 on page 163 of CP relating to Cost of Debt

8.2.5. The Authority noted that the Airport Operator has considered Cost of debt at 12% for the Third Control Period based on its current borrowing rate from a related party and based on Adani Airport Holdings Limited's all-in borrowing cost of 12.10%.
8.2.6. Since the Airport and its holding company have not obtained any credit rating from an external rating agency, there is no direct comparable entity or market data for determining cost of debt for CCSIA.
8.2.7. However, the Authority recommends that the Airport bring in further efficiencies in its cost of borrowing by leveraging its parent entity's financial strength in order to reduce the interest rates. This suggestion is also in keeping with the spirit of PPP whereby it is expected that the financial strength of PPP airports is maintained at an optimal level and their cost of capital is within reasonably allowable limits.
8.2.8. Further the Authority has also noted that average bank lending rate of public sector banks and scheduled commercial banks as per the Reserve Bank of India's publication of September 2022 has been in the range of 8.65% to 9.23% p.a.3 The Authority has also noted that the average cost of debt of other five PPP airports viz., DIAL, MIAL, GHIAL, BIAL and CIAL is 8.96%.
8.2.9. Accordingly, the Authority has considered the Cost of Debt of 9% for the computation of Fair Rate of Return.

Comments by LIAL:-

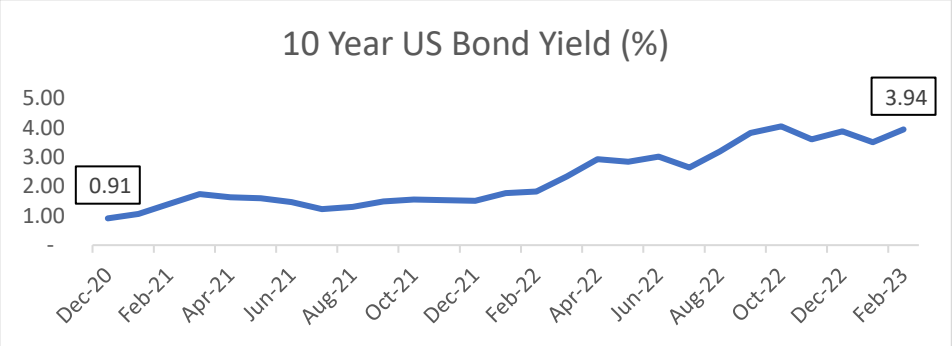
5.2.1 LIAL has considered CoD at 12% for the TCP based on its current borrowing rate from Adani Airport Holdings Limited (AAHL) which in turn has availed borrowing from global institutions like Standard Chartered Bank and Barclays Bank PLC.

5.2.2 However, the authority has proposed cost of borrowing to be considered at 9% p.a. being the average of other five PPP airports viz. DIAL, MIAL (Mumbai), GHIAL, BIAL and CIAL (ranges from 7.80% to 10.30%)

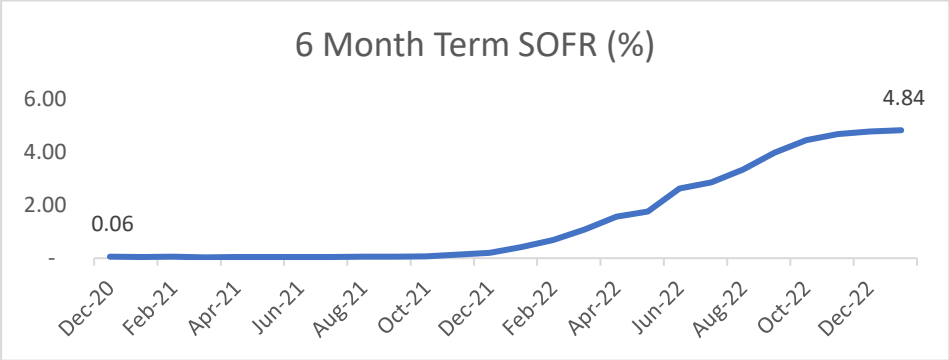
5.2.3 It is to be noted that tariff orders of above-mentioned PPP airports were issued during the period from December 2020 to August 2021. **The change in the global and domestic interest rates after the said period is provided in the following paragraphs.:**

5.2.3.1 ***Global Increase in Interest Rates:***

Given the changing economic scenarios across the globe the central banks of the countries have been increasing their benchmark rates. Below chart details 10 years US Treasury movement, where it is evident that the benchmark rates have been increasing since December 2020 (~3.03%) leading to increase credit spreads and cost of the borrowing globally:

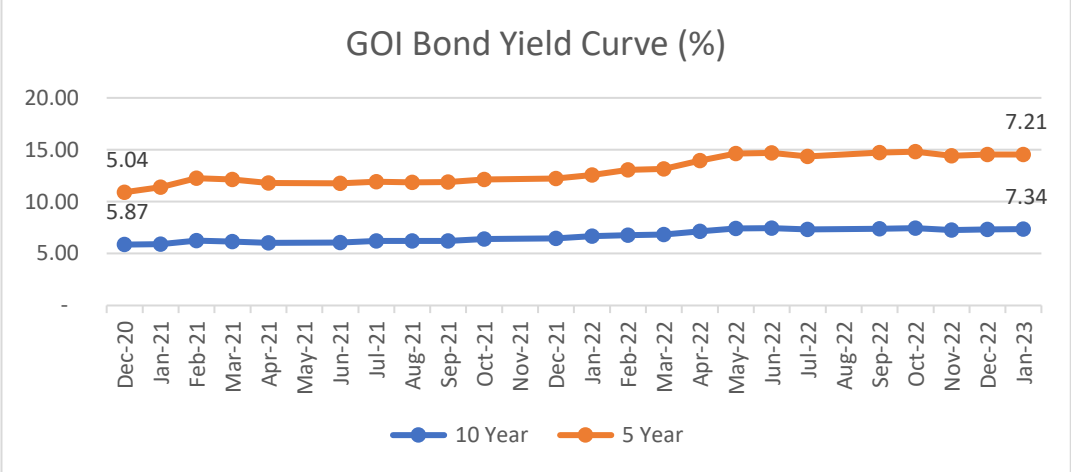


5.2.3.2 ***Secured Overnight Financing Rate (SOFR)**, has also increased materially (~4.78%) in the said period:*

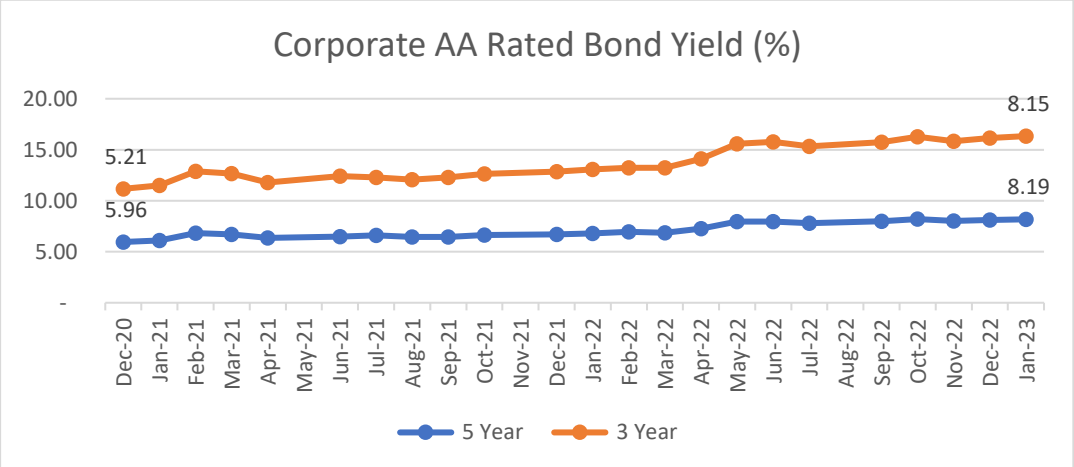


5.2.3.3 ***Increase in Domestic Interest Rates in India:***

Since May-2022, the Reserve Bank of India has increased Repo Rate by 2.50% leading to cost of domestic borrowing becoming dearer in India. Following chart depicts increasing trend in **10 year (+1.47%)** and **5 year (2.17%)** Indian government securities yields:

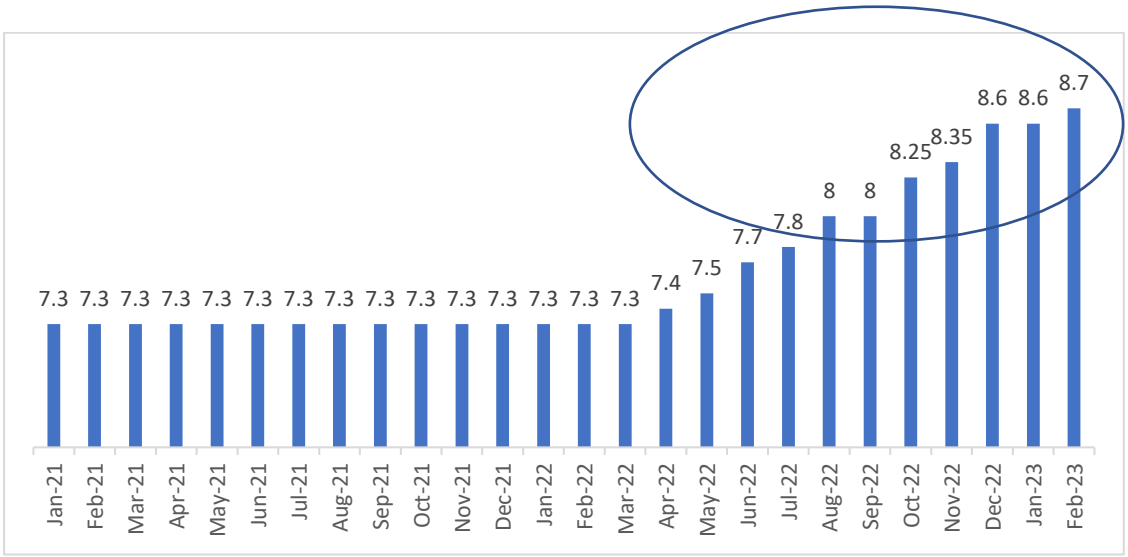


5.2.3.4 *Following chart depicts increasing trend in **5 year (+2.23%)** and **3 year (2.94%)** AA rated corporate bond yields:*



5.2.3.5 ***Increase in MCLR of Indian Banks :-***

3 Year MCLR of both private sector banks and PSU Bank have increased in the range of 100 to 150 bps points from Oct-21 to Feb-23. Also, in past few quarters RBI Policy statement indicates that lower interest era is ended. All Bank Rupee Borrowing is linked to MCLR plus Spread based on Credit Rating and Internal Assessment of respective clients. Accordingly with increase in MCLR there is increase in overall Borrowing cost. Trend in MCLR Cost of SBI is as follows : -



Source : https://sbi.co.in/web/interest-rates/interest-rates/mclr-historical-data

5.2.4 **Rationale of Cost of Debt (CoD) at LIAL:**

Considering the current profile of operation and outlook, rating of LIAL at maximum can be in BBB Category. Interest rate by lenders is fixed on the risk profile, cashflow generating capacity, other parameters including credit rating both internal (by lenders) and by rating agencies.

5.2.5 Option of raising funds at LIAL was not possible without Corporate Guarantee support from Adani Group. Borrowing with Corporate Guarantee of Adani Group in turn amounts to Borrowing at Holding Company level.

5.2.6 We would also like to highlight the fact that the borrowing costs for Government owned Entity and Private Sectors entity are different. Lenders are more comfortable in lending to Government entity since repayment is backed by sovereign guarantee (which carries highest Rating). Whereas in case of private sectors, lending comfort is driven by Industry outlook, cashflow generating capabilities, external and internal rating.

5.2.7 The linking of CoD with weighted average lending rate of public sector banks and commercial banks as given in the CP (the trend of which has also changed in June 2022 publication as per RBI website and it is now on increasing trend) is not appropriate because of the following reasons:-

- Weighted Average Rate means average rate across Rating grades (AAA to BB) and loan duration. It ignores basic premise of lending rate which is based on external rating and internal rating and duration of specific loan.
- Major portion of borrowings by PSU Bank is to State and Central Government Companies and Departments which carries lower interest considering that those are considered as Sovereign rating.

- The interest rate for lending for priority sectors (which constitutes Agriculture and other Areas) is a concessional rate under various scheme of State and Central Government.
- With inclusion of all the above, the average rates become lower. Comparing the said average with a private corporate borrowing rate will not be appropriate.

5.2.8 To have efficiencies in terms of quantum, maturities, and interest rates, borrowing at AAHL was availed in the form of External Commercial Borrowings for capex requirement of various Airports.

5.2.9 Further AAHL combining with Airport SPVs is domestically rated "A+/stable" by India Ratings, which at LIAL level will be BBB or below.

5.2.10 The transition of the Airport from AAI to LIAL happened during the COVID impacted period. This has negatively affected the revenue and cash flow of LIAL and its credit worthiness.

5.2.11 Considering the fact that the debts raised by AO are as per RBI guidelines from two reputed global Banks, reducing the cost by AERA than the actual rate of borrowing by the AO is not in line with AERA Guidelines and, according to us, is arbitrary and prejudicial to the interest of AO and airport development.

5.2.12 **Hence, we request the Authority, to consider the CoD @12% based on actual borrowings from a third party as submitted by LIAL.**

5.3 AERA proposal as 8.2.10 and 8.3.2 on page 163 of CP relating to Fair Rate of Return (FROR)

8.2.10. Based on the above, the Authority proposes to consider the following FRoR for LIAL for the Third Control Period:

Table 89: Fair Rate of Return proposed by the Authority for the Third Control Period

Parameter	Value
Cost of equity	15.18%
Cost of debt	9.00%
Weighted average gearing of equity	52.00%
Weighted average gearing of debt	48.00%
Fair Rate of Return	**12.21%**

8.3.2. To consider the notional debt to equity (gearing) ratio of 48 : 52 in line with target gearing ratio being considered in case of other PPP airports.

Comments by LIAL:-

5.3.1 The Authority, based on reduced CoE, reduced CoD and notional debt to equity (gearing) ratio of 48:52 has proposed to consider FROR of 12.21%. Apart from our comments on CoE and CoD already provided here in above, we would like to submit the following:-

5.3.1.1 As per clause no 4.7 of the CP, the Authority has allowed FROR of 14% to AAI for true up purpose and also allowed FROR of 14% to AO for true up of 5 months from COD to March-2021, as no debt was raised by AAI or AO during the relevant period.

5.3.1.2 Normally any private operator expects a higher FROR than any Government Entity, as both the CoD and expectation of return on equity is lower in case of Government Entity.

5.3.1.3 Because of the methodology proposed by AERA in the CP, the FROR for the TCP proposed by AERA is substantially lower at 12.21% as against 14.76% claimed by the AO.

5.3.1.4 In the recently approved order for Mangaluru and Ahmedabad Airport, the Authority has clarified that notional debt: equity ratio of 48:52 will not be trued-up in the next control period. However, the same is not clarified in the subject CP.

5.3.2 **We would request the Authority to consider our comments on CoE and CoD. We would also request the Authority to clarify regarding true-up of gearing ratio in the final order.**

6 Chapter 6 “Comments on Consultation Paper Chapter 10 - Operation And Maintenance (O&M) Expenses For The Third Control Period”

6.1 AERA proposal as per clause 10.1.13 (ii) on page 175, 176 and 181 of CP relating to Manpower Expenses

Page 175 – Expenses relating to AAI Manpower

f. Further, the Authority proposes to revise the 15% Y-o-Y increase in Payroll costs claimed by the Airport Operator to 6% for the remaining four (4) tariff years of the Third Control Period, as approved by the Authority for other similar airports.

Page 176 – Expenses relating to LIAL Manpower

- *Considering all the above, the Authority proposes to accept the weighted average employee salary cost of ₹ 17.50 lacs per annum in FY 2021-22 as appropriate. However, the Authority proposes to rationalize the growth rate by considering only 6% Y-o-Y for all the 4 FYs, starting from FY 2022-23 in line with what has been considered for Manpower Expenses of AAI employees.*

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However, considering the following pertinent factors such as:

The new Terminal Building T3 is projected to be completed only in two phases i.e., Phase 1 in FY 2023-24 and Phase 2 in FY 2024-25 with corresponding operationalization expected in FY 2024-25 and FY 2025-26 respectively.

Comments by LIAL:-

6.1.1 We would like to submit our analysis as follows: -

1. All India AAI Employees salary growth
2. Lucknow Airport AAI Employees Salary Growth
3. Analysis of Select Employee Cost Paid by LIAL to AAI from COD
4. Analysis of latest orders issued by the Authority

6.1.1.1 **All India AAI Employees salary growth**

Avg salary per employee of all India AAI employee is Rs. 26 lakhs in FY19-20 and the CAGR increase in avg cost per employee from FY13 to FY20 is 13.30%

	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	CAGR FY13 to FY20
No. of Employees	18,573	18,036	17,465	17,370	17,484	17,536	17,487	17,364	
Cost (Rs Crs)									
Pay & Allowances	1,192	1,696	1,777	1,936	2,011	2,131	2,249	2,731	12.57%
Other Staff Cost	469	581	894	625	631	1,375	1,732	1,462	17.64%
PF & Other Funds	338	134	143	152	162	185	1,228	329	-0.40%
Less Recovery of operational funds	-	(14)	(12)	(14)	(16)	(46)	(51)	(41)	
Total Cost (Rs Crs)	**2,000**	**2,397**	**2,802**	**2,699**	**2,788**	**3,645**	**5,158**	**4,481**	12.22%
Year on Your Growth in cost		20%	17%	-4%	3%	31%	42%	-13%	
Avg Cost per employee (Rs Crs)	**0.11**	**0.13**	**0.16**	**0.16**	**0.16**	**0.21**	**0.29**	**0.26**	13.30%
Year on Your Growth in avg cost cost		23%	21%	-3%	3%	30%	42%	-13%	

Source :- AAI Annual Reports

6.1.1.2 Lucknow Airport AAI Employees Salary Growth

Avg salary per AAI employee at Lucknow Airport is Rs. 25 lakhs in FY20-21 and the CAGR increase in avg cost per employee is approx 17% in last 9 years from FY12 to FY21. It is important to note that at Lucknow the average increase in cost has been in between 15-20% every year in last 9 years.

		FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21*	CAGR
Employee Cost (Tabe 19 of the O&M Study and Form 11 B of MYTP submission of Second Control Period)	Rs Crs	21.13	27.19	26.67	31.42	28.19	24.88	34.67	41.42	36.3	38.9	
No. of Aero Employees (Tabe 22 of the O&M Study and Form 11 A of MYTP submission of Second Control Period)	No. of Employees	335	344	324	312	298	156	175	174	167	155	
Avg Cost per employee	**Rs Crs per employe p.a**	0.06	0.08	0.08	0.10	0.09	0.16	0.20	0.24	0.22	0.25	17%
Year on Year Growth in avg cost cost	%		25%	4%	22%	-6%	69%	24%	20%	-9%	16%	

*Salary for FY21 is provided for 7 months in the CP as the Airport was transferred to LIAL on COD. Hence for comparative purposes the cost is annualized.

**FY12 to FY16 the cost is for all AAI employees at Lucknow including ATC based on the information available in public domain.

6.1.1.3 Analysis of Select Employee Cost paid by LIAL to AAI

The Avg cost per employee in FY21-22 has increased by 15.6% over FY20-21.

Month	Invoice (Rs Crs)	Employee Count	Avg Annual Cost per employee (Rs Crs)
Nov-20	1.88	167	0.14
Dec-20	1.98	167	0.14
Jan-21	2.11	167	0.15
Feb-21	2.27	167	0.16
Mar-21	2.06	167	0.15
Total	**10.30**	**835**	**0.15**
Apr-21	2.31	167	0.17
May-21	2.16	167	0.16
Jun-21	2.57	166	0.19
Jul-21	1.87	162	0.14
Aug-21	2.16	160	0.16
Sep-21	2.36	159	0.18
Oct-21	2.38	159	0.18
Nov-21	2.38	159	0.18
Dec-21	2.22	158	0.17
Jan-22	2.45	157	0.19
Feb-22	2.17	156	0.17
Mar-22	2.44	156	0.19
Total for FY 21-22	**27.47**	**1,926**	**0.17**
Avg growth over last year			**15.6%**

It is evident from the above analysis that avg annual cost per AAI employees has been increasing at a rate of 15.6%.

6.1.1.4 **Analysis of recent orders for ISPs.**

It is important to note that AERA has allowed 16% increase in payroll expenses in the recently approved order for ISP Order No. 37/2022-23 dated 06th January 2023. The relevant extract from the said order is as follows:-

5.5.2 The Authority notes from the submission of DCSC that during pandemic period, payroll expenses were low and many welfares activities I trainings etc. were deferred. Now with the improvement in the situation from the pandemic, ex ns in post Co vid period, including FY 2022-23, are expected to reach back to their normal levels. The ISP further submitted that Y-0-Y increase in payroll expenses have been projected after considering the factors like periodic increase in minimum wages notified by the Govt. Authorities from time to time, corresponding increase in other statutory components like EPF, ESI etc. The Authority, also noted at consultation stage that Cargo Handling is a specialized job and requires skilled & trained manpower at the Cargo Terminals. Further, during Covid, there is a shortage of required skill set. ISP further submitted that in order to address the issue of manpower attrition, the annual escalations in payroll expenses are projected in a very holistic manner and paid as per the industry practice.

Similar kind of statement has been made by the Authority in Order No. 32/2022-23 dated 29th December 2022 whereby the increase in cost is allowed by 10% year on year.

5.9.2 The Authority notes from the submission of CDCTM that during pandemic period, payroll expenses were low and many welfares activities I trainings etc. were deferred. Now with the improvement in pandemic situation, expenses in post Covid period, including FY 2022-2 3, are expected to reach back to their normal levels. The ISP further submitted that Y-0-Y increase in payroll expenses have been projected after considering the factors like periodic increase in minimum wages notified by the Govt. Authorities from time to time, corresponding increase in other statutory components like EPF, ESI etc. The Authority, also noted at consultation stage that as per the CDCTM, Cargo Handling is a specialized job and skilled & trained manpower is deployed at the Cargo Terminals. As per the ISP, post Covid, there is a shortage of required skill set. ISP further submitted that in order to address the issue of manpower attrition, the annual escalations in payroll expenses are projected and paid as per the industry practice.

6.1.2 LIAL is a new AO who needs to build its manpower to run the Airport operations. LIAL needs to hire all people from outside who come at 25%-30% higher salaries. According to a recent Michael Page report titled "Talent Trends 2021," better remuneration is the top reason for changing jobs. The report highlights that job seekers on an average expect around 20% salary hike at middle levels and 19% increase at director, Vice President and CXO levels from their current or last salary drawn. Even non-managerial level employees' expectations are an average of 20%."

6.1.3 LIAL would like to highlight the fact that Airport Operators face difficulties while hiring a new workforce. This is because the suitable personnel available for the aviation sector is very limited. While it is comparatively easier to get workforce for accounts, finance, administration etc., it is very difficult to get skilled workforce for airside and terminal operations, engineering and maintenance and safety. To obtain and retain competent employees, it is imperative to compensate them well. The AERA has also supported the same point while providing 15% increase in payroll cost of ISPs in latest orders as already discussed in 6.1.1.4 above.

6.1.4 Based on above analysis, we had requested for annual 15% increase in avg cost per employee. However, AERA has considered increase of 6% only.

6.1.5 **In order to avoid repetition of comment, please refer 4.1 for our request for operationalization of Terminal 3 in October 2023.**

6.1.6 **We request the Authority to provide at least 13% YoY increase in avg cost of salaries for all employees i.e. AAI and LIAL Manpower. Also, we request AERA to increase the manpower number in FY23-24 due to operationalization of Terminal 3 for which LIAL has started hiring required manpower.**

6.2 AERA proposal as 10.2.14 on page 185 of CP relating to Utilities Expenses

In respect of power recovery from the Concessionaires, the Authority is of the view that with the gradual increase in the Non-aeronautical operations, the Airport Operator should correspondingly increase the power recovery. Accordingly, the Authority proposes that the Airport Operator shall constitute a Committee to verify the bills relating to Power expenses and submit a report on the same to the Authority as part of Stakeholder comments / feedback. In case such report is not submitted by the Airport Operator, the Authority proposes to consider power recoveries at a notional rate while issuing the tariff order of the Third Control Period.

Comments by LIAL

6.2.1 Please find attached the report as directed by the Authority (refer **Annexure 22**).

6.3 AERA proposal as 10.2.12 on page 172 of CP relating to One Time escalation claimed by the AO

One time escalation claimed by the AO

10.2.12. One time escalation claimed by AO for various expenses in FY 2023-24 and FY 2024-25 has been analyzed by the Authority. In this regard the Authority is of the view that as per the Capitalization schedule proposed by it (refer Table 76) only Phase I of new Terminal T3 has been considered for capitalization during the current Control Period and Phase II of the T3 project has been shifted to the next Control Period. Accordingly, the Authority proposes to consider only proportionate increase pertaining to Phase I of T3 project for determining the one-time escalation in the expenses in the current Control period, as the Authority feels that the increase in the expenses may not be directly proportional to the increase in the Terminal Building area, due to the technological innovation, advancements and economies of scale. Hence, the Authority proposes to consider 2/3rd (i.e., 66.67%) of the escalation rates claimed by the AO (274.94%) for expenses such as Utilities and Other Operating expenses in the FY 2024-25 (as Phase I of T3 project is expected to be substantially completed by FY 2023-24, as detailed in Chapter 7).

In respect of Security expenses and IT expenses, the Authority notes that the AO has claimed 50% and 20% respectively which the Authority finds to be reasonable and justified. Hence, the Authority proposes to allow the same. However, for Rates & taxes, the Authority notes that the increase of 600% claimed by AO is not justified and hence, proposes to rationalize the same in line with the increase in terminal building area i.e., 274.94%. The details of escalation rates submitted by the AO and that proposed by the Authority for all the aforementioned expenses are shown in the table below:

Comments by LIAL

6.3.1 In order to avoid repetition of comment, please refer point 4.1 regarding LIAL request for likely capitalization of T3 in October 2023.

6.3.2 It is to be noted that it is a practice whereby AERA has allowed increase in utilities and other operating expenses (housekeeping) in proportion to increase in terminal area for the Airports which enjoys economies of scale and are future technology ready. For your kind reference the details are tabled below:

Airport	Control Period	AERA Order No.	Reference
Hyderabad	Third Control Period	12/2021-22 dated 31st August 2021	Utilities and Housekeeping expenses increased in proportion to increase in Terminal Area. Terminal area is increasing from 117,000 sq mtr to 365,809 s mtr i.e. 213% *Extract from the order* *Utility Costs* *7.2.27 The Authority had reviewed the submissions made by HIAL with regard to the utility expenses and is of the opinion that there is a merit in the argument that expansion at the airport shall res ult in increase in utility related expenses. The Authority proposed to*

			consider the utility cost projected with FY2020 as the base year. *7.2.40 The Authority proposed to consider the aforementioned revision in the projection methodology for housekeeping expenses for projections of aero housekeeping cost with FY2020 as the base year.* *Further, the Authority approved expansion of the terminal as a driver for the housekeeping cost and therefore accepts HIAL's consideration that increase in housekeeping cost due to expansion has to be factored for the operational months for expanded terminal.* *7.4.11 HIAL commented that it agrees to Authority's approach for increasing the housekeeping cost in proportion to the increase in terminal area in line with expansion, 80% of the housekeeping is fixed in nature and maintenance and upkeep of the infrastructure has to be ensured irrespective of the traffic levels. Hyderabad Airport has an integrated terminal and doesn't have flexibility to shut down a section of the terminal.*
Chennai	Third Control Period	38/2020-21 dated 04th February 2022	Utilities expenses increased in proportion to increase in Terminal Area. Terminal area is increasing by 33% *Extract from the order* *9.2.8. The Authority had noted that there would be a 33% net increase in terminal building area in FY 2022-23 after capitalization of modernization of Chennai International Airport, Phase II (NITB Part - I). Along these lines the Authority had proposed a 33% net increase power charges in FY2022-23* *9.5.6 It may be noted that the Authority has decided on a 33% increase in power charges after considering the recommended operational efficiencies at the airport.*
Trichy	First Control Period	55/2020-21 dated 22th October 2020	Housekeeping expenses increase in proportion to increase in Terminal Area. Terminal area is increasing from 14,450 sq mtr to 73,535 i.e. 410% *Extract from the order*

			12.2. II AAI has proposed an additional 10% increase in Watch & Ward charges and 460% increase in Upkeep charges in the FY 2022-23, due to operationalization of the New Terminal Building. AAI has clarified that there will be a composite maintenance contract for the entire NTB based on unit area. The Authority finds the same to be reasonable, considering the size of the New Terminal Building.

6.3.3 **In view of the above, we request AERA to proportionately increase the utilities and other operating charges (housekeeping charges) in line with proportionate increase in terminal area ~ 275%. Also, we request AERA to apply all one-time charges (Utilities, Other Operating Expenses, Rates and Taxes, Security Expenses, IT Expenses) from FY23-24 instead of FY24-25 as the T3 Phase 1 will be operational in October 2023.**

6.4 AERA proposal as 10.2.16 on page 186 of CP relating to Security Other (Counter Drone system)

10.2.16. The Authority on its examination of the expense claimed towards Security Others and notes the following:

i. Airport Operator has projected expenses of ₹ 15.60 Crores in FY 2021-22 with an increase of 5% Y-o-Y towards charges proposed to be paid to a Service Vendor for commissioning, operation and maintenance of 'Aerial Threat Detection and Neutralization System' (i.e., Counter-Drone system) at CCSIA based on the directive of Bureau of Civil Aviation Security (BCAS), which had directed the Indian Airports to implement sophisticated, reliable, robust and highly effective Counter drone technology/solution for Surveillance, detection and Neutralization of drones/ UAVs vide AVSEC Circular no 02/2020 dated February 11, 2020 and vide addendum dated February 9, 2021 to the said circular.

ii. However, the Authority notes that the above-mentioned Circular has been subsequently withdrawn by BCAS vide Order No. CAS-6(11)/2018/ Div-I/RPA/ (Part2)/ 180940 dated February 23, 2022 and hence the Authority proposes not to consider this expense during the Third Control Period.

Comments by LIAL:-

6.4.1 In the Tariff order No. 40/2023-23 for Ahmedabad Airport, AERA has allowed such expenses on actual incurrence basis. The relevant extract from the order is as: -

10,2.62, However, the Authority noted that the above-mentioned Circular was subsequently withdrawn by BCAS vide Order No. CAS-6(I 1)/2018/ Div-I/RPA/ (Part2)/ 180940 dated 23rd February 2022. Therefore, the Authority proposes to exclude this expense during the Third Control Period and considering the same based on actuals at the time of true up in case a revised Circular issued by the BCAS mandating the requirement for the implementation of Counter Drone System,

6.4.1 **Hence, we request the Authority to kindly provide the similar clarification for LIAL in the final tariff order.**

6.5 AERA proposal as 10.2.12 page 173 of CP relating to Rates & Taxes

However, for Rates & taxes, the Authority notes that the increase of 600% claimed by AO is not justified and hence, proposes to rationalize the same in line with the increase in terminal building area i.e., 274.94%. The details of escalation rates submitted by the AO and that proposed by the Authority for all the aforementioned expenses are shown in the table below:

Comments by LIAL:-

6.5.1. Authority has erred in linking increase in amount of Rates and Taxes with increase in area of Terminal Building. Rates and taxes are governed by local regulation and has prescribed formulae.

6.5.2. LIAL in its MYTP has submitted formula for calculating property taxes. The said portion of MYTP is reproduced below.

14.7. **Rates and taxes**

14.7.1. Rates and taxes costs contain several costs such as property tax, water tax and sewage tax to local authorities. As per local regulation the prescribed formula for various tax calculation is as : -

14.7.1.1. Property Tax = 15% * 7% * (Land value + Cost of Construction of Terminal)

6.5.3. Thus, it can be seen from above that value of property tax is derived from the formulae prescribed by local authority and is dependent on the value of assets. Thus, linking Rates and taxes with the area will not be correct.

6.5.4. **Thus, LIAL request the Authority to consider the amount submitted by LIAL for the purpose of property tax.**

6.6 AERA proposal as 10.2.17 on page 187 onwards of CP relating to Corporate Cost Allocation

(vi) However, the Authority observes that the aforementioned actual cost includes the costs of inhouse legal team, which is in addition to the cost of employees of Legal department, already considered under the manpower expenses of the Airport Operator (refer Table 105 above) and is not justified. Hence, the Authority proposes to exclude ₹ 0.11 Crores from the Corporate Allocation cost submitted by the AO and allow the remaining amount of ₹ 12.67 Crores for FY 2021-22.

(vii) Further the Authority observes that Salary cost constitutes the major portion of the Corporate Cost and hence, proposes to rationalize the increase claimed by the Airport Operator to 6% Y-o-Y across all the five tariff years in the Third Control Period, which is in line with the increase proposed for Manpower expenses under Para 10.2.11 (ii) above.

Comments by LIAL:-

6.6.1. **To avoid repetition of comments on in-house legal team, please refer the comments provided in 2.4.1.**

6.6.2. **Since the major portion of the Corporate Cost Allocation is comprising of Salary, we request Authority to provide increase in average cost per employee by 13% YoY as requested in point 6.1**

6.7 AERA proposal as 10.2.20 on page 191 of CP relating to Repairs and Maintenance

iii. The Authority as part of its review notes that the actual R&M expenses incurred by the AO for FY 2021-22 is ₹ 22.51 Crores (higher than its estimate of ₹ 20 Crores in the revised MYTP). Further, the Authority observes that out of the total amount claimed by the Airport Operator in each FY, the expense is higher than 6% of the Opening Net block of Aeronautical Assets for the first Three (3) tariff years of the Third Control Period and lower than 6% of the Opening RAB (Net block of Assets) for the last 2 tariff years, i.e., FY 2024-25 and FY 2025-26.

iv. The Authority is of the view that CCSIA is a brownfield airport, wherein Capital Additions have been newly proposed for the Third Control Period. As the newly constructed/ installed assets are covered under warranty clauses, they may need only minimum repairs and maintenance. The Authority, therefore, proposes to restrict the total repairs and maintenance expenses claimed by the Airport Operator to 6% of the Opening Net block of Aeronautical Assets for the FYs 2021-22, 2022-23, 2023-24 and consider the amount claimed by the Airport Operator towards repairs and maintenance for the FY 2024-25 and FY 2025-26.

Comments by LIAL :-

6.7.1 To avoid repetition of discussion on Repair and Maintenance, please refer the comments provided above in 2.4.3.

6.7.2 In addition, we would like to submit that Repairs and Maintenance expenses for FY21-22, FY22-23 and FY23-24 are either incurred or committed. These are expenses which need to be incurred for maintaining safe operations at the Airport.

6.7.3 **We hereby request Authority not to prescribe any cap at least for FY21-22, FY22-23 and FY23-24.**

6.8 AERA proposal as 10.2.24 on page 194 of CP relating to Fuel Operating Expenses

The Authority examined all the above and summarized its view as under:

a) The Authority proposes to consider the Fixed O&M and Variable O&M expenses as submitted by the Airport Operator for FY 2022-23. However, the Authority understands from AO's explanation that the outsourced vendor has commenced services only from August 1, 2022 and hence proposes to consider the estimated cost (both fixed and variable) proportionately for eight months during FY 2022-23.

b) Further the Authority proposes to consider the fuel throughput volume for the remaining 3 tariff years, i.e., FY 2023-24 to FY 2025-26, based on the growth rate proposed by the Authority for ATM traffic as per Table 57 and correspondingly derive the O&M expenses.

Comments by LIAL:-

6.8.1 As mentioned by the Authority, Open Access Fuel Farm has started from August-2022. From August-2022 to February-2023, the throughout volume of fuel is approx. 90,000 KL with monthly run-rate of approx. 12,000 KL. Therefore, the projected volume for FY22-23 is likely to be nearer to volume projected by the Authority of 99,900 KL.

6.8.2 It is understood that the Authority has applied ATM growth rate for arriving at volume for future years. It is to be noted that the volume for FY22-23 is for 8 months i.e. from August 2022 to March 2023, accordingly future years projection need to be projected considering the annualized volume for FY22-23 instead of 8 months as full year volume. The revised throughput volume should be as follows : -

	FY21-22	FY22-23	FY23-24	FY24-25	FY25-26
Total ATMs (Table 57 of CP)	30,000	38,460	43,870	52,900	62,790
Fuel Farm Operations (months)		8	12	12	12
Throughput Volume (KL)	0	99,900	153,545	185,150	219,765
KL per ATM		3.5	3.5	3.5	3.5

6.8.3 **We hereby request Authority to kindly revise the Fuel Throughput volume and corresponding operating expenses for FY24 to FY26 based on volume as projected above.**

7 Chapter 7 “Comments on Consultation Paper Chapter 11 - Non-Aeronautical Revenue For The Third Control Period”

7.1 AERA proposal as 11.2.2 to 11.2.10 from page 201 onwards of CP relating to Non-Aeronautical Revenues

11.2.2. The Authority notes that the AO undertook two-stage tendering process through e-tender mode vide Request for Proposal (RFP) dated March 1, 2021. Pursuant to the above RFP, three prospective bidders (domestic and global) had submitted their proposals to the AO. Based on technical qualification, financial parameters and evaluation criteria provided under the RFP, Adani Airport Holdings Limited was selected as the Service Provider, with whom the AO had entered into a Master Services Agreement. The criteria for selection of the Master Concessionaire seems restrictive. The Authority notes that the revenues projected by the Airport Operator are based on the said Agreement.

11.2.3. The Authority notes that the total Non-aeronautical revenue projected by the Airport Operator for the Third Control Period is only ₹ 114.84 Crores (refer Table 121) which is substantially lower than the actual Non-aeronautical revenue earned by AAI for the Pre-COD period (FY 2016-17 till COD) which was for ₹ 202.11 Crores. The Authority notes that the period in which AAI was operating the Airport included the pandemic impact where the traffic came to a standstill. The following table and chart shows the year wise NAR earned by AAI during the period FY 2016-17 till FY 2020-21 (up to COD) and the projections of the AO for the Third Control Period

11.2.4. The Authority takes cognizance of the fact that Non-aeronautical revenues have been projected for the Third Control Period by the Airport Operator, after taking in to consideration the pandemic and economic conditions on traffic which will reduce the consumer spending at airports. However, the Authority is not convinced about the revenue projection in the Master Services Agreement which is remaining constant for the entire Control Period, while all the other costs are increasing substantially across the Third Control Period. It is pertinent to note here that, with the development of new Terminal Building T3, space will be increasing considerably adding more area for Non-aeronautical services, which has not been factored into the revenue projection as per the Master Services Agreement. Hence, the Authority feels that the gradual increase in Non-aeronautical operations (by increasing the Non-aeronautical area within the Terminal Building from the existing 7.5% to 10% and above), will lead to increase in the Non-aeronautical revenues. Further, it is the responsibility of the AO to ensure that in the Third Control Period they should achieve NAR higher than what was achieved in the Second Control Period by AAI. In this context, there was no obligation on the AO to accept the bid of Master Concessionaire offering such low revenue share.

11.2.5…

11.2.6…… The Authority feels that with the progressive increase in the passenger traffic, the AO should make efforts to generate Non-aeronautical revenue higher than that earned by AAI during the pre-COD period.

11.2.7….

11.2.8…

11.2.9…

11.2.10 The Authority is of the view that the NAR projected by the AO for the Third Control Period is significantly lower as compared to that of other PPP airports (DIAL, MIAL, BIAL, GHIAL, CIAL), wherein the NAR projected by such PPP airports either equalize or higher or constitute at least 50% of the total O&M expenses projected by them for the respective Control Period. Whereas in the case of CCSIA, the Authority notes that the NAR projected by the AO for the Third Control Period is ₹ 114.84 Crores which is significantly lower as compared to the O&M expenses submitted by the AO which is ₹ 1,555.55 Crores (refer Chapter 10).

The Authority is of the view that the AO should take efforts to substantially increase NAR for the Third Control Period in line with the other PPP airports. Otherwise, AERA may propose a notional increase in the NAR for the Third Control Period, while determining tariff for the Fourth Control Period, in the interest of the Airport Users.

Comments by LIAL:-

7.1.1 The AO invited bids through a global competitive bidding process for selection of a Master Service Provider for Non-Aeronautical services at CCSIA. The bids were invited through an e-procurement portal. A third-party consultant was appointed to oversee the process adopted by the AO. Entire process was undertaken in a fair and transparent manner. The AO submits that the sanctity of open competitive bidding process should be maintained, and the Authority may not disapprove the price discovery undertaken through open competitive bidding.

7.1.2 Such a course of action would vitiate the very purpose of the open competitive bidding and undermine the well-established judicial principles in this regard. It is settled in law that the price discovered through open bidding has to be taken at face value and there is no reason to disbelieve such price. The Authority should not obliviate the entire bidding process on the premise that the price discovered could have been better as the price discovered through the bidding process is highest amongst bidders who submitted their financial proposal. It is well known that even in insolvency / liquidation proceedings, business /assets are sold at lower price than the value / benchmark of the business / assets. Therefore, we request the Authority to relook into their approach to extrapolate the non-aeronautical revenue on notional basis. The only test which applies is the fairness with which the bidding process was conducted. As long as there is no procedural irregularity, the outcome of the open competitive bidding process cannot be altered to achieve a particular requirement. It is submitted with respect that even the courts of law do not interfere with the outcome of the open competitive bidding process as long as the process is not vitiated by arbitrariness, illegality and unfairness.

7.1.3 During the COVID-19 period, the Non-Aeronautical revenues of the Airport were severely impacted. In order to protect its business interests, LIAL entered into a Master Service Agreement whereby a minimum amount of Non-Aeronautical revenues are guaranteed to the AO. This has insulated the Airport Operator from any future unforeseen event which may negatively impact the Non-Aeronautical revenues. The necessary commercial arrangements are provided in the Master Service Agreement based on which revenues for LIAL are projected.

7.1.4 There is no provision in AERA Guidelines 2011 for notional increase in the Non-Aeronautical revenues while determining tariffs.

7.1.5 Approach for selection of Master Concessionaire was not restrictive. It started with issuance of public advertisement in newspapers. The technical parameters for the bidders were set by the AO as per the capacity and size envisaging the master plan submitted to AAI by AO in consonance with concession agreement. Bidders qualifying the technical round submitted their financial proposal and the bidder offering highest revenue share was selected as Master Concessionaire.

7.1.6 **In light of above, we request the Authority to accept the Non-Aeronautical Revenues as projected by the AO which is in line with the contract entered based on market discovery rate.**

8 Chapter 8 “Comments on Consultation Paper Chapter 12 - Taxation For The Third Control Period”

8.1 AERA proposal as 12.2.2 from page 206 of CP relating to Taxation for the TCP Revenues

12.2.2 Therefore, the Authority is of the view that:-

• Non-Aeronautical revenues (30%) should not be treated as a subsidy for the airport operator as the airport operator has already earned it from Non-Aeronautical services and is meant as a cross subsidy to the airport user.

• The consideration of 30% Non-Aeronautical revenues as part of revenues from Aeronautical services would result in undeserved enrichment to the airport operator effectively reducing the cross-subsidy benefit to the airport user from the present 30% Non-Aeronautical income.

Comments by LIAL:

8.1.1 We refer to the direction of the TDSAT in the judgment dated 15th November 2018 in the matter of AERA appeal no 4 of 2013. The Judgment at Para 41(i) remands the matter of considering the S-Factor as part of revenue in calculation of tax, to AERA. LIAL is also of the view that the S Factor should be considered as part of the aeronautical revenue while calculation of tax. Our claim is supported by the following arguments.

Extract from TDSAT Judgment 15th November 2018

"41. To conclude, we find no good reason to interfere with the impugned tariff order, except to the extent indicated below – (i) In respect of decision XV.a, the question of 'S' as an element of revenue pertaining to aero services for the purpose of calculating 'T' is remanded back. Only to this limited extent, we direct AERA to consider the issue afresh through a consultative process in the next control period that may be falling for consideration."

8.1.2 As per AERA guidelines 5.5.1 as provided below, corporate tax paid on ***income from assets/ amenities/ facilities/ services*** (emphasis) taken into consideration for determination of Aggregate Revenue Requirement (ARR) will be considered for calculation of taxation component of ARR. Clause 5.5 of the AERA Guidelines is reproduced below:

5.5. Taxation (T)

5.5.1. Taxation represents payments by the Airport Operator in respect of corporate tax on income from assets/ amenities/ facilities/ services taken into consideration for determination of Aggregate Revenue Requirement.

5.5.2. The Authority shall review forecast for corporate tax calculation with a view to ascertain inter alia the appropriateness of the allocation and the calculations thereof.

Explanation: For avoidance of doubt, it is clarified that any interest payments, penalty, fines and other such penal levies associated with corporate tax, shall not be taken into consideration for calculation of Taxation.

"5.5. Taxation (T)

5.5.1. Taxation represents payments by the Airport Operator in respect of corporate tax on income from assets/ amenities/ facilities/ services taken into consideration for determination of Aggregate Revenue Requirement.

5.5.2. The Authority shall review forecast for corporate tax calculation with a view to ascertain inter alia the appropriateness of the allocation and the calculations thereof.

Explanation: For avoidance of doubt, it is clarified that any interest payments, penalty, fines and other such penal levies associated with corporate tax, shall not be taken into consideration for calculation of Taxation."

8.1.3 Income from Non-Aeronautical services are used in calculating the overall ARR. Therefore, in order to calculate the taxation under the regulatory framework, income from Non-Aeronautical services as proposed by AERA in the CP need to be considered. In case, the Authority does not consider income from Non-Aeronautical services for the purposes of taxation, it will be in contradiction to its guidelines.

8.1.4 **We hereby request the Authority to add the 30% of Non-Aeronautical revenues while determining the tax.**

9 Chapter 9 "Comments on Consultation Paper Chapter 14 - Aggregate Revenue Requirement (ARR) For The Third Control Period"

9.1 AERA proposal as 14.2.6 from page 211 of CP relating to Carry forward some portion of ARR

14.2.6. The Authority notes that the AO has on-going capital expenditure projects and other planned works, which have resulted in a higher ARR for the Third Control Period. Whereas, the existing traffic base is not sufficient for the complete recovery of ARR in the current Control Period and this would require a significant increase in tariff, which in the present times is likely to adversely impact the recovery of air traffic. Further, a significant increase in Aeronautical tariff, is also attributable on account of the fact that the new Aeronautical tariff proposed by the Authority may be implemented only by the first quarter of next Financial Year, thereby resulting in only lesser tariff years being available for recovery of the ARR

In this regard, the Authority would like to draw reference to the guiding principles issued by the International Civil Aviation Organization ("ICAO") on charges for Airports and Air Navigation Services (ICAO DoC 9082), which lays down the main purpose of economic oversight which is to achieve a balance between the interest of Airports and the Airport Users. This policy document categorically specifies that caution be exercised when attempting to compensate for shortfalls in revenue considering its effects of increased charges on aircraft operators and end users. The said policy document also emphasizes on balancing the interests of airports on one hand and aircraft operators, end users on the other, in view of the importance of the air transport system to States. This should be applied particularly during periods of economic difficulty. Therefore, the policy document recommends that States encourage increased cooperation between airports and aircraft operators to ensure that the economic difficulties facing them all are shared in a reasonable manner.

This may also be read in conjunction with the objectives of the National Civil Aviation Policy (NCAP) 2016, which intends to provide affordable and sustainable air travel for passengers/ masses. As per para 12 (c) of the NCAP, "In case the tariff in one particular year or contractual period turns out to be excessive, the Airport Operator and the Regulator will explore ways to keep the tariff reasonable and spread the excess amount over the future." The above has also been conveyed by AERA vide its Order No. 14/2016-17 dated January 12, 2017.

Further, it is pertinent to note that considerable investments in capacity have already been made which would be sufficient for the foreseeable future. Therefore, the subsequent control periods are expected to witness lower capital expenditure requirements while catering to a larger traffic base.

Based on the above considerations, the Authority has proposed to carry forward some portion of the ARR to the next Control Period in the harmonious interest of all the stakeholders chain including the Airport Operator.

Comments by LIAL:-

9.1.1 We request the Authority to take cognizance of the following facts: -

Investment mobilization through Privatization

9.1.1.1 In last 30 years investments of approx. Rs. 400 Crs has been made in the Lucknow Airport, the last major expansion being in the year 2012. During the period FY16 to FY20 traffic had increased significantly. Going forward, the annual passenger throughput is expected to grow to approx. 10 million in next 5 years and approx. 20 million over 10 years.

Considering the potential demand and operational requirements, AAI planned for the new terminal in FY2015-16 itself and envisioned the construction of New Terminal 3 in 2018. The same is carried forward by LIAL as per terms of the CA. In addition to T3, LIAL has earmarked various other investments and it is mobilizing investments of over Rs 5,000 crores during the control period.

Financial Position of the Airport

9.1.1.2 In respect to the financial position of the Airport, it is to be noted that: -

9.1.1.2.1 Lucknow Airport has been incurring losses since privatization. LIAL has incurred cash losses in FY21 and FY22 totaling to ~Rs. 125 Crs. LIAL is likely to incur cash losses of Rs. 130 Crs in FY23. Deferment of a part of the ARR, which is determined as per AERA Act & Guidelines, will further adversely affect the cash flow, profitability and financial position of the Airport Operator.

9.1.1.2.2 There are certain obligations under the Concession Agreement which are to be met like payment of Adjusted Deemed Initial RAB to AAI, reimbursement of select employee salaries to AAI, monthly concession fees payments to AAI, maintenance of service standards for operation and development.

9.1.1.2.3 The existing debt of the company is based on cash flow assumptions including full recovery of the ARR. In case it does not happen, the credit profile of the company will further erode, and it will have cascading impact leading to higher cost of debt. This will ultimately translate into a higher FRoR.

Significant Increase in Tariffs

9.1.1.3 It is mentioned in the CP that recovery of ARR will lead to significant increase in tariff. In this regard we would like to place a sample comparison of recently approved yield per pax as follows: -

Airport	Reference	Yield Per Pax (Rs)
Cochin	TCP Order No. 08/21-22	512
Kolkata	TCP Order No. 43/21-22	501
Lucknow	CP 16/2022-23	545

Unserved consideration

9.1.2 In the proposed CP, substantial amounts relating to justified projects and operational expenditure are already proposed on actual incurrence basis without taking its impact in current ARR. It is expected that YPP in next control period will be equal or more than the proposed YPP in the CP. Therefore, the deferment of ARR is not going to serve any purpose other than causing undue cash flow burden to LIAL.

9.1.3 Further the deferred amount is to be trued-up along with carrying cost in the next control period which will also be higher burden on the passengers.

Economic and viable operations

9.1.4 As per AERA Act 2008, Clause 13 (a) (iv) Functions of Authority, the Authority need to consider the economic and viable operations of the Airport while determining the tariffs.

9.1.5 In light of above, we earnestly request the Authority not to carry forward any portion of the ARR which will affect the financial viability of the AO. Further that will jeopardize the efficient operations of the Airport and adversely impact the very purpose of privatization.

9.2 AERA proposal as 14.2.9 page 213 of CP relating to Tariff Card for TCP

14.2.9. The Authority notes that, it is necessary to have the individual year wise tariff card laying down the different aeronautical charges and the workings for the aeronautical revenues, in order to have a constructive stakeholder discussion and hence AO is directed to submit the detailed Annual Tariff proposals in line with the ARR and Yield arrived at by the Authority within 7 days of issue of the Consultation Paper.

Comments by LIAL:-

9.2.1 The tariff card was submitted to the Authority on 25th February and subsequently published by the Authority vide Public Notice No. 21/2022-23 dated 27th February 2023.

9.2.2 **We request the Authority to make suitable adjustments in the ARR after considering the impacts of the requests raised in this document and provide AO an opportunity to revise the tariff card as per the final approved ARR.**

10 Chapter 10 “Other Points”

10.1 Please refer the point 7.9 as submitted in the MYTP. For easy reference the same is reproduced below: -

CCSIA has a single runway, which is in 09/27 orientation, measuring 2,742 m in length and 45m in width. It can handle a wide range of aircrafts, from narrow-body Code C (A320/B737) to wide-body Code E (B787/A350). Although the airport has been designated as Code 4D but also can handle Code E aircrafts with prior intimation. The runway length of 2,742m enables all narrow body aircraft to operate without commercial weight restrictions. However, for wide body aircrafts there are payload restrictions. (i) A runway extension is required to mitigate these operational impacts. (ii) Development of mandatory Runway End Safety Area (RESA) of airport, at the end of runway, beyond existing eastern boundary wall of airport is another essential compliance requirement. (iii) Similarly, development of full-length parallel taxiway is another important necessity for CCSIA to enhance its runway capacity and to improve operational efficiency. (iv) It is essential to ensure required mandatory clear distance from runway centerline up to airport boundary wall. Development of a full-length northern parallel taxiway for runway 09/27, by acquiring required land outside current airport boundary, is a critical project for CCSIA.

In order to take up these projects, erstwhile Airport Operator i.e. AAI had initiated discussion with local state authorities for the purchase of approx. 68 Acres of land. After privatization, LIAL has actively carried forward those discussions with the state authorities (refer Annexure - K attached)

LIAL acknowledges that land acquisition is time consuming. It involves multiple stakeholders, various processes and procedures which have variability on the timing of the purchase of land. Considering these factors, ALIAL has not considered the costs of land acquisition and necessary construction works as part of the capital expenditure in this MYTP. Therefore, LIAL request the AERA to kindly consider the necessary trueups for the same in the next control period, to provide for eligible return on land acquisition cost and associated construction works, along with carrying cost, in case it gets fructified during the TCP. LIAL will keep AERA informed on the developments of the matter from time to time.

10.1.1 We observed that there is no mention of the same in the CP. We request Authority to take cognizance of the facts submitted and to allow for necessary true-ups on the basis of actual incurrence in the next control period.

11 Chapter 11 "Annexures"

i. Annexure 1 – Contract for BHS
ii. Annexure 2 – LOA for PBB
iii. Annexure 3 – LOA for Security Equipment's and Hand Baggage Security Equipment
iv. Annexure 4 – LOA for Passenger Screening Equipment
v. Annexure 5 – LOA for Self Bag Drop
vi. Annexure 6 – LOA for ATRS
vii. Annexure 7 – LOA for MTCS
viii. Annexure 8 – LOA for Data Centre
ix. Annexure 9 – LOA for video wall
x. Annexure 10 – LOA for Immigration CCTV & CCTV
xi. Annexure 11 – LOA for FIDS
xii. Annexure 12 – LOA for ACS
xiii. Annexure 13 – LOA for ACN
xiv. Annexure 14 – LOA for PBX
xv. Annexure 15 – LOA for Training room and Meeting room
xvi. Annexure 16 – LOA for system integrator
xvii. Annexure 17 – Application for power connection to Madyanchal Vidyut Vitran Nigam
xviii. Annexure 18 – Letter from NCC
xix. Annexure 19 – IATA Guidance Note on assessment of storage requirement
xx. Annexure 20 – Letter from IOCL
xxi. Annexure 21 – ACRP Report
xxii. Annexure 22 – Certificate on recovery of electricity

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भारतीय विमानपत्तन प्राधिकरण
AIRPORTS AUTHORITY OF INDIA

संख्या भाविप्रा/निमु /उ.क्षे./अभि.(वि.)/लखनऊ/बीएचएस/2019-20/112 दिनांक:- 20.03.2020
No. AAI/CHQ/NR/Engg(E)/ Lucknow/BHS/2019-20 Date: - 20.03.2020

स्पीड पोस्ट /Speed post
ई-मेल/E-Mail

मैसर्स वांडेरलानडे इंडस्ट्रीज़ प्राइवेट लिमिटेड ,
यूनिट 508, 5th फ्लोर ,टावर 2
वर्ल्ड ट्रेड सेंटर, खराड़ी,
पुणे-411014,
महाराष्ट्र, इण्डिया

M/s Vanderlande Industries Private Limited,
Unit- 508, 5th Floor, Tower 2,
World Trade Centre, Khraradi,
Pune-411014
Maharashtra, India,

कार्य का नाम : सी.सी.एस. अंतर्राष्ट्रीय हवाई अड्डे, लखनऊ में नए एकीकृत यात्री टर्मिनल भवन का निर्माण। उपशीर्ष:- सीटी-ईडीएस के साथ बैगेज हैंडलिंग सिस्टम का प्रावधान।

Name of Work: - Construction of New Integrated Passenger Terminal Building AT C.C.S International Airport, Lucknow SH:- Provision of Baggage Handling System along with CT-EDS."

संदर्भ / Ref :

i) आपकी ई - बोली (टैंडर आईडी नंबर 2019_AAI_26791_1) जो दिनांक 09.09.2019 को खोली गई और रिवर्स ऑक्शन दिनांक 19.09.2019 को सम्पन्न हुआ।
Your e - bid (Tender ID No. 2019_AAI_26791_1) opened on 09.09.2019 & Reverse Auction completed on dated 19.09.2019.

ii) शुद्धिपत्र - 1CCP ई - टैंडर पोर्टल पर दिनांक 14.06.2019 पर अपलोड किया गया।
Corrigendum- 1 uploaded on CCP e- tender portal on dated 14.06.2019.

iii) शुद्धिपत्र - 2 CCP ई - टैंडर पोर्टल पर दिनांक 12.07.2019 पर अपलोड किया गया।
Corrigendum- 2 uploaded on CCP e- tender portal on dated 12.07.2019

iv) शुद्धिपत्र - 3 CCP ई - टैंडर पोर्टल पर दिनांक 22.07.2019 पर अपलोड किया गया।
Corrigendum- 3 uploaded on CCP e- tender portal on dated 22.07.2019.

थोमस मैथ्यु. टी / THOMAS MATHEW. T
संयुक्त महाप्रबंधक (अभि.-विद्युत) / Jt. GM (Engg.-Elect.)
भा. वि. प्रा. निगमित मु. / AAI, CHQ

राजीव गांधी भवन
Rajiv Gandhi Bhawan
सफदरजंग हवाई अड्डा नई दिल्ली 110003
Safdarjung Airport, New Delhi-110003
दूरभाष : 24632950
Phone: 24632950

Vanderlande Industries Pvt. Ltd.

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v) शुद्धिपत्र - 4 CCP ई - टैंडर पोर्टल पर दिनांक 02.08.2019 पर अपलोड किया गया।
Corrigendum- 4 uploaded on CCP e- tender portal on dated 02.08.2019.

vi) शुद्धिपत्र - 5 CCP ई - टैंडर पोर्टल पर दिनांक 16.08.2019 पर अपलोड किया गया।
Corrigendum- 5 uploaded on CCP e- tender portal on dated 16.08.2019.

vii) निविदा की वैद्यता की अवधि को 24 अप्रैल तक बढाने हेतु मै॰ वांडेरलानडे द्वारा पत्र दिनाँक 17 फरवरी 2020.
M/s Vanderlande Letter dated 17th February 2020 regarding Extension of Tender validity till 24th April 2020.

महोदय / Dear Sir(s),

1. उल्लिखित कार्य हेतु आपकी निविंदा के संबंध में, आपके द्वारा उद्धरित कुल $55,09,610.26 (डालर पच्पन लाख नौ हजार छह सौ दस और छब्बीस सेंट केवल) कस्टम ड्यूटी और जीएसटी अतिरिक्त और Rs.64,84,13,925.90 (रु॰ चौसठ करोड़ चौरासी लाख तेरह हजार नौ सौ पच्चीस और नब्बे पैसे केवल) जीएसटी अतिरिक्त को अध्यक्ष , भारतीय विमानपत्तन प्राधिकरण की ओर से स्वीकृत किया जाता है ।

Your tender for the work mentioned above is hereby accepted on behalf of Chairman, Airports Authority of India at the item rates quoted by you totaling to $ 55,09,610.26 ($ Fifty-Five Lakhs Nine Thousand Six hundred ten and Twenty-six Cent Only) excluding custom duty & GST and Rs. 64,84,13,925.90 (Rs. Sixty-four Crore Eighty-Four Lakh Thirteen Thousand Nine Hundred Twenty-Five and Ninety Paisa Only) Excluding GST.

2. संयुक्त/ उप महाप्रबंधक (अभि॰- वि॰) भारतीय विमानपत्तन प्राधिकरण ,लखनऊ एयरपोर्ट कार्य के प्रभारी अभियंता होंगे । आपसे निवेदन है कि आप अधिकृत प्रतिनिधि , जिन्हें आपकी ओर से ठेका करार पर हस्ताक्षर करने का अधिकार हो, को दिनांक : 07.04.2020 तक संयुक्त/उप महा प्रबन्धक (अभि- विद्युत), भा वि प्रा ,उत्तरी क्षेत्र, राजीव गांधी भवन, सफदरजंग हवाई अड्डा, नई दिल्ली के कार्यालय मे भेजकर करार पर हस्ताक्षर करने तथा करार की कार्यवाही पूर्ण कराने का कष्ट करें । ठेका करार का निष्पादन एक सौ रुपए मूल्य के गैर अदालती स्टैम्प पेपर (नई दिल्ली) पर किया जाएगा तथा स्टैम्प पेपर का खर्च आपके द्वारा वहन किया जाएगा ।

Jt./ Dy. GM (Engg. - E) Airports Authority of India Lucknow Airport shall be the Engineer - in - charge of the work. You are requested to depute your accredited representative, empowered to sign the contract agreement on your behalf to attend the office of the Jt./Dy.GM (Engg-E) AAI, Northern Region, Rajiv Gandhi Bhawan, Safdarjung Airport, New

Vanderlande Industries Pvt. Ltd.

थोमस मैथ्यु॰ टी / THOMAS MATHEW.T
संयुक्त महाप्रबंधक (अभि.-विद्युत) / Jt. GM (Engg-E)
उ. क्षे. प्रा., नियमित मु. / AAI, CHQ

Delhi by 07.04.2020 to sign and complete the contract agreement. The contract agreement shall be executed on a non - judicial stamp paper of Delhi Government of value of Rs. 100 / - (Rs. One hundred only) and the cost of the stamp paper shall be borne by you.

3. ठेका कागजातों के पृष्ठ –जीसीसी-6 की धारा 18 के शर्त के अनुसार, आपकी निविदा के साथ बैंक गारंटी के रूप मे प्राप्त बयाना राशि रू 1,39,93,200/- (रू एक करोड़ उनतालीस लाख तिराण्वे हजार दो सौ मात्र) को सुरक्षा जमा राशि के लिए प्राप्त बैंक गारंटी एवं बिड बॉन्ड की प्राप्ति पर वापस कर दिया जाएगा। आपसे अनुरोध है कि निविदा दस्तावेज के शर्त 18 पृष्ठ –जीसीसी 6-7 के अनुसार अपरिवर्तनीय बैंक गारंटी के रूप में सुरक्षा जमानत राशि और निष्पादन गारंटी जमा करें।

   The earnest money amount of Rs. 1,39,93,200/- (Rs. One Crore Thirty-Nine Lakhs Ninety-Three Thousand Two Hundred only) in the form of Bank Guarantee received along with your tender shall be returned on the receipt of bank guarantee towards security deposit and bid bond for the work as per condition of clause18 on page No.GCC-6 of the tender. You are requested to submit the security deposit and Performance Guarantee in the form of irrevocable bank Guarantee as per clause no 18 - page no. GCC 6-7 of the Tender Document.

4. निविदा की धारा 18 (अ) प्रष्ट संख्या जीसीसी 6 के अनुसार बिड बॉन्ड के लिए बिड बॉन्ड फॉर्म और बैंक गारंटी फॉर्म B, C तथा C1 के अनुसार धरोहर राशि ए एआई और ठेकेदार के बीच अनुबंध एवं एलसी खोलने से पहले जमा की जावे। बिड बॉन्ड और सपोर्टिंग बैंक गारंटी काम के पूरा होने की तारीख (यानी एस॰आई॰टी॰सी॰) के पश्चात छह महीने तक वैध रहेगी।

   The bid Bond Form and bank Guarantee towards Bid Bond as per form B, C & C1 amounting equivalent to EMD shall be furnished as per Clause No. 18 on page no. GCC-6 before the agreement is executed between AAI and the contractor and before opening of LC. The Bid bond and supporting bank Guarantee shall remain valid for six month: beyond the date of completion of work (i.e . SITC Work.)

5. आपसे अनुरोध है कि अनुबंध श्रम (विनियमन और उन्मूलन) अधिनियम 1970 और अनुबंध श्रम (विनियमन और उन्मूलन) , केंद्रीय नियम 1971 बाल श्रम (निषेध और विनियमन) अधिनियम 1986, निर्माण श्रमिक रोजगार और स्थिति का विनियमन) सेवा) अधिनियम 1996 , भवन और अन्य निर्माण श्रमिक कल्याण उपकर अधिनियम 1996 और कर्मचारी भविष्य निधि और विविध प्रावधान अधिनियम, 1952 और ईएसआई अधिनियम, 1948 . जीसीसी / पुरक शर्तों और विशेष विवरण में निर्दिष्ट , वार्षिक व्यापक रखरखाव के तहत निविदा और केंद्रीय नियमों के अनुबंध और राज्य सरकारें के प्रावधानों का पालन करें ।

   You are requested to comply with the provision of Contract labour (Regulation and Abolition) Act 1970 and contract labour (Regulation and

थोमस मैथ्यु, टी / THOMAS MATHEW T
संयुक्त महाप्रबंधक (सिवि.-विद्युत) / Jt. GM (Engg.-Elect.)
भा. वि. प्रा., निगमित मु. / AAI, CHQ

Landerlande Industries Pvt. Ltd.

Abolition) Central rules 1971 Child Labour (Prohibition & Regulation) Act 1986 , Construction Workers (Regulation of Employment and Condition of Service) Act 1996 , Building and other construction Workers Welfare Cess Act 1996 and Employee Provident Fund & Miscellaneous Provision Act , 1952 & ESI Act , 1948 as specified in GCC / Supplementary Conditions and Particular Specification Under Annual Comprehensive maintenance Contracts of tender and rules of Central and State Governments .

6. आपको निर्देश दिया जाता है की आप संयुक्त/ उप महाप्रबंधक (इंजी -विद्युत) , भारतीय विमानपत्तन प्राधिकरण , लखनऊ हवाई अड्डा से तुरंत संपर्क करे जो आपको कार्य स्थल सौंपने की व्यवस्था करेंगे।

   You are also directed to contact Jt./ Dy. GM (E-E), Airports Authority of India, Lucknow Airport immediately who will arrange to hand over the site to you.

7. कृपया यह भी भली भांति नोट कर लें कि निविदा पृष्ठ संख्या जीसीसी 16-17 पर खंड 27 के अनुसार कार्य निष्पादन हेतु अनुमानित समय एस . आई . टी . सी . हेतु बाईस माह (दस महीने फ़ेस –I के लिए तथा बारह महीने फ़ेस- II के लिए), संचालन एवं अनुरक्षण के लिए सात साल एवं सभी समवेशी व्यापक रख-रखाव हेतु पाँच साल जो दो साल की दोष दायित्व अवधि के उपरान्त है, इस पत्र के जारी होने के 10 दिन बाद से गिना जाएगा ।

   Please note that as per tender clause 27 on page no. GCC 16-17 the time allowed for carrying out the work shall be 22 (Twenty-two) months for S.I.T.C work (10 months for Phase- I & 12 months for Phase-II), Operation & Maintenance for 7 years and All Inclusive Comprehensive Maintenance of the installation for the specified 5 years period after defect liability period of 2 years and same shall be reckoned from the 10th day from the date of issue of this letter.

8. इस ठेके से संबंधित आगे की किसी भी प्रकार के पत्र व्यवहार के लिए संयुक्त/ उप महाप्रबंधक (इंजी - विद्युत) , भारतीय विमानपत्तन प्राधिकरण , लखनऊ विमानपत्तन को संबोधित करेंगे।

   Any further correspondence in connection with the contract should be addressed to Jt. /Dy. GM(E-E), AAI, Lucknow Airport.

9. कृपया इस पत्र की प्राप्ति सूचना दें तथा इसके साथ अनुलग्न अनुप्रति पर हस्ताक्षर करके स्वीकृति के टोकन के रुप में अधोहस्ताक्षरी को वापस भेज दें ।

   Please acknowledge the receipt and return the duplicate copy of this letter enclosed herewith after signing it to the undersigned as a token of acceptance.

थोमस मैथ्यु. टी / THOMAS MATHEW. T
संयुक्त महाप्रबंधक (अभि.-विद्युत) / Jt. GM (Engg.-Elect.)
भा. वि. प्रा., लखनऊ हवाई अड्डा / AAI, CHQ

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10. हिंदी और अंग्रेजी वर्जन में कहीं भी किसी तरह की विसंगति होने पर, अंग्रेजी वर्जन मान्य होगी।
In case of any difference or ambiguity in Hindi and English version anywhere, the English version will prevail.

संलग्नकः मात्राओं की अनुसूची / Enclosure : Schedule of Quantities

आपका आभारी / Yours faithfully

20/03/2020

(थोमस मैथ्यु टी /Thomas Mathew T.)
संयुक्त महाप्रबंधक(इंजी –विद्युत)
Jt. General Manager (Engg-Elect)
अध्यक्ष , भा. वि. प्रा. के लिए व उनकी तरफ से
For and on behalf of Chairman, AAI
भारतीय विमानपत्तन प्राधिकरण /
Airports Authority of India

Copy to:-

1. Regional Executive Director RHQ, NR Operational Office Complex, Gurgaon Road, Rangpuri, New Delhi-110037.
2. Airport Director, C.C.S Airport, Lucknow, Airports Authority of India, Lucknow-226009.
3. G. M. Engg (Project), C.C.S Airport, Lucknow, Airports Authority of India, Lucknow-226009.
4. Jt. GM (E-E), C.C.S Airport, Lucknow, Airports Authority of India, Lucknow-226009.
5. The Regional Provident Fund Commissioner,
6. The Commissioner of Service Tax
7. The Labour Commissioner,
8. The Commissioner of Income Tax,

Enclosed 4 Nos. copy for G.M. Engg (Project), Lucknow for facilitate the delivery of the individual copy.

20/03/2020

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संयुक्त महाप्रबंधक (अभि.-विद्युत) / Jt. GM (Engg.-Elect.)
भा. वि. प्रा., निगमित मु. / AAI, CHQ

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LETTER OF AWARD

16th June 2022
Ref. NO.: PROC/LKO/21-22/LOA/006

M/s. SHENZHEN CIMC-TIANDA AIRPORT SUPPORT LTD.
9 Fuyuan 2th Rd. Fuhai, Baoan, Shenzhen China
Tel: 86-755 23362528, Fax: 86-755 26685815

Kind Attn: Mr. Feng Liu (International Marketing & Sales Center)

Subject: Letter of Award for Design & Supply on CIF, any Indian Sea port basis of Thirteen (13) units of Passenger Boarding Bridges (PBB) along with two (02) years of DLP at Lucknow International Airport Ltd, Lucknow.

References.:
1. EOI publish dtd 22nd Dec'21
2. RFQ - PreQ dtd 10th Jan'22
3. Your Initial proposal dtd 23rd Feb'22
4. Various discussions/meetings/communications during 22nd Dec'21 till 2nd May'22
5. Your final proposal dtd 2nd May'22

Dear Sir,

With reference to the above references and subsequent discussions, we are pleased to issue this Letter of Award ("LOA") to you for the 'Design, Manufacture & Supply on CIF any Indian sea port basis of Thirteen (13) units of Passenger Boarding Bridges in two phases along with two (02) years of DLP at Lucknow International Airport Ltd (LIAL), ("Project")' as per the technical specifications contained in tender documents, addendums and amendments issued, discussions between us and Consortium and the agreed scope of work

Based on the above and the understanding reached between LIAL and Supplier, we are hereby pleased to issue this LOA on the following terms

1. **LOA Price:** We, Lucknow International Airport Ltd. ("LIAL") agree to pay a sum of **USD 45,50,000** (US Dollars Four Million Five Hundred Fifty Thousand only) in two phases with below phase wise breakup. The prices shall be valid until October 2023.

    a. **Phase – 1: 28,00,000** (US Dollars Two Million Eight Hundred Thousand only) for Eight (08) set of PBBs

    b. **Phase – 2: 17,50,000** (US Dollars One Million Seven Hundred Fifty Thousand only) for Five (05) set of PBBs

    This amount includes design & supply of thirteen (013) sets of PBBs (with two (02) years of DLP and along with all necessary accessories & spares for DLP) on CIF any Indian Sea port basis (excluding Custom duty @ 8.50% and GST @ 18%), towards completion of your responsibilities under this LOA in terms of the Project, as per the price mentioned above. The LOA price is on fixed rate basis, shall be fixed for the tenure of the LOA and subject to variation only on account of the variation in the scope of work for completion of the Project & as per agreed terms and conditions.
    Detailed price BOQ break up is as per the attached Annexure 1.

Lucknow International Airport Ltd
(Formerly known as Adani Lucknow International Airport Ltd)
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2. **Scope of Supplies:** Detailed technical specifications, agreed parameter matrix, final RFI sheet of PBBs along with other complete technical documents are attached as Annexure-2

3. **Taxes and Duties**: The LOA price set out above includes all taxes & duties and excludes Custom Duty @ 8.50% and GST @ 18%.

4. The unit prices for any spare parts shall be as per attached agreed rate card, whose rates are valid for a period of 2 years from the date of LOA

5. The Installation, testing & commissioning along with 06 years of CAMC & 08 years of Operations for phase – 1 quantity of Eight (08) PBBs & 05 years of CAMC & 07 years of Operations for Phase-2 quantity of Five (05) PBBs shall be carried by M/s Millennium Aero Dynamics Pvt Ltd (who is authorized Indian partner of Shenzhen CIMC TIANDA) against LOA ref: PROC/LKO/21-22/LOA/007 dtd 16th June'22

6. **CPBG:** The CPBG shall be submitted for 10% of contract value within 15 days from the date of order confirmation / date of LOA. The CPBG shall be valid till handover of SITC works + 6 months claim period. CPBG format is attached to this LOA. The CPBG shall be submitted in two phase wise based on the value of respective phase as per attached price annexure 1.

7. **PBG:** The PBG shall be submitted for 10% of the contract value valid from handover date until Two (02) years of warranty/defect liability period + 6 Months claim period. PBG format is attached to this LOA. The PBG shall be submitted in two phase wise based on the value of respective phase as per attached price annexure 1.

8. **Terms of Payment:** Payment shall be made as per below mentioned milestone basis:

   - **Phase – 1 Qty (Eight (08) No. of PBBs)**
     - 10% advance against submission of ABG of equal amount.
     - 70% through LC with 45 days usance,
     - 10% after installation of PBB at site.
     - 10% after commissioning and handover to Airport Operator and against submission of 10% PBG valid till completion of warranty/defect liability period (DLP)

   - **Phase – 2 Qty (Five (05) No. of PBBs)**
     - 10% advance against submission of ABG of equal amount.
     - 70% through LC with 45 days usance,
     - 10% after installation of PBB at site.
     - 10% after commissioning and handover to Airport Operator and against submission of 10% PBG valid till completion of warranty/defect liability period (DLP)

   All payments shall be released within Thirty (30) days from the date of submission of clear invoice duly certified by LIAL representative

9. **Schedule of Delivery:** The SITC shall be done as per below mentioned timelines:

   a. **Phase – 1:** SITC of PBBs shall be completed and handed over to LIAL engineer in charge with acceptance within Ten (10) months from the date of this LOA.

   b. **Phase – 2:** SITC of PBBs shall be completed and handed over to LIAL engineer in charge with acceptance within Ten (10) months from the date of giving manufacturing clearance for phase- 2 from LIAL team.

10. **Liquidated damages (LD):** It will be applicable at 0.5% per week delay and part thereof maximum up to 5% of the total basic contract value after agreed completion schedule.

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FUHAI,BAOAN,
SHENZHEN,CHINA
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11. This LOA is subject to the terms and conditions contained herein, agreed Special Terms & Conditions, terms of reference, general Conditions of Contract (GCC) and all such other documents agreed by the parties by the way of the addenda issued to the tender and tender deviations – agreed between the parties as referred above

12. **Limitation of Liability:** The consortium's liability shall be limited to the maximum 100% of contract value and no consequential damage shall apply except for liabilities incurred in cases of fraud and breach of mutually agreed terms.

13. **Warranty/ Defect Liability Period (DLP)**: 24 months from the date of installation or 30 months from the date of supply whichever is earlier. Supply of material shall be done after approval of Engineer in Charge as per agreed schedule

14. We, LIAL, will be issuing a formal purchase order (PO) in this regard soon and until the finalisation and execution of such contract, the terms of this LOA and GCC and related documents attached with this LOA shall govern the understanding between the parties in respect of the Project and the Supplier/Contractor is required by LIAL to commence the Project in accordance with the References above-mentioned

15. Governing Law and Jurisdiction: This LOA Contract shall be interpreted, construed and governed by the Laws of India. Jurisdiction shall be Ahmedabad

16. The Contractor shall perform their obligations in terms of this LOA in accordance with applicable law and the instructions of LIAL

A Formal Purchase Order (PO) is under preparation and will be issued in due course of time. Till then this LOA is being issued to enable you to start the work.

Please acknowledge and send us one copy of this LOA duly signed and stamped on each page as a token of its unconditional acceptance.

For, Lucknow International Airport Limited

Balvir Bhatia
Balvir Bhatia (Jun 17, 2022 13:31 GMT+5.5)

Authorized Signatory
Balvir Singh Bhatia
CHIEF AIRPORT OFFICER

For, Shenzhen CIMC-TIANDA Airport Support Ltd

2022.6.17

SHENZHEN CIMC-TIANDA AIRPORT SUPPORT LTD, 6F FUYUAN 2ND ROAD, FUHAI, BAOAN, SHENZHEN, CHINA TEL:+86-755-26688488 FAX:+86-755-26685815

Authorized Signatory
LIU FENG
Senior Sales Manager

Enclosures:
Annexure 1: Price break up sheet
Annexure 2: List of below documents

- Project schedule
- Signed Terms of Reference
- Signed PBB specifications
- Signed Scope of works during DLP
- Signed technical compliance matrix
- Signed RFI sheet
- Signed list of shop drawings
- Signed GTC foreign supply
- Signed GTC domestic supply
- Signed commercial terms MoM
- ABG & CPBG formats
- List of spares to be supplied for DLP
- Spare parts rate card valid for 2 years from date of LOA

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Aneex 1 to LOA ref:PROC/LKO/21-22/LOA/006 dtd 16th June 2022					
Sno	**Description**	**Quantity**	**UOM**	**Rate**	**Amount**
	Phase 1				
1	Supply of Passenger Boarding Bridge along with complete accessories and recommended spares for DLP period	8	No	$290,000	$2,320,000
2	Freight Charges	8	No	$60,000	$480,000
	Total Phase -1				**$2,800,000**
	Phase 2				
3	Supply of Passenger Boarding Bridge along with complete accessories and recommended spares for DLP period	5	No	$290,000	$1,450,000
4	Freight Charges	5	No	$60,000	$300,000
	Total Phase -2				**$1,750,000**
	Total Import cost (Phase - 1 + Phase - 2) on CIF any Indian Seaport basis				**$4,550,000**

Note:

Custom Duty @ 8.5% & GST @ 18% are extra on above figures

The above prices shall be valid until October 2023

SHENZHEN CIMC-TIANDA AIRPORT SUPPORT LTD,
9,FUYUAN 2ND ROAD,
FUHAI,BAOAN,
SHENZHEN,CHINA
TEL:+86-755-26688488
FAX:+86-755-26685815

LETTER OF AWARD

12th August 2022
Ref. NO.: PROC/LKO/22-23/LOA/012

M/s. SMITHS DETECTION SYSTEMS PVT LTD
Khasra No 1233/1349 Mustitial No.159,
Village Badshahpur, Sohna Road, Sector 68,
Gurugram, Haryana, India

Kind Attn: *Mr. Samir Panjwani (Sales Head- West)*

Subject: Letter of Award for Design, Supply, Installation, Testing and Commissioning of Three (03) units of Hold Baggage Screening System (HBSS) including Two (02) Years of Defect Liability Period (DLP) & Five (05) years of Comprehensive maintenance at Lucknow International Airport Ltd (LIAL), Lucknow

References.:
1. EOI publish dtd 10th Mar'22
2. RFQ - PreQ dtd 13th Apr'22 ("RFQ")
3. Your proposal dtd 25th May'22

Dear Sir,

With reference to the above references and subsequent discussions, we are pleased to issue this Letter of Award ("LOA") to M/s. Smiths Detection Systems Pvt Ltd ("Vendor") for SITC of HBSS at the Airport ("Project") as per the technical specifications contained in tender documents, addendums and amendments issued, agreed scope of work and subsequent discussions.

Based on the above and the understanding reached between LIAL and Vendor, we are hereby pleased to issue this LOA on the following terms

1. **LOA Price:** We, Lucknow International Airport Ltd. ("LIAL") agree to pay a sum of **INR 47,11,87,053 (Rupees Forty-Seven Crores Eleven Lacs Eighty–Seven Thousand and Fifty-Three only)** including all applicable taxes, duties & GST @ 18% **,** this amount includes Design, Supply, Installation, Testing and Commissioning of Three (03) units of Hold Baggage Screening System (HBSS) including Two (02) Years of Defect Liability Period (DLP) & Five (05) years of Comprehensive maintenance towards completion of your responsibilities under this LOA in terms of the Project, as per the price mentioned above.

   The LOA price is on fixed rate basis, shall be fixed for the tenure of the LOA and subject to variation only on account of the variation in the scope of work for completion of the Project & as per agreed terms and conditions.
   Detailed price BOQ break up is as per the attached Annexure 1.

2. **Scope of Supplies:** Scope of works is attached as annexure 2.

3. **Taxes and Duties**: The LOA price set out above includes all taxes & duties.

4. **Advance Bank Guarantee (ABG):** The ABG shall be submitted for the 10% of the total contract value valid till completion time + 6 Months claim period. ABG shall be strictly as per the format attached to this LOA.

5. **Contract Performance Bank Guarantee (CPBG):** The CPBG shall be submitted for 10% of contract value within 15 days from the date of order confirmation / date of LOA. The CPBG shall be valid till handover of SITC works + 6 months claim period. CPBG shall be strictly as per the format attached to this LOA.

6. **Performance Bank Guarantee (PBG):** The PBG shall be submitted for 10% of the contract value valid from handover date until Two (02) years of warranty/defect liability period + 6 Months claim period. PBG shall be strictly as per the format attached to this LOA.

7. **Terms of Payment:** All payments shall be made within Thirty (30) days from the date of submission of clear invoice duly certified by the LIAL's Representative.as per the below breakup:

    a. **Material Supply:**
        i. 10% shall be released as advance against submission of ABG of equal amount
        ii. 80% against material receipt and acceptance at site.
        iii. 10% on installation of HBSS system at site.
        iv. 10% on commissioning and successful takeover by LIAL and against submission of PBG valid till completion of warranty/defect liability period (DLP)

    b. **Installation, Testing and Commissioning services:**
        i. 80% on completion of installation works
        ii. 20% on commissioning and handing over to LIAL and against submission of performance bank guarantee equal to 10% of total contract value valid till completion of warranty/defect liability period (DLP).

    c. **Comprehensive annual maintenance (CAMC):** Payment shall be made on monthly basis after certification from engg. In charge.

8. **Schedule of Completion:** The Entire works shall be completed and handed over to LIAL by 30th January 2023 as per below breakup:

    a. Delivery of machines at LIAL site by 30th December 2022
    b. ITC works to be completed and hand over by 30th January 2023.

9. **Liquidated damages (LD):** It will be applicable at 0.5% per week delay and part thereof maximum up to 5% of the total basic contract value after agreed completion schedule.

10. This LOA is subject to the terms and conditions contained herein, agreed Special Terms & Conditions, terms of reference, general Terms and Conditions (GTC) and all such other documents agreed by the parties by the way of the addenda issued to the tender and tender deviations – agreed between the parties as referred above

11. **Limitation of Liability:** The consortium's liability shall be limited to the maximum 100% of contract value and no consequential damage shall apply except for liabilities incurred in cases of fraud and breach of mutually agreed terms.

12. **Warranty/ Defect Liability Period (DLP)**: 24 months from the date of installation or 30 months from the date of supply whichever is earlier.

13. We, LIAL, will be issuing a formal Contract agreement in this regard soon and until the finalisation and execution of such contract, the terms of this LOA and GTC and related documents attached with this LOA shall govern the understanding between the parties in respect of the Project and the Vendor is required by LIAL to commence the Project in accordance with the References above-mentioned

14. Governing Law and Jurisdiction: This LOA Contract shall be interpreted, construed and governed by the Laws of India. Jurisdiction shall be Ahmedabad

15. The Vendor shall perform their obligations in terms of this LOA in accordance with applicable law and the instructions of LIAL

A formal Contract Agreement is under preparation and will be issued in due course of time. Till then this LOA is being issued to enable you to start the work.

Please acknowledge and send us one copy of this LOA duly signed and stamped on each page as a token of its unconditional acceptance.

For, Lucknow International Airport Limited

Balvir Bhatia
Balvir Bhatia (Aug 12, 2022 16:40 GMT+5.5)

Authorized Signatory
Balvir Singh Bhatia
Chief Airport Officer

For, Smiths Detection Systems Pvt Ltd

Authorized Signatory

Enclosures:
Annexure 1: Price break-up sheet
Annexure 2: Scope of works
Annexure 3: GTC, STC & other related documents

Lucknow International Airport Ltd
(Formerly known as Adani Lucknow International Airport Ltd)
First Floor, Terminal 1
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adaniairports@adani.com
www.adani.com

Registered Office: Adani Corporate House, Shantigram, Nr Vaishno Devi Circle, S G Highway, Khodiyar, Ahmedabad 382 421, Gujarat, India

LETTER OF AWARD

02nd January 2023
Ref. NO.: PROC/LKO/22-23/LOA/026

M/s. ECIL – Rapiscan Ltd
Plot No: 16 & 17 part, SY No.1/1, Kancha Imarat,
Hardware Park, Raviryala Village,
Maheshwaram Mandal, Shamshabad,
Hyderabad - 500005, Telangana

Kind Attn: Mr. Sheel Thakur (Regional sales Head- South & West)

Subject: Letter of Award for Manufacture, Supply, Installation, Testing and Commissioning of Door Frame metal Detector (DFMD) including Three (03) Years of Defect Liability Period (DLP) & CAMC for Five (05) years.

References.:.
1. Your proposal dtd 15th December 2022

Dear Sir,

With reference to the above references and subsequent discussions, we are pleased to issue this Letter of Award ("LOA") to M/s. ECIL – Rapiscan Ltd ("Vendor") for SITC of DFMD at the Airport ("Project") as per the technical specifications contained in tender documents, addendums and amendments issued, agreed scope of work and subsequent discussions.

Based on the above and the understanding reached between LIAL and Vendor, we are hereby pleased to issue this LOA on the following terms

1. **LOA Price:** We, Lucknow International Airport Ltd. ("LIAL") agree to pay a sum of **INR 2,22,62,272 (Rupees Two Crore Twenty-Two Lakhs Sixty-Two Thousand Two Hundred and Seventy-Two only)** including all applicable taxes & duties,, this amount includes Manufacture, Supply, Installation, Testing and Commissioning of DFMD including Three (03) Years of Defect Liability Period (DLP) & CAMC for Five (05) years. towards completion of your responsibilities under this LOA in terms of the Project, as per the price mentioned above.

   The LOA price is on fixed rate basis, shall be fixed for the tenure of the LOA and subject to variation only on account of the variation in the scope of work for completion of the Project & as per agreed terms and conditions. Detailed price BOQ break up is as per the attached Annexure 1.

2. **Scope of Supplies:** Scope of works is attached as annexure 2.

3. **Taxes and Duties**: The LOA price set out above includes all taxes & duties.

4. **Performance Bank Guarantee (PBG):** The PBG shall be submitted for 10% of the contract value valid from handover date until Three (03) years of warranty/defect liability period + 6 Months claim period. PBG shall be strictly as per the format attached to this LOA.

5. **Terms of Payment:** All payments shall be made within Thirty (30) days from the date of submission of clear invoice duly certified by the LIAL's Representative.as per the below breakup:

   SITC Works:
   - 90% of Total Order value within 30 days from receipt of material at LIAL store and tax invoice.
   - 10% of Total Order value within 30 days against successful installation, Testing and commissioning and submission of Performance Bank Guarantee.

CAMC Works:

- Payment shall be made on monthly basis after certification from engg. In charge.

6. **Schedule of completion:** SITC shall be completed within 10 - 12 weeks from the date of order confirmation.

7. **Liquidated damages (LD):** It will be applicable at 0.5% per week delay and part thereof maximum up to 5% of the total basic contract value after agreed completion schedule.

8. This LOA is subject to the terms and conditions contained herein, agreed Special Terms & Conditions, terms of reference, general Terms and Conditions (GTC) and all such other documents agreed by the parties by the way of the addenda issued to the tender and tender deviations – agreed between the parties as referred above

9. **Limitation of Liability:** The consortium's liability shall be limited to the maximum 100% of contract value and no consequential damage shall apply except for liabilities incurred in cases of fraud and breach of mutually agreed terms.

10. **Warranty/ Defect Liability Period (DLP)**: 36 months from the date of installation or 42 months from the date of material delivery & acceptance at site, whichever is earlier.

11. We, LIAL, will be issuing a formal Purchase Order in this regard soon and until the finalisation and execution of such contract, the terms of this LOA, GTC and related documents attached with this LOA shall govern the understanding between the parties in respect of the Project and the Vendor is required by LIAL to commence the Project in accordance with the References above-mentioned

12. **Governing Law and Jurisdiction:** This LOA Contract shall be interpreted, construed and governed by the Laws of India. Jurisdiction shall be Ahmedabad

13. The Vendor shall perform their obligations in terms of this LOA in accordance with applicable law and the instructions of LIAL

A formal Purchase Order is under preparation and will be issued in due course of time. Till then this LOA is being issued to enable you to start the work.

Please acknowledge and send us one copy of this LOA duly signed and stamped on each page as a token of its unconditional acceptance.

For, Lucknow International Airport Limited

Rahul Bhatkoti

Rahul Bhatkoti (Jan 2, 2023 17:15 GMT+5.5)

Authorized Signatory

Rahul Bhatkoti

Chief Airport Officer

For, ECIL – Rapiscan Ltd

Authorized Signatory

Enclosures:

Annexure 1: Price break-up sheet
Annexure 2: Scope of works
Annexure 3: GTC, STC & other related documents

Lucknow International Airport Ltd
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Registered Office: Adani Corporate House, Shantigram, Nr Vaishno Devi Circle, S G Highway, Khodiyar, Ahmedabad 382 421, Gujarat, India

Annexure 1 to LOA ref:PROC/LKO/22-23/LOA/026 dtd 2nd January 2023				
Item	**Qty**	**UOM**	**Unit rate**	**Amount**
SITC of DFMD	58	Nos	235,729	13,672,282
Accessories to DFMD	1	Lot	88,890	88,890
Capex Total				**13,761,172**
Opex - CMC	**Qty**	**UOM**	**Unit rate**	**Amount**
DFMD	58	Nos	88,020	5,105,160
Opex Total				**5,105,160**
Capex +Opex - DFMD				**18,866,332**
GST @ 18%				3,395,940
Grand Total Incl. GST @ 18%				**22,262,272**

LETTER OF AWARD

02nd January 2022
Ref. NO.: PROC/LKO/22-23/LOA/025

M/s. M S TECH LTD
PO BOX NO. 12357,6 GALGALEI HAPLADA STREET
HERZLIYA-PITUACH, TEL AVIV,46733,06, TEL AVIV, ISRAEL

Kind Attn: Mr. Rakesh Gupta

Subject: Letter of Award for Manufacture, Supply, Installation, Testing and Commissioning of Explosive Trace Detector (ETD) including Three (03) Years of Defect Liability Period (DLP).

References.:

1. Enquiry Email dtd 2nd July 2022.
2. Your Initial Proposal Email dtd 16th July 2022.
3. Your proposal dtd 15th August 2022

Dear Sir,

With reference to the above references and subsequent discussions, we are pleased to issue this Letter of Award ("LOA") to M/s. M S TECH LTD ("Vendor") for SITC of ETD at the Airport ("Project") as per the technical specifications contained in tender documents, addendums and amendments issued, agreed scope of work and subsequent discussions.

Based on the above and the understanding reached between LIAL and Vendor, we are hereby pleased to issue this LOA on the following terms

1. **LOA Price:** We, Lucknow International Airport Ltd. ("LIAL") agree to pay a sum of **USD 300,000 (US Dollars Three Hundred Thousand only)** including all applicable taxes, duties, & excluding Custom Duty & GST, this amount includes Manufacture, Supply, Installation, Testing and Commissioning of ETD including Three (03) Years of Defect Liability Period (DLP) towards completion of your responsibilities under this LOA in terms of the Project, as per the price mentioned above.

   The LOA price is on fixed rate basis, shall be fixed for the tenure of the LOA and subject to variation only on account of the variation in the scope of work for completion of the Project & as per agreed terms and conditions.
   Detailed price BOQ break up is as per the attached Annexure 1.

2. **Scope of Supplies:** Scope of works is attached as annexure 2.

3. **Taxes and Duties**: The LOA price set out above includes all taxes & duties except GST @ 18%.

4. **Performance Bank Guarantee (PBG):** The PBG shall be submitted for 10% of the contract value valid from handover date until Three (03) years of warranty/defect liability period + 6 Months claim period. PBG shall be strictly as per the format attached to this LOA.

5. **Terms of Payment:** All payments shall be made within Thirty (30) days from the date of submission of clear invoice duly certified by the LIAL's Representative.as per the below breakup:

   - 80% on submission of clear invoice against material receipt & acceptance at site
   - 10% on completion of installation, testing & commissioning works and handover at site
   - 10% shall be released against submission of Performance Bank Guarantee (PBG) of 10% of the total contract value valid till completion of defect Liability Period

6. **Schedule of completion:** Material shall be delivered at site within 12 -15 weeks from the date of order confirmation.

7. **Liquidated damages (LD):** It will be applicable at 0.5% per week delay and part thereof maximum up to 5% of the total basic contract value after agreed completion schedule.

8. This LOA is subject to the terms and conditions contained herein, agreed Special Terms & Conditions, terms of reference, general Terms and Conditions (GTC) and all such other documents agreed by the parties by the way of the addenda issued to the tender and tender deviations – agreed between the parties as referred above

9. **Limitation of Liability:** The consortium's liability shall be limited to the maximum 100% of contract value and no consequential damage shall apply except for liabilities incurred in cases of fraud and breach of mutually agreed terms.

10. **Warranty/ Defect Liability Period (DLP)**: 36 months from the date of installation or 42 months from the date of material delivery & acceptance at site, whichever is earlier.

11. We, LIAL, will be issuing a formal Purchase Order in this regard soon and until the finalisation and execution of such contract, the terms of this LOA, GTC and related documents attached with this LOA shall govern the understanding between the parties in respect of the Project and the Vendor is required by LIAL to commence the Project in accordance with the References above-mentioned

12. **Governing Law and Jurisdiction:** This LOA Contract shall be interpreted, construed and governed by the Laws of India. Jurisdiction shall be Ahmedabad

13. The Vendor shall perform their obligations in terms of this LOA in accordance with applicable law and the instructions of LIAL

A formal Purchase Order is under preparation and will be issued in due course of time. Till then this LOA is being issued to enable you to start the work.

Please acknowledge and send us one copy of this LOA duly signed and stamped on each page as a token of its unconditional acceptance.

For, Lucknow International Airport Limited

Rahul Bhatkoti
Rahul Bhatkoti (Jan 2, 2023 17:14 GMT+5.5)

Authorized Signatory
Rahul Bhatkoti
Chief Airport Officer

For, M S TECH LTD

Authorized Signatory

Enclosures:
Annexure 1: Price break-up sheets
Annexure 2: Scope of works
Annexure 3: GTC, other related documents

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Annexure 1 to LOA ref: PROC/LKO/22-23/LOA/025dtd 30th December 2022				
Item	**Qty**	**UOM**	**Unit Rate(USD)**	**Amount(USD)**
Supply of ETD	20	Nos	15,000	300,000
Total Amount(excluding GST & Custom Duty)				**300,000**

Note: the above prices for ETD is exclusive of Custom Duty & GST which shall be payable extra on actual however custom clearance is in the scope of vendor.
Standard number of Consumables are included in the capex extra cosumables shall be procured on agreed rates as per requirement at site

LETTER OF AWARD

02nd January 2023
Ref. NO.: PROC/LKO/22-23/LOA/027

M/s. SECURITY SHOPPE (INDIA) PVT. LTD.
Plot No: 16 & 17 part, SY No.1/1, Kancha Imarat,
Hardware Park, Raviryala Village,
Maheshwaram Mandal, Shamshabad,
Hyderabad - 500005, Telangana

Kind Attn: Mr. Anshu Gulati (Director)

Subject: Letter of Award for Manufacture & Supply of Hand-Held Metal Detector (HHMD) with rechargeable battery kit including Two (02) Years of Defect Liability Period (DLP).

References.:.
1. Your proposal dtd 15th December 2022

Dear Sir,

With reference to the above references and subsequent discussions, we are pleased to issue this Letter of Award ("LOA") to M/s. Security Shoppe (India) Pvt. Ltd. ("Vendor") for SITC of HHMD at the Airport ("Project") as per the technical specifications contained in tender documents, addendums and amendments issued, agreed scope of work and subsequent discussions.

Based on the above and the understanding reached between LIAL and Vendor, we are hereby pleased to issue this LOA on the following terms

1. **LOA Price:** We, Lucknow International Airport Ltd. ("LIAL") agree to pay a sum of **INR 14,65,560 (Rupees Fourteen Lakhs Sixty-Five Thousand Five Hundred and Sixty only)** including all applicable taxes & duties, this amount includes Manufacture & Supply of HHMD including Two (02) Years of Defect Liability Period (DLP). towards completion of your responsibilities under this LOA in terms of the Project, as per the price mentioned above.

   The LOA price is on fixed rate basis, shall be fixed for the tenure of the LOA and subject to variation only on account of the variation in the scope of work for completion of the Project & as per agreed terms and conditions. Detailed price BOQ break up is as per the attached Annexure 1.

2. **Scope of Supplies:** Scope of works is attached as annexure 2.

3. **Taxes and Duties**: The LOA price set out above includes all taxes & duties.

4. **Terms of Payment:** All payments shall be made within Thirty (30) days from the date of submission of clear invoice duly certified by the LIAL's Representative.as per the below:

   - 100% of Total Order value within 30 days from receipt of material at LIAL store and tax invoice.

5. **Schedule of Delivery:** Material shall be delivered within 4- 6 weeks from the date of order confirmation.

6. **Liquidated damages (LD):** It will be applicable at 0.5% per week delay and part thereof maximum up to 5% of the total basic contract value after agreed completion schedule.

7. This LOA is subject to the terms and conditions contained herein, agreed Special Terms & Conditions, terms of reference, general Terms and Conditions (GTC) and all such other documents agreed by the

parties by the way of the addenda issued to the tender and tender deviations – agreed between the parties as referred above

8. **Limitation of Liability:** The consortium's liability shall be limited to the maximum 100% of contract value and no consequential damage shall apply except for liabilities incurred in cases of fraud and breach of mutually agreed terms.

9. **Warranty/ Defect Liability Period (DLP)**: 24 months from the date material delivery & acceptance at site.

10. We, LIAL, will be issuing a formal Purchase Order in this regard soon and until the finalisation and execution of such contract, the terms of this LOA, GTC and related documents attached with this LOA shall govern the understanding between the parties in respect of the Project and the Vendor is required by LIAL to commence the Project in accordance with the References above-mentioned

11. **Governing Law and Jurisdiction:** This LOA Contract shall be interpreted, construed and governed by the Laws of India. Jurisdiction shall be Ahmedabad

12. The Vendor shall perform their obligations in terms of this LOA in accordance with applicable law and the instructions of LIAL

A formal Purchase Order is under preparation and will be issued in due course of time. Till then this LOA is being issued to enable you to start the work.

Please acknowledge and send us one copy of this LOA duly signed and stamped on each page as a token of its unconditional acceptance.

For, Lucknow International Airport Limited

Rahul Bhatkoti
Rahul Bhatkoti (Jan 6, 2023 17:33 GMT+5.5)

Authorized Signatory
Rahul Bhatkoti
Chief Airport Officer

For, Security Shoppe (India) Pvt. Ltd.

Authorized Signatory

Enclosures:
Annexure 1: Price break-up sheet
Annexure 2: Scope of works
Annexure 3: GTC, STC & other related documents

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Annexure 1 to LOA Ref: PROC/LKO/22-23/LOA/027 dtd 02nd January 2023				
Item	**Qty**	**UOM**	**Unit rate**	**Amount**
SITC of HHMD	54	Nos	23,000	1,242,000
Total				**1,242,000**
GST @ 18%				223,560
Grand Total Incl. GST @ 18%				**1,465,560**

adani™

LETTER OF AWARD

Date: 14th December 2022
Ref. NO.: PROJ/LKO/22-23/LOA/024

M/s. Materna IPS India Private Limited
2nd Floor # RMZ North Star,
Ambedkar Colony, Yelhanka,
Bangalore-560064, India

Kind Attn: Mr. Kiran Kumar (Head Sales)

Subject: Letter of Award for Supply, Installation, Testing & commissioning of Self Baggage Drop (SBD) at Lucknow International Airport Limited (LIAL).

References.:
1. Your Proposal dtd 13th December 2022

Dear Sir,

With reference to the above and subsequent discussions, we are pleased to issue this Letter of Award ("LOA") for Supply, Installation, Testing & commissioning of Self Baggage Drop (SBD) at Lucknow International Airport Limited to you as per the technical specifications contained in tender documents, addendums and amendments issued, discussion between us and the agreed scope of work

Based on the above and the understanding reached between at Lucknow International Airport Limited and Supplier/Contractor we are hereby pleased to issue this LOA on the following terms

1. **LOA Price:** We, at Lucknow International Airport Limited pay a sum of **INR 22,30,81,987 (Rupees Twenty-Two Crore Thirty Lakhs Eighty-One Thousand Nine Hundred and Eighty-Seven only)** including GST @18%, towards supply, installation, testing, commissioning (SITC, as per agreed scope and detailed price BOQ is attached as per the attached Annexure 1.

   towards completion of your responsibilities under this LOA in terms of the Project, as per the price mentioned above. The LOA price is on fixed rate basis, shall be fixed for the tenure of the LOA and subject to variation only on account of the variation in the scope of work for completion of the Project & as per agreed terms and conditions.

2. **Scope of Works:** Supply, Installation, Testing & commissioning of Self Baggage Drop (SBD), detailed scope of works is attached as Annexure 2 to this LOA

3. **Taxes and Duties:** The LOA price set out above includes all the applicable taxes, duties & GST @ 18%.

4. **Terms of Payment:** All payments shall be released within Thirty (30) days from the date of submission of clear invoice duly certified by Lucknow International Airport Limited representative

   a. **Supply:**
      - 10% amount shall be paid as advance against submission of ABG of same amount.
      - 5% amount shall be paid after obtaining manufacturing clearance from LIAL against design & Drawing submission.
      - 65% amount shall be paid after delivery of materials at site on prorate basis.
      - 10% amount shall be paid after installation of the equipment's on prorate basis.
      - 10% amount shall be after successful handover of the System (after operation trial).

   b. **Installation, Testing & Commissioning:**
      - 10% amount shall be paid as advance against submission of ABG of same amount.
      - 70% amount shall be paid after installation of the equipment's on prorate basis.
      - 10% amount shall be paid after testing & commissioning of the equipment.
      - 10% amount shall be after successful handover of the System.

Lucknow International Airport Ltd
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MATERNA IPS INDIA PRIVATE LIMITED BANGALORE

adani

c. **Payment Terms for Cloud hosting:** Against monthly billing (Payment shall be made within 15 working days).

d. **Payment Terms for CAMC:** Against monthly billing (Payment shall be made within 15 working days).

5. **ABG:** Vendor shall submit ABG for the 10% of the total contract value valid till handover of the project to LIAL Engg. In charge + 6 Months claim period.

6. **CPBG cum PBG:** Vendor shall submit CPBG cum PBG within 15 days from the date of order confirmation for the 10% of the total contract value valid till completion of Defect Liability Period (DLP) + 6 Months claim period.

7. **Effective Date:** 14th December 2022

8. **Schedule of Delivery:** SITC shall be completed and handed over to the LIAL's Engg. In charge by 15th April 2023.

9. **Liquidated damages (L.D.):** It will be applicable at 0.5% per week delay and part thereof maximum up to 5% of the total basic contract value after agreed completion schedule.

10. This LOA is subject to the terms and conditions contained herein, in the tender documents, general Conditions of Contract (GCC) and such other conditions that have been agreed to by the parties by the way of the addenda issued to the tender and tender deviations – agreed between the parties as referred above

11. **Limitation of Liability:** The vendor's liability shall be limited to the maximum 100% of contract value and no consequential damage shall apply except for liabilities incurred in cases of fraud and breach of mutually agreed terms.

12. **Warranty/ defect liability:** 24 months from the date of handover to LIAL's Engineer in Charge and successful Revenue Operation Trial (ROT).

13. We, Lucknow International Airport Limited, will be issuing a formal purchase order (PO) in this regard soon and until the finalisation and execution of such contract, the terms of this LOA and GTC shall govern the understanding between the parties in respect of the Project and the Supplier/Contractor is required by Lucknow International Airport Limited to commence the Project in accordance with the References above-mentioned

14. **Governing Law and Jurisdiction:** This LOA Contract shall be interpreted, construed and governed by the Laws of India. Jurisdiction shall be Ahmedabad

15. The Contractor shall perform their obligations in terms of this LOA in accordance with applicable law and the instructions of Lucknow International Airport Limited

A Formal Purchase Order (PO) is under preparation and will be issued in due course of time. Till then this LOA is being issued to enable you to start the work.

Please acknowledge and send us one copy of this LOA duly signed and stamped on each page as a token of its unconditional acceptance.

For, Lucknow International Airport Limited

Balvir Bhatia
Balvir Bhatia (Dec 16, 2022 14:49 GMT+5.5)

Balvir Singh Bhatia
Chief Airport Officer

For, Materna IPS India Private Limited

MATERNA IPS INDIA PRIVATE LIMITED BANGALORE

Authorized Signatory

Enclosures:
Annexure 1: Price break-up
Annexure 2: Scope of works
Annexure 3: GTC and other related documents

Lucknow International Airport Ltd
(Formerly known as Adani Lucknow International Airport Ltd)
First Floor, Terminal 1
CCS International Airport
Lucknow 226 009
Uttar Pradesh, India
CIN: U63030GJ2019PLC109814

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Fax +91 522 243 2883
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www.adani.com

Registered Office: Adani Corporate House, Shantigram, Nr Vaishno Devi Circle, S G Highway, Khodiyar, Ahmedabad 382 421, Gujarat, India

LETTER OF AWARD

31st October 2022
Ref. NO.: PROC/LKO/22-23/LOA/019

M/s. SJK Innovations Pvt Ltd
No. 105-D, GN Mills Post, Mettupalayam
Road, Coimbatore - 641 029, Tamilnadu, INDIA

Kind Attn: *Mr. Suraj Shanta Kumar*

Subject: Letter of Award for Design, Supply, Installation, Testing and Commissioning of Automatic Tray Retrieval System (ATRS) including Three (03) Years of Defect Liability Period (DLP) & Five (05) years of Comprehensive maintenance at Lucknow International Airport Ltd (LIAL), Lucknow

References.:
1. EOI publish dtd 30th October'22
2. RFQ - PreQ dtd 5th Sept'22 **("RFQ")**
3. Your proposal dtd 08th October'22

Dear Sir,

With reference to the above references and subsequent discussions, we are pleased to issue this Letter of Award ("LOA") to M/s. SJK Innovations Pvt Ltd ("Vendor") for SITC of ATRS at the Airport ("Project") as per the technical specifications contained in tender documents, addendums and amendments issued, agreed scope of work and subsequent discussions.

Based on the above and the understanding reached between LIAL and Vendor, we are hereby pleased to issue this LOA on the following terms

1. **LOA Price:** We, Lucknow International Airport Ltd. ("LIAL") agree to pay a sum of **INR 31,86,00,000 (Rupees Thirty-One Crores and Eighty-Six Lacs only)** including all applicable taxes, duties & GST @ 18% **,** this amount includes Design, Supply, Installation, Testing and Commissioning of ATRS including Three (03) Years of Defect Liability Period (DLP) & Five (05) years of Comprehensive maintenance towards completion of your responsibilities under this LOA in terms of the Project, as per the price mentioned above.

   The LOA price is on fixed rate basis, shall be fixed for the tenure of the LOA and subject to variation only on account of the variation in the scope of work for completion of the Project & as per agreed terms and conditions.
   Detailed price BOQ break up is as per the attached Annexure 1.

2. **Scope of Supplies:** Scope of works is attached as annexure 2.

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3. **Taxes and Duties**: The LOA price set out above includes all taxes & duties.

4. **Advance Bank Guarantee (ABG):** The ABG shall be submitted for the 10% of the total contract value valid till completion time + 6 Months claim period. ABG shall be strictly as per the format attached to this LOA. Advance shall be recovered/Adjusted against milestone billing from the vendor.

5. **Contract Performance Bank Guarantee (CPBG):** The CPBG shall be submitted for 10% of contract value within 15 days from the date of order confirmation / date of LOA. The CPBG shall be valid till handover of SITC works + 6 months claim period. CPBG shall be strictly as per the format attached to this LOA.

6. **Performance Bank Guarantee (PBG):** The PBG shall be submitted for 10% of the contract value valid from handover date until Three (03) years of warranty/defect liability period + 6 Months claim period. PBG shall be strictly as per the format attached to this LOA.

7. **Terms of Payment:** All payments shall be made within Thirty (30) days from the date of submission of clear invoice duly certified by the LIAL's Representative.as per the below breakup:

I. **Advance:** 10% of the total contract value shall be released as advance against submission of ABG of equal amount

II. Supply:

- 70% on pro rata basis against material receipt at site
- 20% on pro rata basis against completion of installation, testing & commissioning works and handover at site
- 10% on implementation of remote screening feature and acceptance by airport operator or 6 months from the date of handover of ITC works, whichever is earlier

III. Installation, testing and Commissioning (ITC):

- 90% on pro rata basis against completion of installation, testing & commissioning works and handover at site
- 10% on implementation of remote screening feature and acceptance by airport operator or 6 months from the date of handover of ITC works, whichever is earlier

IV. **Remote Screening:** 100% payment shall be made after commissioning and acceptance of remote screening feature by LIAL Engg. in charge

V. **Comprehensive annual maintenance (CAMC):** Payment shall be made on monthly basis after certification from engg. In charge.

8. **Schedule of completion:** Supply, Installation, Testing & Commissioning shall be completed within 4 to 6 months from the date of order confirmation. Material deliveries shall start reaching LIAL site from 1st week of March 2023.

9. **Liquidated damages (LD):** It will be applicable at 0.5% per week delay and part thereof maximum up to 5% of the total basic contract value after agreed completion schedule.

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10. This LOA is subject to the terms and conditions contained herein, agreed Special Terms & Conditions, terms of reference, general Terms and Conditions (GTC) and all such other documents agreed by the parties by the way of the addenda issued to the tender and tender deviations – agreed between the parties as referred above

11. **Limitation of Liability:** The consortium's liability shall be limited to the maximum 100% of contract value and no consequential damage shall apply except for liabilities incurred in cases of fraud and breach of mutually agreed terms.

12. **Warranty/ Defect Liability Period (DLP)**: 36 months from the date of installation or 42 months from the date of material delivery & acceptance at site, whichever is earlier.

13. We, LIAL, will be issuing a formal Contract agreement in this regard soon and until the finalisation and execution of such contract, the terms of this LOA, GTC and related documents attached with this LOA shall govern the understanding between the parties in respect of the Project and the Vendor is required by LIAL to commence the Project in accordance with the References above-mentioned

14. **Governing Law and Jurisdiction:** This LOA Contract shall be interpreted, construed and governed by the Laws of India. Jurisdiction shall be Ahmedabad

15. The Vendor shall perform their obligations in terms of this LOA in accordance with applicable law and the instructions of LIAL

A formal Contract Agreement is under preparation and will be issued in due course of time. Till then this LOA is being issued to enable you to start the work.

Please acknowledge and send us one copy of this LOA duly signed and stamped on each page as a token of its unconditional acceptance.

For, Lucknow International Airport Limited

Balvir Bhatia
Balvir Bhatia (Oct 31, 2022 18:51 GMT+5.5)

Authorized Signatory
Balvir Singh Bhatia
CHIEF AIRPORT OFFICER

For, SJK Innovations Pvt Ltd

Authorized Signatory

Enclosures:
Annexure 1: Price break-up sheet
Annexure 2: Scope of works
Annexure 3: GTC, STC & other related documents

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LETTER OF AWARD

Date: 02nd August 2022
Ref. NO.: PROJ/LKO/22-23/LOA/011

M/s. Netcon Technologies (India) Private Limited
No 523/3, Bushido Towers, Udayampalayam Road, Near
Kurinji Hospital, Avinashi Road, Nava India, Coimbatore

Kind Attn: Mr. Michel Raj A.R (Director - smart mobility practice)

Subject: Letter of Award for Supply, Installation, Testing & commissioning of Master Time Clock System (MTCS) at Lucknow International Airport Limited.

References.:

1. Your Initial Proposal dtd 29th June 2022
2. Your Final Proposal dtd 02nd August 2022

Dear Sir,

With reference to the above and subsequent discussions, we are pleased to issue this Letter of Award ("LOA") for Supply, Installation, Testing & commissioning of MTCS at Lucknow International Airport Limited.to you as per the technical specifications contained in tender documents, addendums and amendments issued, discussion between us and the agreed scope of work

Based on the above and the understanding reached between at Lucknow International Airport Limited and Supplier/Contractor we are hereby pleased to issue this LOA on the following terms

1. **LOA Price:** We, at Lucknow International Airport Limited pay a sum of **INR 48,89,920 (Rupees Forty – Eight Lakhs Eighty - Nine Thousand Nine Hundred and Twenty only)** including GST @ 18%, towards supply, installation, testing, commissioning (SITC, as per agreed scope and detailed price BOQ is attached as per the attached Annexure 1).

   towards completion of your responsibilities under this LOA in terms of the Project, as per the price mentioned above. The LOA price is on fixed rate basis, shall be fixed for the tenure of the LOA and subject to variation only on account of the variation in the scope of work for completion of the Project & as per agreed terms and conditions.

2. **Scope of Works:** Supply, Installation, Testing & commissioning of MTCS at Lucknow International Airport Limited, detailed scope of works is attached as Annexure 2 to this LOA

3. **Taxes and Duties**: The LOA price set out above includes all the applicable taxes and duties.

4. **Terms of Payment:** All payments shall be released within Thirty (30) days from the date of submission of clear invoice duly certified by Lucknow International Airport Limited representative

   - **Supply:**
     - 80% on pro rata basis against supply of respective material at site
     - 10% on pro rata basis against installation works at site
     - 10% against handover and acceptance by LIAL's Engg in charge

   - **Installation:**
     - 90% on pro rata basis against installation works at site
     - 10% against handover and acceptance by LIAL's Engg in charge.

5. **CPBG cum PBG:** Vendor shall submit CPBG cum PBG within 15 days from the date of order confirmation for the 10% of the total contract value valid till completion of Defect Liability Period (DLP).

6. **Effective Date:** 02nd August 2022

7. **Schedule of completion:** SITC works shall be completed within 14 – 16 weeks from the effective date.

8. **Liquidated damages (L.D.):** It will be applicable at 0.5% per week delay and part thereof maximum up to 5% of the total basic contract value after agreed completion schedule.

9. This LOA is subject to the terms and conditions contained herein, in the tender documents, general Conditions of Contract (GCC) and such other conditions that have been agreed to by the parties by the way of the addenda issued to the tender and tender deviations – agreed between the parties as referred above

10. **Limitation of Liability:** The consortium's liability shall be limited to the maximum 100% of contract value and no consequential damage shall apply except for liabilities incurred in cases of fraud and breach of mutually agreed terms.

11. **DLP:** 12 months from the date of handover and acceptance to LIAL's Engineer in Charge.

12. **Manufacturer's Warranty:** 2 years from the date of supply at LIAL site.

13. We, Lucknow International Airport Limited, will be issuing a formal purchase order (PO) in this regard soon and until the finalisation and execution of such contract, the terms of this LOA and GTC shall govern the understanding between the parties in respect of the Project and the Supplier/Contractor is required by Lucknow International Airport Limited to commence the Project in accordance with the References above-mentioned

14. **Governing Law and Jurisdiction:** This LOA Contract shall be interpreted, construed and governed by the Laws of India. Jurisdiction shall be Ahmedabad

15. The Contractor shall perform their obligations in terms of this LOA in accordance with applicable law and the instructions of Lucknow International Airport Limited

A Formal Purchase Order (PO) is under preparation and will be issued in due course of time. Till then this LOA is being issued to enable you to start the work.

Please acknowledge and send us one copy of this LOA duly signed and stamped on each page as a token of its unconditional acceptance.

For, Lucknow International Airport Limited

Balvir Bhatia
Balvir Bhatia (Aug 3, 2022 09:51 GMT+5.5)

Balvir Singh Bhatia
CHIEF AIRPORT OFFICER,

For, Netcon Technologies (India) Private Limited

Authorized Signatory

Enclosures:
Annexure 1: Price break up
Annexure 2: Scope of works
Annexure 3: GTC and other related documents

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Annexure 1 to LOA ref: PROJ/LKO/22-23/LOA/011 dtd 02nd August 2022									
						Supply		Installation	
Sl. No	**BOQ ITEM NO**	**DESCRIPTION OF ITEM**	**UNIT**	**Make**	**Total New Qty**	**Unit Rate**	**Amount**	**Unit Rate**	**Amount**
F.1.1	1271.1	SITC NTP Server - Quad Port Enterprise Class Network Time Serever with: GPS antenna one with each server and lightning protector NTP 800 Clock Management System with web GUI	No's	Brandywine	2	530,000.00	1,060,000.00	100,000.00	100,000.00
F.1.2	1271.2	SITC NTP Slave Clock - Digital Display Clock ECO-M-DC. 100x.6	No's	Mobatime	8	55,000.00	440,000.00	100,000.00	100,000.00
F.1.3	1271.3	SITC NTP Slave Clock - Smart Analouge Clock DIAL 000 LED	No's	Mobatime	33	68,000.00	2,244,000.00	200,000.00	200,000.00
TOTAL							**3,744,000.00**		**400,000.00**
TOTAL SITC PRICE								**4,144,000.00**	
GST @ 18%								745,920.00	
Total Incl. GST @ 18%								**4,889,920.00**	

LETTER OF AWARD

Date: 10th August 2022
Ref. NO.: PROJ/LKO/22-23/LOA/013

M/s. Meridian Infotech Ltd
301-Prasanna House-I, Associated Society,
Opp Radha Krishna Park Society,
Akota, Vadodara – 390 020.

Kind Attn: Mr. Atul Dhokiya (AVP - Technology)

Subject: Letter of Award for Supply, Installation, Testing & commissioning of Primary & Secondary Data center at Lucknow International Airport Limited.

References.:

1. Your Initial Proposal dtd 25th July 2022
2. Your Final Proposal dtd 10th August 2022

Dear Sir,

With reference to the above and subsequent discussions, we are pleased to issue this Letter of Award ("LOA") for Letter of Award for Supply, Installation, Testing & commissioning of Primary & Secondary Data center at Lucknow International Airport Limited to you as per the technical specifications contained in tender documents, addendums and amendments issued, discussion between us and the agreed scope of work

Based on the above and the understanding reached between at Lucknow International Airport Limited and Supplier/Contractor we are hereby pleased to issue this LOA on the following terms

1. **LOA Price:** We, at Lucknow International Airport Limited pay a sum of **INR 1,70,30,680 (Rupees One Crore Seventy Lakhs Thirty Thousand Six Hundred and Eighty only)** excluding GST as applicable, towards supply, installation, testing, commissioning (SITC, as per agreed scope and detailed price BOQ is attached as per the attached Annexure 1).

   towards completion of your responsibilities under this LOA in terms of the Project, as per the price mentioned above. The LOA price is on fixed rate basis, shall be fixed for the tenure of the LOA and subject to variation only on account of the variation in the scope of work for completion of the Project & as per agreed terms and conditions.

2. **Scope of Works:** Supply, Installation, Testing & commissioning of Primary & secondary Data Centre, detailed scope of works is attached as Annexure 2 to this LOA

3. **Taxes and Duties**: The LOA price set out above includes all the applicable taxes and duties and excludes GST as applicable.

4. **Terms of Payment:** All payments shall be released within Thirty (30) days from the date of submission of clear invoice duly certified by Lucknow International Airport Limited representative

   - **Supply:**
     - 100% on pro rata basis against supply of respective material at site and acceptance by LIAL's Engg. In charge
   - **Installation:**
     - 100% on pro rata basis against installation works at site and acceptance by LIAL's Engg. In charge

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5. **CPBG cum PBG:** Vendor shall submit CPBG cum PBG within 15 days from the date of order confirmation for the 10% of the total contract value valid till completion of Defect Liability Period (DLP).

6. **Effective Date:** 10th August 2022

7. **Schedule of completion:** SITC works shall be completed within Four (04) Months from the effective date.

8. **Liquidated damages (L.D.):** It will be applicable at 0.5% per week delay and part thereof maximum up to 5% of the total basic contract value after agreed completion schedule.

9. This LOA is subject to the terms and conditions contained herein, in the tender documents, general Conditions of Contract (GCC) and such other conditions that have been agreed to by the parties by the way of the addenda issued to the tender and tender deviations – agreed between the parties as referred above

10. **Limitation of Liability:** The consortium's liability shall be limited to the maximum 100% of contract value and no consequential damage shall apply except for liabilities incurred in cases of fraud and breach of mutually agreed terms.

11. **Defect Liability Period:** 12 months from the date of handover and acceptance by LIAL's Engineer in Charge.

12. We, Lucknow International Airport Limited, will be issuing a formal purchase order (PO) in this regard soon and until the finalisation and execution of such contract, the terms of this LOA and GTC shall govern the understanding between the parties in respect of the Project and the Supplier/Contractor is required by Lucknow International Airport Limited to commence the Project in accordance with the References above-mentioned

13. **Governing Law and Jurisdiction:** This LOA Contract shall be interpreted, construed and governed by the Laws of India. Jurisdiction shall be Ahmedabad

14. The Contractor shall perform their obligations in terms of this LOA in accordance with applicable law and the instructions of Lucknow International Airport Limited

A Formal Purchase Order (PO) is under preparation and will be issued in due course of time. Till then this LOA is being issued to enable you to start the work.

Please acknowledge and send us one copy of this LOA duly signed and stamped on each page as a token of its unconditional acceptance.

For, Lucknow International Airport Limited

Balvir Bhatia
Balvir Bhatia (Aug 11, 2022 11:21 GMT+5.5)

Balvir Singh Bhatia
CHIEF AIRPORT OFFICER,

For, Meridian Infotech Ltd

Authorized Signatory

Enclosures:
Annexure 1: Price break up
Annexure 2: Scope of works
Annexure 3: GTC and other related documents

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Annexure 1 to LOA ref:PROJ/LKO/22-23/LOA/013 dtd 10th August 2022										
Sl. No	**DESCRIPTION OF ITEM**	**UNIT**	**Total New Qty**	**Rate**	**Amount**	**Rate**	**Amount**	**Model**	**Make**
I	**Primary Data Center**			**Supply**		**Services**			
IN.1	**Rodent Repellent system**								
IN.1.1	SITC of Rodent Repellent Panel with required accessories (Supports 24 Transducers)	Nos	2	20,588.00	41,176.00	3,500.00	7,000.00	VHFO-V2	MASER
IN.1.2	SITC of Transducers 1 for every 150 sq ft (above false ceiling, on floor 4 considered extra	Nos	30	1,942.00	58,260.00	1,000.00	30,000.00	VHFO-V2	MASER
IN.1.3	Supply and Laying of Wire Bundle of 200 Mtr	Nos	1	23,000.00	23,000.00	6,000.00	6,000.00	POLYCAB	POLYCAB
IN.1.4	Supply and laying of MS Conduit 25mm	Mtr	200	142.00	28,400.00	45.00	9,000.00	BBC	BBC
IN.2	**Water Leakage Detection**								
IN.2.1	4 Zone Water Leak detection system control Panel with LCD Display, Power supply, battery backup, built in zone module & all required accessories . For Server room, Tenant room, DAS and TRMS rooms	Nos	3	21,764.00	65,292.00	3,500.00	10,500.00	JE 3523	SYNOPSYS
IN.2.2	Water leak sensing FRLS cable (25m). long, mechanically strong, resistant to corrosion and abrasion. The cable shall be constructed with two sensing wires, alarm signaling wire, continuity wire and all shall be PVC twisted pair stainless 316 elements.	Nos	7	12,000.00	84,000.00	1,000.00	7,000.00	WD-CS	SYNOPSYS
IN.2.3	Electronic Hooter for water sensing indication.	Nos	3	3,235.00	9,705.00	500.00	1,500.00	RE-24	Ravel
IN.3	55" LED wall mount display panel	Nos	1	57,650.00	57,650.00	1,000.00	1,000.00	Samsung	Samsung
	IT Racks for Primary Data Center		0						
IN.4	Supply and installation of 42U Server racks mounted on the floor(600mmX1200mm) with Heavy Duty Extruded Aluminium Frame for rigidity, 2 x 32A Vertical mounted Intelligent Power Distribution Units (with PDU level monitoring) with 25 power outputs. The racks must have steel front / rear perforated doors. (12 for Server Room, 4 for Tenant Room, 10 for and DAS TRMS Room) All Tenant room rack should contain minimum 5 shelf 1U blanking panels: 10nos. 2U Blanking panels: 5 nos	Nos	26	57,600.00	1,497,600.00	4,500.00	117,000.00	Valrack (PDU - Eaton)	Valrack (PDU - Eaton)

Annexure 1 to LOA ref:PROJ/LKO/22-23/LOA/013 dtd 10th August 2022									
Sl. No	**DESCRIPTION OF ITEM**	**UNIT**	**Total New Qty**	**Rate**	**Amount**	**Rate**	**Amount**	**Model**	**Make**
I	**Primary Data Center**			**Supply**		**Services**			
IN.5	Supply and Installation of 42U Network racks mounted on the floor(800mmX1200mm) with Heavy Duty Extruded Aluminium Frame for rigidity, Intelligent Power Distribution Units 2 per rack, Power Distribution Unit - Vertically Mounted, 32AMPs (with PDU level monitoring) with 25 Power Outputs, The racks must have steel (solid / grill / mesh) front / rear doors and side panels. (10 for DAS and TRMS room, 4 for Server Room, 3 for ISP Room and 12 for Tenant Room) All Tenant room rack should contain minimum 5 shelf 1U blanking panels: 10nos. 2U Blanking panels: 5 nos	Nos	29	61,600.00	1,786,400.00	4,500.00	130,500.00	Valrack (PDU - Eaton)	Valrack (PDU - Eaton)
	Cable Management System for Network Cables								
IN.6	Supply and installation of 400mm x 105mm wire basket system with all required supports and necessary accessories complete as required. For Server room, Tenant room and DAS&TRMS room.	Mtr	130	3,758.00	488,540.00	225.00	29,250.00	Standard	Standard
IN.7	Supply and installation of 150mm x 50mm wire basket system with all required supports and necessary accessories complete as required. For Server room, Tenant room and DAS&TRMS room.	Mtr	130	2,412.00	313,560.00	225.00	29,250.00	Standard	Standard
	Network Cabling System								
IN.8	Supplying, laying, termination & Testing 12 Core multimode unarmoured OM4 Fibre Optic cable complete as required.	Mtr	650	207.00	134,550.00	20.00	13,000.00	Belden	Belden
IN.9	Supply, Installation & Testing of fully loaded 24 port MM Fiber LIU	Nos	3	12,174.00	36,522.00	13,278.00	39,834.00	Belden	Belden
IN.10	Supply, Installation & Testing of fully loaded 48 port MM Fiber LIU	Nos	6	17,935.00	107,610.00	24,966.00	149,796.00	Belden	Belden
IN.11	Supply, Installation & Testing of LC to LC Fiber Patch Cord Multimode 3Meter	Nos	130	1,305.00	169,650.00	20.00	2,600.00	Belden	Belden
IN.12	Supply, Installation & Testing of LC to LC Fiber Patch Cord Multimode 5 Meter	Nos	10	1,415.00	14,150.00	20.00	200.00	Belden	Belden
IN.13	Supply, Installation & Testing of LC to LC Fiber Patch Cord Multimode 10 Meter	Nos	45	1,652.00	74,340.00	20.00	900.00	Belden	Belden

Annexure 1 to LOA ref:PROJ/LKO/22-23/LOA/013 dtd 10th August 2022									
Sl. No	**DESCRIPTION OF ITEM**	**UNIT**	**Total New Qty**	**Rate**	**Amount**	**Rate**	**Amount**	**Model**	**Make**
I	**Primary Data Center**			**Supply**		**Services**			
IN.14	Supply, Installation & Testing of LC to LC Fiber Patch Cord Multimode 15 Meter	Nos	45	1,902.00	85,590.00	20.00	900.00	Belden	Belden
IN.15	Supply, Installation & Testing of LC to LC Fiber Patch Cord Multimode 20 Meter	Nos	90	2,500.00	225,000.00	20.00	1,800.00	Belden	Belden
IN.16	Supply, Installation & Testing of LC to LC Fiber Patch Cord Multimode 30 Meter	Nos	5	2,935.00	14,675.00	20.00	100.00	Belden	Belden
IN.17	Supplying, laying, termination & Testing CAT6A Cable and necessary Accessories (305 Mtr)	Box	35	12,880.00	450,800.00	2,135.00	74,725.00	Belden	Belden
IN.18	Supply, Installation & Testing of loaded 24 ports discrete Patch panels	Nos	70	8,914.00	623,980.00	2,665.00	186,550.00	Belden	Belden
IN.19	Supply and installation of CAT6A patch chords- 2 meter	Nos	700	320.00	224,000.00	20.00	14,000.00	Belden	Belden
IN.20	Supply and installation of CAT6A patch chords- 1 meter	Nos	300	272.00	81,600.00	20.00	6,000.00	Belden	Belden
	Secondary Data Center								
IN.21	**Rodent Repellent system**								
IN.21.1	SITC of Rodent Repellent Panel with required accessories (Supports 24 Transducers)	Nos	1	20,588.00	20,588.00	3,500.00	3,500.00	VHFO-V2	MASER
IN.21.2	SITC of Transducers	Nos	15	1,942.00	29,130.00	1,000.00	15,000.00	VHFO-V2	MASER
IN.21.3	Supply and Laying of Wire Bundle of 100m	Nos	1	12,500.00	12,500.00	3,000.00	3,000.00	POLYCAB	POLYCAB
IN.21.4	Supply and laying of MS Conduit 25mm	Mtr	100	142.00	14,200.00	45.00	4,500.00	BBC	BBC
IN.22	**Water Leakage Detection**								
IN.22.1	4 Zone Water Leak detection system control Panel with LCD Display, Power supply, battery backup, built in zone module & all required accessories . The panel should have the capability to be integrated to the Intelligent Fire Alarm System.	Nos	1	21,764.00	21,764.00	3,500.00	3,500.00	JE 3523	SYNOPSYS
IN.22.2	Water leak sensing FRLS cable (25m). long, mechanically strong, resistant to corrosion and abrasion. The cable shall be constructed with two sensing wires, alarm signaling wire, continuity wire and all shall be PVC twisted pair stainless 316 elements.	Nos	3	12,000.00	36,000.00	1,000.00	3,000.00	WD-CS	SYNOPSYS
IN.22.3	Electronic Hooter for water sensing indication.	Nos	1	3,235.00	3,235.00	500.00	500.00	RE-24	Ravel
	IT Racks for Secondary Data Center								

Annexure 1 to LOA ref:PROJ/LKO/22-23/LOA/013 dtd 10th August 2022									
Sl. No	**DESCRIPTION OF ITEM**	**UNIT**	**Total New Qty**	**Rate**	**Amount**	**Rate**	**Amount**	**Model**	**Make**
I	**Primary Data Center**			**Supply**		**Services**			
IN.23	Supply and installation of 42U Server racks mounted on the floor(600mmX1200mm) with Heavy Duty Extruded Aluminium Frame for rigidity, 2 x 32A Vertical mounted Intelligent Power Distribution Units (with PDU level monitoring) with 25 power outputs. The racks must have steel front / rear perforated doors. All Tenant room rack should contain minimum 5 shelf 1U blanking panels: 10nos. 2U Blanking panels: 5 nos (Server Room: 18 racks, Tenant Room: 4 racks)	Nos	22	57,600.00	1,267,200.00	4,500.00	99,000.00	Valrack (PDU - Eaton)	Valrack (PDU - Eaton)
IN.24	Supply and Installation of 42U Network racks mounted on the floor(800mmX1200mm) with Heavy Duty Extruded Aluminium Frame for rigidity, Intelligent Power Distribution Units 2 per rack, Power Distribution Unit - Vertically Mounted, 32AMPs (with PDU level monitoring) with 25 Power Outputs, The racks must have steel (solid / grill / mesh) front / rear doors and side panels. All Tenant room rack should contain minimum 5 shelf 1U blanking panels: 10nos. 2U Blanking panels: 5 nos (Server Room: 4 racks, Tenant Room: 3 racks)	Nos	7	61,600.00	431,200.00	4,500.00	31,500.00	Valrack (PDU - Eaton)	Valrack (PDU - Eaton)
	Cable Management System for Network Cables								
IN.25	Supply and installation of 400mm x 105mm wire basket system with all required supports and necessary accessories complete as required. For Server room, Tenant room and DAS&TRMS room.	Mtr	80	3,316.00	265,280.00	225.00	18,000.00	Standard	Standard
IN.26	Supply and installation of 150mm x 50mm wire basket system with all required supports and necessary accessories complete as required. For Server room, Tenant room and DAS&TRMS room.	Mtr	80	2,128.00	170,240.00	225.00	18,000.00	Standard	Standard

Annexure 1 to LOA ref:PROJ/LKO/22-23/LOA/013 dtd 10th August 2022									
Sl. No	**DESCRIPTION OF ITEM**	**UNIT**	**Total New Qty**	**Rate**	**Amount**	**Rate**	**Amount**	**Model**	**Make**
I	**Primary Data Center**			**Supply**		**Services**			
	Network Cabling System		0						
IN.10.1	Supplying, laying, termination & Testing 12 Core multimode unarmoured OM4 Fibre Optic cable complete as required.	Mtr	200	206.00	41,200.00	20.00	4,000.00	Belden	Belden
IN.10.2	Supply, Installation & Testing of fully loaded 24 port MM Fiber LIU	Nos	3	12,174.00	36,522.00	13,278.00	39,834.00	Belden	Belden
IN.10.3	Supply, Installation & Testing of fully loaded 48 port MM Fiber LIU	Nos	2	17,934.00	35,868.00	24,966.00	49,932.00	Belden	Belden
IN.10.4	Supply, Installation & Testing of LC to LC Fiber Patch Cord Multimode 3Meter	Nos	36	1,305.00	46,980.00	27.00	972.00	Belden	Belden
IN.10.5	Supply, Installation & Testing of LC to LC Fiber Patch Cord Multimode 5 Meter	Nos	5	1,415.00	7,075.00	27.00	135.00	Belden	Belden
IN.10.6	Supply, Installation & Testing of LC to LC Fiber Patch Cord Multimode 10 Meter	Nos	40	1,652.00	66,080.00	27.00	1,080.00	Belden	Belden
IN.10.7	Supply, Installation & Testing of LC to LC Fiber Patch Cord Multimode 15 Meter	Nos	40	1,902.00	76,080.00	27.00	1,080.00	Belden	Belden
IN.10.8	Supply, Installation & Testing of LC to LC Fiber Patch Cord Multimode 20 Meter	Nos	40	2,500.00	100,000.00	27.00	1,080.00	Belden	Belden
IN.10.9	Supply, Installation & Testing of LC to LC Fiber Patch Cord Multimode 25 Meter	Nos	40	2,718.00	108,720.00	27.00	1,080.00	Belden	Belden
IN.10.10	Supply, Installation & Testing of LC to LC Fiber Patch Cord Multimode 30 Meter	Nos	5	2,935.00	14,675.00	27.00	135.00	Belden	Belden
IN.10.11	Supplying, laying, termination & Testing CAT6A Cable and necessary Accessories (305 Mtrs)	Box	34	12,880.00	437,920.00	2,135.00	72,590.00	Belden	Belden
IN.10.12	Supply, Installation & Testing of loaded 24 ports discrete Patch panels	Nos	50	8,914.00	445,700.00	2,665.00	133,250.00	Belden	Belden
IN.10.13	Supply and installation of CAT6A patch chords- 2 meter	Nos	800	320.00	256,000.00	27.00	21,600.00	Belden	Belden
IN.10.14	Supply and installation of CAT6A patch chords- 1 meter	Nos	400	272.00	108,800.00	27.00	10,800.00	Belden	Belden
	M-PDU,ZU 24,32A 1P IEC309 20,4 230/230V/ 802002005/EMIV0002	Nos	168	29,025.00	4,876,200.00	-	-	Eaton	Eaton
Sub Total					**15,625,207.00**		**1,405,473.00**		
Total SITC excluding GST as applicable						**17,030,680.00**			

LETTER OF AWARD

Date: 02nd August 2022
Ref. NO.: PROJ/LKO/22-23/LOA/010

M/s. Cosmos Business Machine
501-503, 5th Floor, Simran Plaza,
Khar (W),
Mumbai 400 052

Kind Attn: Mr. Punita Datta (Regional Manager- AV)

Subject: Letter of Award for Supply, Installation, Testing & commissioning of Video Wall at Lucknow International Airport Limited.

References.:
1. Your Initial Proposal dtd 29th June 2022
2. Your Final Proposal dtd 02nd August 2022

Dear Sir,

With reference to the above and subsequent discussions, we are pleased to issue this Letter of Award ("LOA") for Supply, Installation, Testing & commissioning of Video Wall at International Airport Limited to you as per the technical specifications contained in tender documents, addendums and amendments issued, discussion between us and the agreed scope of work

Based on the above and the understanding reached between at Lucknow International Airport Limited and Supplier/Contractor we are hereby pleased to issue this LOA on the following terms

1. **LOA Price:** We, at Lucknow International Airport Limited pay a sum of **INR 1,05,38,800 (Rupees One Crore Five Lakhs Thirty - Eight Thousand Eight Hundred only)** including GST as applicable, towards supply, installation, testing, commissioning (SITC, as per agreed scope and detailed price BOQ is attached as per the attached Annexure 1).

   towards completion of your responsibilities under this LOA in terms of the Project, as per the price mentioned above. The LOA price is on fixed rate basis, shall be fixed for the tenure of the LOA and subject to variation only on account of the variation in the scope of work for completion of the Project & as per agreed terms and conditions.

2. **Scope of Works:** Supply, Installation, Testing & commissioning of video wall, detailed scope of works is attached as Annexure 2 to this LOA

3. **Taxes and Duties**: The LOA price set out above includes all the applicable taxes and duties.

4. **Terms of Payment:** All payments shall be released within Thirty (30) days from the date of submission of clear invoice duly certified by Lucknow International Airport Limited representative

   - **Supply:**
     - 80% on pro rata basis against supply of respective material at site
     - 10% on pro rata basis against installation works at site
     - 10% against handover and acceptance by LIAL's Engg in charge

   - **Installation:**
     - 90% on pro rata basis against installation works at site
     - 10% against handover and acceptance by LIAL's Engg in charge.

5. **CPBG cum PBG:** Vendor shall submit CPBG cum PBG within 15 days from the date of order confirmation for the 10% of the total contract value valid till completion of Defect Liability Period (DLP).

6. **Effective Date:** 02nd August 2022

7. **Schedule of completion:** SITC works shall be completed within Ten (10) weeks from the effective date.

8. **Liquidated damages (L.D.):** It will be applicable at 0.5% per week delay and part thereof maximum up to 5% of the total basic contract value after agreed completion schedule.

9. This LOA is subject to the terms and conditions contained herein, in the tender documents, general Conditions of Contract (GCC) and such other conditions that have been agreed to by the parties by the way of the addenda issued to the tender and tender deviations – agreed between the parties as referred above

10. **Limitation of Liability:** The consortium's liability shall be limited to the maximum 100% of contract value and no consequential damage shall apply except for liabilities incurred in cases of fraud and breach of mutually agreed terms.

11. **DLP:** 12 months from the date of handover and acceptance to LIAL's Engineer in Charge.

12. **Manufacturer's Warranty:** 3 years from the date of supply at LIAL site.

13. We, Lucknow International Airport Limited, will be issuing a formal purchase order (PO) in this regard soon and until the finalisation and execution of such contract, the terms of this LOA and GTC shall govern the understanding between the parties in respect of the Project and the Supplier/Contractor is required by Lucknow International Airport Limited to commence the Project in accordance with the References above-mentioned

14. **Governing Law and Jurisdiction:** This LOA Contract shall be interpreted, construed and governed by the Laws of India. Jurisdiction shall be Ahmedabad

15. The Contractor shall perform their obligations in terms of this LOA in accordance with applicable law and the instructions of Lucknow International Airport Limited

A Formal Purchase Order (PO) is under preparation and will be issued in due course of time. Till then this LOA is being issued to enable you to start the work.

Please acknowledge and send us one copy of this LOA duly signed and stamped on each page as a token of its unconditional acceptance.

For, Lucknow International Airport Limited

Balvir Bhatia
Balvir Bhatia (Aug 2, 2022 19:19 GMT+5.5)

Balvir Singh Bhatia
CHIEF AIRPORT OFFICER,

For, Cosmos Business Machine

Authorized Signatory

Enclosures:
Annexure 1: Price break up
Annexure 2: Scope of works
Annexure 3: GTC and other related documents

Lucknow International Airport Ltd
(Formerly known as Adani Lucknow International Airport Ltd)
First Floor, Terminal 1
CCS International Airport
Lucknow 226 009
Uttar Pradesh, India
CIN: U63030GJ2019PLC109814

Tel +91 522 243 6022
Fax +91 522 243 2883
adaniairports@adani.com
www.adani.com

Registered Office: Adani Corporate House, Shantigram, Nr Vaishno Devi Circle, S G Highway, Khodiyar, Ahmedabad 382 421, Gujarat, India

Annexure 1 to LOA ref: PROJ/LKO/22-23/LOA/010 dtd 02nd August 2022					
Amount in INR					
Sl. No	**DESCRIPTION OF ITEM**	**UNIT**	**Qty**	**Unit Rate**	**Amount**
	Video Wall (SOCC, AOCC, BHS)				
1	SOCC 6*2 55" Videowall panel as per technical specification Video Wall Bracket Suitable and all required Support Frame(12 nos)	**Set**	**1**	2,116,200	2,116,200.00
1.1	Control And Switching System Videowall controller supporting minimum of 10 inputs of HDMI & 12 outputs of HDMI, as per technical specifications, with necessary cables.and all required accessories and its floor mount rack.	**Set**	**1**	1,109,660	1,109,660.00
2	AOCC & BHS Control Room 4*2 55" Videowall panel as per technical specification Video Wall Bracket Suitable and all required Support Frame(16 nos)	**Set**	**2**	1,423,300	2,846,600
2.2	Videowall controller supporting minimum of 10 inputs of HDMI & 8 outputs of HDMI, as per technical specifications, with necessary cables.and all required accessories and its floor mount rack.	**Set**	**2**	1,109,660	2,219,320
3	Installation Charges	**Job**	**1**	258,220	258,220.00
Total					**8,550,000.00**
GST @ 28% on item 1 & 2 @, 18% for controller & displays					1,988,800.40
Grand Total Incl. GST					**10,538,800.40**

adani

Letter of Award

15th December 2022
Ref. NO.: PROC/LKO/22-23/LOA/025

M/s. E-Sec Security Consultants Pvt. Ltd.
1001, Br vooklyn Tower, Near YMCA Club,
S.G Highway, Ahmedabad – 51

Kind Attn: Mr. Dhruv Pandya (Director)

Subject: Letter of Award (LOA) for Design, Supply, Installation, Testing & Commissioning of CCTV System at Lucknow International Airport Ltd (LIAL), Lucknow

References.:
1. Your Initial Proposal email dtd 15th October 2022
2. Your Final Proposal email dtd 14th December 2022

Dear Sir,

With reference to the above references and subsequent discussions, we are pleased to issue this Letter of Award ("LOA") to M/s. E-Sec Security Consultants Pvt. Ltd. ("System Integrator") for Design, Supply, Installation, Testing & Commissioning of CCTV System ("Project") as per the technical specifications contained in tender documents, addendums and amendments issued, agreed scope of work and subsequent discussions.

Based on the above and the understanding reached between LIAL and System Integrator, we are hereby pleased to issue this WO on the following terms

1. **LOA Price:** We, Lucknow International Airport Ltd. ("LIAL") agree to pay a sum of Indian Rupees **INR 13,40,03,946 (Rupees Thirteen Crores Forty Lacs Three Thousand Nine Hundred and Forty-Six only)** including all applicable taxes, duties & GST @ 18%, this amount includes Design, Supply, Installation, Testing & Commissioning of CCTV System towards completion of your responsibilities under this LOA in terms of the Project, as per the price mentioned above.

   The LOA price is on fixed unit rate basis, shall be fixed for the tenure of the LOA and subject to variation only on account of the variation in the scope of work for completion of the Project & as per agreed terms and conditions.

   Detailed price BOQ break up is as per the attached Annexure 1.

2. **Scope of Supplies:** Scope of works is attached as annexure 2.

3. **Taxes and Duties:** The LOA price set out above includes all taxes & duties.

4. **Contract Performance Bank Guarantee Cum Performance Bank Guarantee (CPBG cum PBG):** The CPBG cum PBG shall be submitted for 10% of total contract value within 15 days from the date of order confirmation. The CPBG cum PBG shall be valid till completion of Defect Liability Period + 6 months claim period. CPBG shall be strictly as per the format attached to this LOA.

5. **Terms of Payment:** All payments shall be made within Thirty (30) days from the date of submission of clear invoice duly certified by the LIAL's Representative as per the below breakup:
   a. **Supply:** 100% on pro rata basis against supply & acceptance of respective material at site
   b. **Services:**
      i. 90% on pro rata basis against material receipt and acceptance at site.
      ii. 10% against completion of Testing & Commissioning & Handover & acceptance by LIAL Engg. in charge

Lucknow International Airport Ltd
(Formerly known as Adani Lucknow International Airport Ltd)
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www.adani.com

Registered Office: Adani Corporate House, Shantigram, Nr Vaishno Devi Circle, S G Highway, Khodiyar, Ahmedabad 382 421, Gujarat, India

adani

6. **Schedule of Completion:** SITC works shall be completed within 12 -16 weeks from the date of Order Confirmation.

7. **Liquidated damages (LD):** It will be applicable at 0.5% per week delay and part thereof maximum up to 5% of the total basic contract value after agreed completion schedule.

8. This LOA is subject to the terms and conditions contained herein, agreed Special Terms & Conditions, terms of reference, general Terms and Conditions (GTC) and all such other documents agreed by the parties by the way of the addenda issued to the tender and tender deviations – agreed between the parties as referred above

9. **Limitation of Liability:** The liability shall be limited to the maximum 100% of contract value and no consequential damage shall apply except for liabilities incurred in cases of fraud and breach of mutually agreed terms.

10. **Manufacturer's Warranty:** Three (03) years from the date of issue of Take over certificate by Airport Operator

11. **Defect Liability Period:** Three (03) years from the date of issue of Take over certificate by Airport Operator

12. We, LIAL will be issuing a formal Work Order (WO)in this regard soon and until the finalisation and execution of such WO, the terms of this LOA and GTC and related documents attached with this LOA shall govern the understanding between the parties in respect of the Project and the System Integrator is required by LIAL to commence the Project in accordance with the References above-mentioned

13. **Governing Law and Jurisdiction:** This LOA Contract shall be interpreted, construed and governed by the Laws of India. Jurisdiction shall be Ahmedabad

14. The System Integrator shall perform their obligations in terms of this LOA in accordance with applicable law and the instructions of LIAL

A formal Work Order is under preparation and will be issued in due course of time. Till then this LOA is being issued to enable you to start the work.

Please acknowledge and send us one copy of this LOA duly signed and stamped on each page as a token of its unconditional acceptance.

For, Lucknow International Airport Limited

Balvir Bhatia
Balvir Bhatia (Dec 16, 2022 14:37 GMT+5.5)

Authorized Signatory

Balvir Singh Bhatia
CHIEF AIRPORT OFFICER

For, Essel Security Consultants Pvt. Ltd.

ESSEL SECURITY CONSULTANTS PVT. LTD. AHMEDABAD

16/12/2022

Authorized Signatory

Jaykishan Mamnani
SR. Manager Accounts & Finance

Enclosures:
Annexure 1: Price break-up sheet
Annexure 2: Scope of works
Annexure 3: GTC, STC & other related documents

Lucknow International Airport Ltd
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Annexure 1 to LOA ref: PROJ/LKO/22-23/LOA/025 dtd 15th December 2022				
CCTV - Summary				
Amount in Rs Crores				
Sr No.	**Perticulars**	**Supply**	**Installation**	**Total Amt**
1	Immigration CCTV	0.59	0.07	0.66
2	Terminal CCTV	10.14	0.56	10.70
TOTAL		**10.72**	**0.63**	**11.36**
GST @ 18%		1.93	0.11	2.04
Grand Total Incl. GST @ 18%		**12.64**	**0.74**	**13.40**

Note: During DLP Period E-sec has to arrange the shift timings of deployed manpower as per requirement of LIAL Engg. In charge.

LETTER OF AWARD

Date: 19th August 2022
Ref. NO.: PROJ/LKO/22-23/LOA/014

M/s. Infosoft Digital Design & services Pvt. Ltd.
104-105, Suneja Tower 1,
District Centre, Janakpuri,
New Delhi- 110 058, India.

Kind Attn: Mr. Tulsi Dutt Joshi (Director- Projects)

Subject: Letter of Award for Design, Supply, Installation, Testing & commissioning of Flight Information Display System (FIDS) at Lucknow International Airport Limited (LIAL).

References.:
1. Your Initial Proposal dtd 02nd August 2022
2. Your Final Proposal dtd 19th August 2022

Dear Sir,

With reference to the above and subsequent discussions, we are pleased to issue this Letter of Award ("LOA") for Supply, Installation, Testing & commissioning of FIDS at International Airport Limited to you as per the technical specifications contained in tender documents, addendums and amendments issued, discussion between us and the agreed scope of work

Based on the above and the understanding reached between at Lucknow International Airport Limited and Supplier/Contractor we are hereby pleased to issue this LOA on the following terms

1. **LOA Price:** We, at Lucknow International Airport Limited pay a sum of **INR 3,64,51,480 (Rupees Three Crore Sixty-Four Lakhs Fifty-One Thousand Four Hundred and Eighty only)** excluding GST as applicable, towards supply, installation, testing, commissioning (SITC, as per agreed scope and detailed price BOQ is attached as per the attached Annexure 1).

   towards completion of your responsibilities under this LOA in terms of the Project, as per the price mentioned above. The LOA price is on fixed rate basis, shall be fixed for the tenure of LOA and subject to variation only on account of the variation in the scope of work for completion of the Project & as per agreed terms and conditions.

2. **Scope of Works:** Supply, Installation, Testing & commissioning of FIDS, detailed scope of works is attached as Annexure 2 to this LOA

3. **Taxes and Duties**: The LOA price set out above includes all the applicable taxes & duties and excludes GST as applicable.

4. **Terms of Payment:** All payments shall be released within Thirty (30) days from the date of submission of clear invoice duly certified by Lucknow International Airport Limited representative

   a. **Supply:**
      i. 90% on pro rata basis against supply of respective material at site.
      ii. 10% after successful Installation, hand over and acceptance by LIAL Engg. in charge

   b. **Installation:**
      i. 100% on pro rata basis against installation works and acceptance by LIAL's Engg. in charge

5. **CPBG cum PBG:** Vendor shall submit CPBG cum PBG within 15 days from the date of order confirmation for the 10% of the total contract value valid till completion of Defect Liability Period (DLP).

6. **Commencement Date:** 19th August 2022

7. **Schedule of completion:** SITC works shall be completed within sixteen (16) weeks from the commencement date.

8. **Liquidated damages (L.D.):** It will be applicable at 0.5% per week delay and part thereof maximum up to 5% of the total basic contract value after agreed completion schedule.

9. This LOA is subject to the terms and conditions contained herein, in the tender documents, general Conditions of Contract (GCC) and such other conditions that have been agreed to by the parties by the way of the addenda issued to the tender and tender deviations – agreed between the parties as referred above

10. **Limitation of Liability:** The consortium's liability shall be limited to the maximum 100% of contract value and no consequential damage shall apply except for liabilities incurred in cases of fraud and breach of mutually agreed terms.

11. **Defect Liability Period (DLP):** 12 months from the date of handover and acceptance to LIAL's Engineer in Charge.

12. **Manufacturer's Warranty:** Manufacturer's warranty is applicable for 42 months from the date of supply or 36 months from the date of installation whichever is earlier

13. We, Lucknow International Airport Limited, will be issuing a formal purchase order (PO) in this regard soon and until the finalisation and execution of such Order, the terms of this LOA and GTC shall govern the understanding between the parties in respect of the Project and the Supplier/Contractor is required by Lucknow International Airport Limited to commence the Project in accordance with the References above-mentioned

14. **Governing Law and Jurisdiction:** This LOA Contract shall be interpreted, construed and governed by the Laws of India. Jurisdiction shall be Ahmedabad

15. The Contractor shall perform their obligations in terms of this LOA in accordance with applicable law and the instructions of Lucknow International Airport Limited

A Formal Purchase Order (PO) is under preparation and will be issued in due course of time. Till then this LOA is being issued to enable you to start the work.

Please acknowledge and send us one copy of this LOA duly signed and stamped on each page as a token of its unconditional acceptance.

For, Lucknow International Airport Limited

Balvir Bhatia
Balvir Bhatia (Aug 20, 2022 14:13 GMT+5.5)

Balvir Singh Bhatia
Chief Airport Officer

For, Infosoft Digital Design & services Pvt. Ltd.

Authorized Signatory

Enclosures:
Annexure 1: Price break up
Annexure 2: Scope of works
Annexure 3: STC, GTC and other related documents

Lucknow International Airport Ltd
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Annexure 1 to LOA ref: PROJ/LKO/22-23/LOA/014 dtd 19th August 2022				
Amount in INR				
Sr No.	**Item Description**	**Qty**	**Unit Rate**	**Amount**
1	55" Display - 700 Nits - QH55 or Equivalent LG/ Sony With mount in pole/wall/ ceiling	116	53,925	6,255,300
2	43" Display - 700 Nits - QH50 or Equivalent LG/ Sony With mount in pole/wall/ ceiling	141	39,180	5,524,380
3	Out Door 55" FIDS - 3000 Nits - OH55 or Equivalent LG/ Sony With mount in pole/wall/ ceiling	25	270,000	6,750,000
4	Media Player as per Spec in RFP	282	52,900	14,917,800
5	Integration with AODB	1	included	included
6	Charges for the installation, Integration (Include ICD doscument in coordination with other system), Testing and Commissioning of the complete System with necessary power distribution boards, power point boxes etc. as per specifications & Creation of VM with VM software in server proposed in Data Center Configuration of On Prim instances failover	1	included	included
7	Migration of Existing FIDS from T1/ T2 to T3	80	3,800	304,000
8	Installation Charges & project management charges	1	2,700,000	2,700,000
Total excluding GST as applicable				**36,451,480**

LETTER OF AWARD

Date: 02nd November 2022
Ref. NO.: PROJ/LKO/22-23/LOA/022

M/s. Mantra Softech India Private Limited
B203, Shapath Hexa,Opp. Gujarat High Court,S.G. Highway, Sola,Ahmedabad - 380060, Gujarat..

Kind Attn: Mr. Atul Surve

Subject: Letter of Award for Design, Supply, Installation, Testing & commissioning of Primary & Secondary Access Control System (ACS) at Lucknow International Airport Limited (LIAL).

References.:

1. Your Initial Proposal dtd 13th July 2022
2. Your Final Proposal dtd 02nd November 2022

Dear Sir,

With reference to the above and subsequent discussions, we are pleased to issue this Letter of Award ("LOA") for Design, Supply, Installation, Testing & commissioning of ACS at Lucknow International Airport Limited to you as per the technical specifications contained in tender documents, addendums and amendments issued, discussion between us and the agreed scope of work

Based on the above and the understanding reached between at Lucknow International Airport Limited and Supplier/Contractor we are hereby pleased to issue this LOA on the following terms

1. **LOA Price:** We, at Lucknow International Airport Limited pay a sum of **INR 5,86,71,443 (Rupees Five Crore Eighty-Six Lakhs Seventy-One Thousand Four Hundred and Forty-Three only)** including GST @ 18%, towards design, supply, installation, testing, commissioning (SITC, as per agreed scope and detailed price BOQ is attached as per the attached Annexure 1).

   towards completion of your responsibilities under this LOA in terms of the Project, as per the price mentioned above. The LOA price is on fixed rate basis, shall be fixed for the tenure of LOA and subject to variation only on account of the variation in the scope of work for completion of the Project & as per agreed terms and conditions.

2. **Scope of Works:** Supply, Installation, Testing & commissioning of ACS, detailed scope of works is attached as Annexure 2 to this LOA

3. **Taxes and Duties**: The LOA price set out above includes all the applicable taxes & duties, including GST @ 18%.

4. **Terms of Payment:** All payments shall be released within Thirty (30) days from the date of submission of clear invoice duly certified by Lucknow International Airport Limited representative and as per the below milestones.

   a. **Supply:**
      i. 90% on pro rata basis against supply and acceptance of respective material at site.
      ii. 10% after successful Installation, hand over and acceptance by LIAL Engg. in charge
   b. **Installation:**
      i. 90% on pro rata basis against installation works and acceptance by LIAL's Engg. in charge
      ii. 10% after successful Installation, hand over and acceptance by LIAL Engg. in charge

Lucknow International Airport Ltd
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CCS International Airport
Lucknow 226 009
Uttar Pradesh, India
CIN: U63030GJ2019PLC109814

Tel +91 522 243 6022
Fax +91 522 243 2883
adaniairports@adani.com
www.adani.com

5. **CPBG cum PBG:** Vendor shall submit CPBG cum PBG within 15 days from the date of order confirmation for the 10% of the total contract value valid till completion of Defect Liability Period (DLP).

6. **Commencement Date:** 02nd November 2022

7. **Schedule of completion:** SITC works shall be completed within Five (05) Months from the commencement date.

8. **Liquidated damages (L.D.):** It will be applicable at 0.5% per week delay and part thereof maximum up to 5% of the total basic contract value after agreed completion schedule.

9. This LOA is subject to the terms and conditions contained herein, in the tender documents, general terms & Conditions (GTC) and such other conditions that have been agreed to by the parties by the way of the addenda issued to the tender and tender deviations – agreed between the parties as referred above

10. **Limitation of Liability:** The liability shall be limited to the maximum 100% of contract value and no consequential damage shall apply except for liabilities incurred in cases of fraud and breach of mutually agreed terms.

11. **Defect Liability Period (DLP):** 24 months from the date of handover and acceptance to LIAL's Engineer in Charge.

12. We, Lucknow International Airport Limited, will be issuing a formal Work order (WO) in this regard soon and until the finalisation and execution of such Order, the terms of this LOA and GTC shall govern the understanding between the parties in respect of the Project and the Supplier/Contractor is required by Lucknow International Airport Limited to commence the Project in accordance with the References above-mentioned

13. **Governing Law and Jurisdiction:** This LOA Contract shall be interpreted, construed and governed by the Laws of India. Jurisdiction shall be Ahmedabad

14. The Contractor shall perform their obligations in terms of this LOA in accordance with applicable law and the instructions of Lucknow International Airport Limited

A Formal Purchase Order (PO) is under preparation and will be issued in due course of time. Till then this LOA is being issued to enable you to start the work.

Please acknowledge and send us one copy of this LOA duly signed and stamped on each page as a token of its unconditional acceptance.

For, Lucknow International Airport Limited

Balvir Bhatia
Balvir Bhatia (Nov 2, 2022 20:55 GMT+5.5)

Balvir Singh Bhatia
Chief Airport Officer

For, Mantra Softech India Private Limited

Authorized Signatory

Enclosures:
Annexure 1: Price break up
Annexure 2: Scope of works
Annexure 3: STC, GTC and other related documents

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Letter of Award

25th November 2022
Ref. NO.: PROC/LKO/22-23/LOA/021

M/s. Velocis Systems Private Limited
B-608, Mondeal Heights, Iscon Cross Road,
Besides Novotel Hotel, SG Highway, Ahmedabad – 380015

Kind Attn: Mr. Jignesh Rachh (Director)

Subject: Letter of Award (LOA) for Design, Supply, Interfacing, Implementation, Testing, Commissioning and Certification of Active Network System at Lucknow International Airport Ltd (LIAL), Lucknow

References.:

1. Enquiry Email dtd 19th August 2022
2. Your Initial Proposal dtd 26th August 2022
3. Final Proposal dtd 23rd November 2022

Dear Sir,

With reference to the above references and subsequent discussions, we are pleased to issue this Letter of Award ("LOA") to M/s. Velocis Systems Private Limited ("System Integrator") for Design, Supply, Interfacing, Implementation, Testing, Commissioning and Certification of Active Network System ("Project") as per the technical specifications contained in tender documents, addendums and amendments issued, agreed scope of work and subsequent discussions.

Based on the above and the understanding reached between LIAL and System Integrator, we are hereby pleased to issue this WO on the following terms

1. **LOA Price:** We, Lucknow International Airport Ltd. ("LIAL") agree to pay a sum of Indian Rupees **INR 23,40,96,303 (Rupees Twenty-Three Crores Forty Lacs Ninety-Six Thousand Three Hundred and Three only)** including all applicable taxes, duties & GST @ 18%, this amount includes Design, Supply, Interfacing, Implementation, Testing, Commissioning and Certification of Active Network System towards completion of your responsibilities under this LOA in terms of the Project, as per the price mentioned above.

   The LOA price is on fixed unit rate basis, shall be fixed for the tenure of the LOA and subject to variation only on account of the variation in the scope of work for completion of the Project & as per agreed terms and conditions.

   Detailed price BOQ break up is as per the attached Annexure 1.

2. **Scope of Supplies:** Scope of works is attached as annexure 2.

3. **Taxes and Duties**: The LOA price set out above includes all taxes & duties.

4. **Advance Bank Guarantee (ABG):** The ABG shall be submitted for the 10% of the total contract value valid till completion time + 6 Months claim period. ABG shall be strictly as per the format attached to this LOA.

5. **Contract Performance Bank Guarantee (CPBG):** The CPBG shall be submitted for 10% of total contract value 15 days prior to submission of First invoice from Velocis. The CPBG shall be valid till handover of SITC works + 6 months claim period. CPBG shall be strictly as per the format attached to this LOA.

6. **Performance Bank Guarantee (PBG):** The PBG shall be submitted for 10% of the contract value valid from handover date until One (01) years of defect liability period + 6 Months claim period. PBG shall be strictly as per the format attached to this LOA.

7. **Terms of Payment:** All payments shall be made within Thirty (30) days from the date of submission of clear invoice duly certified by the LIAL's Representative.as per the below breakup:

    a. **Advance:** 10% shall be released as an Advance against submission of ABG of equal amount. Advance shall be recovered/adjusted against progressive billing from the Vendor.
    b. **Supply:**
        i. 90% on pro rata basis against material receipt and acceptance at site.
        ii. 10% on commissioning and successful takeover by LIAL and against submission of PBG valid till completion of warranty/defect liability period (DLP)
    c. **Services:**
        i. 30% on submission and acceptance of Solution Design Document submission.
        ii. 30% on pro rata basis against physical deployment and acceptance of devices at site.
        iii. 20% on pro rata basis against Configuration of devices and acceptance at site.
        iv. 20% on commissioning, acceptance and handing over to LIAL and against submission of performance bank guarantee equal to 10% of total contract value valid till completion of defect liability period (DLP).

8. **Schedule of Delivery:** The Entire works shall be completed and handed over to LIAL as per below breakup. If the material / hardware delivery lead times fail to meet the project timeline, then Velocis has to make prior interim arrangements as per the site requirement of LIAL's Engg. in charge at no extra cost.

    a. Design & Material Supply: 6 to 8 Months from the commencement date of LOA.
    b. Implementation, Testing, Commissioning & certification works to be completed and hand over to LIAL in 4 to 6 months from the date of Supply.

9. **Liquidated damages (LD):** It will be applicable at 0.5% per week delay and part thereof maximum up to 5% of the total basic contract value after agreed completion schedule.

10. This LOA is subject to the terms and conditions contained herein, agreed Special Terms & Conditions, terms of reference, general Terms and Conditions (GTC) and all such other documents agreed by the parties by the way of the addenda issued to the tender and tender deviations – agreed between the parties as referred above

11. **Limitation of Liability:** The liability shall be limited to the maximum 100% of contract value and no consequential damage shall apply except for liabilities incurred in cases of fraud and breach of mutually agreed terms.

12. **Manufacturer's Warranty:** 36 months from the date of Supply of material & acceptance at site.

13. **Defect Liability Period:** One (01) year from the date of issue of Take over certificate by Airport Operator

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14. We, LIAL, will be issuing a formal Contract agreement in this regard soon and until the finalisation and execution of such contract, the terms of this LOA and GTC and related documents attached with this LOA shall govern the understanding between the parties in respect of the Project and the System Integrator is required by LIAL to commence the Project in accordance with the References above-mentioned

15. **Governing Law and Jurisdiction:** This LOA Contract shall be interpreted, construed and governed by the Laws of India. Jurisdiction shall be Ahmedabad

16. The System Integrator shall perform their obligations in terms of this LOA in accordance with applicable law and the instructions of LIAL

A formal Contract Agreement is under preparation and will be issued in due course of time. Till then this LOA is being issued to enable you to start the work.

Please acknowledge and send us one copy of this LOA duly signed and stamped on each page as a token of its unconditional acceptance.

For, Lucknow International Airport Limited

Balvir Bhatia
Balvir Bhatia (Nov 26, 2022 12:57 GMT+5.5)

Authorized Signatory
Balvir Singh Bhatia
CHIEF AIRPORT OFFICER

For, Velocis Systems Private Limited

SANDEEP AGRAWAL
Digitally signed by SANDEEP AGRAWAL
Date: 2022.11.26 12:10:07 +05'30'

Authorized Signatory

Enclosures:
Annexure 1: Price break-up sheet
Annexure 2: Scope of works
Annexure 3: GTC, STC & other related documents

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LETTER OF AWARD

Date: 26th September 2022
Ref. NO.: PROJ/LKO/22-23/LOA/016

M/s. VIS Networks Pvt. Ltd.
No. 94, 4th Cross, 2nd Block,
Koramangala, Bangalore – 560034,
Karnataka, India

Kind Attn: Mr. Ravindra Thombre (Director- Projects)

Subject: Letter of Award for Design, Supply, Installation, Testing and Commissioning of Cisco IP Telephony & Recording Solution at Lucknow International Airport Ltd, Lucknow (LIAL)

References.:

1. Enquiries vide Email dtd 28th July 2022
2. Your Initial Proposal dtd 25th August 2022
3. Your Final Proposal dtd 23rd September 2022

Dear Sir,

With reference to the above and subsequent discussions, we are pleased to issue this Letter of Award ("LOA") for Supply, Installation, Testing and Commissioning of Cisco IP Telephony & Recording Solution at Lucknow International Airport Ltd, Lucknow to you as per the technical specifications contained in tender documents, addendums and amendments issued, discussion between us and the agreed scope of work

Based on the above and the understanding reached between at Lucknow International Airport Limited and Supplier/Contractor we are hereby pleased to issue this LOA on the following terms

1. **LOA Price:** We, at Lucknow International Airport Limited pay a sum of **INR 1,71,62,185 (Rupees One Crore Seventy-One Lakhs Sixty-Two Thousand One Hundred and Eighty-Five only)** Including GST@ 18%, towards supply, installation, testing, commissioning (SITC, as per agreed scope and detailed price BOQ is attached as per the attached Annexure 1).

   towards completion of your responsibilities under this LOA in terms of the Project, as per the price mentioned above. The LOA price is on fixed rate basis, shall be fixed for the tenure of LOA and subject to variation only on account of the variation in the scope of work for completion of the Project & as per agreed terms and conditions.

2. **Scope of Works:** Supply, Installation, Testing and Commissioning of Cisco IP Telephony & Recording Solution at Lucknow International Airport Limited, detailed scope of works is attached as Annexure 2 to this LOA

3. **Taxes and Duties**: The LOA price set out above includes GST @ 18% all the applicable taxes & duties.

4. **Terms of Payment:** All payments shall be released within Thirty (30) days from the date of submission of clear invoice duly certified by Lucknow International Airport Limited representative

   i. 90% on pro rata basis against supply of respective material at site.
   ii. 10% after successful Installation, hand over and acceptance by LIAL Engg. in charge

5. **CPBG cum PBG:** Vendor shall submit CPBG cum PBG within 15 days from the date of order confirmation for the 10% of the total contract value valid till One year from the date of handover and acceptance by LIAL Engg. In charge.

6. **Commencement Date:** 26th September 2022

7. **Schedule of completion:** SITC works shall be completed within 9 months from the commencement date of LOA. However, to abide by the project timelines Vis net has to arrange the rental devices at no additional cost if the delivery lead time is not matching the project timelines of LIAL.

8. **Liquidated damages (L.D.):** It will be applicable at 0.5% per week delay and part thereof maximum up to 5% of the total basic contract value after agreed completion schedule.

9. This LOA is subject to the terms and conditions contained herein, in the tender documents, general Conditions of Contract (GCC) and such other conditions that have been agreed to by the parties by the way of the addenda issued to the tender and tender deviations – agreed between the parties as referred above

10. **Limitation of Liability:** The consortium's liability shall be limited to the maximum 100% of contract value and no consequential damage shall apply except for liabilities incurred in cases of fraud and breach of mutually agreed terms.

11. **L2/L3 support Services:** 5 years from the date of handover and acceptance to LIAL's Engineer in Charge.

12. **Manufacturer's Warranty:** 5 Years from the date of supply to LIAL.

13. We, Lucknow International Airport Limited, will be issuing a formal purchase order (PO) in this regard soon and until the finalisation and execution of such Order, the terms of this LOA and GTC shall govern the understanding between the parties in respect of the Project and the Supplier/Contractor is required by Lucknow International Airport Limited to commence the Project in accordance with the References above-mentioned

14. **Governing Law and Jurisdiction:** This LOA Contract shall be interpreted, construed and governed by the Laws of India. Jurisdiction shall be Ahmedabad

15. The Contractor shall perform their obligations in terms of this LOA in accordance with applicable law and the instructions of Lucknow International Airport Limited

A Formal Purchase Order (PO) is under preparation and will be issued in due course of time. Till then this LOA is being issued to enable you to start the work.

Please acknowledge and send us one copy of this LOA duly signed and stamped on each page as a token of its unconditional acceptance.

For, Lucknow International Airport Limited

Balvir Bhatia
Balvir Bhatia (Sep 26, 2022 12:06 GMT+5.5)

Balvir Singh Bhatia
Chief Airport Officer

For, VIS Networks Pvt. Ltd.

Authorized Signatory

Enclosures:
Annexure 1: Price break up
Annexure 2: Scope of works
Annexure 3: GTC and other related documents

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Annexure 1 to LOA ref: PROJ/LKO/22-23/LOA/016 dtd 26th September 2022				
Part Number	**Description**	**Qty**	**Unit Rate**	**Amount**
BE7H-M5-K9	Cisco Business Edition 7000H (M5) Appliance, Export Restr SW	2	1,068,407	2,136,814
CON-SNT-BE79M5KH	SNTC-8X5XNBD Cisco Business Edition 7000H (M5) Applia	2	73,705	147,410
BE7K-PSU	Cisco UCS 1050W AC Power Supply for Rack Server	4	-	-
BE7K-NIC1	Intel i350 Quad Port 1Gb Adapter	4	-	-
BE7K-PCIERISER	Riser 1B incl 3 PCIe slots (x8, x8, x8); all slots from CPU1	2	-	-
BE7K-RAIDCTRLR	Cisco 12G Modular RAID controller with 4GB cache	2	-	-
BE7K-DISK	300GB 12G SAS 10K RPM SFF HDD	48	-	-
R2XX-RAID5	Enable RAID 5 Setting	2	-	-
BE7K-RAM-M5-NEW	16GB DDR4-2933-MHz RDIMM/1Rx4/1.2v	24	-	-
BE7K-CPU	2.6 GHz 6132/140W 14C/19.25MB Cache/DDR4 2666MHz	4	-	-
CAB-250V-10A-ID	AC Power Cord - 250V, 10A , India	4	-	-
BE6/7K-VIRTENH-7X	Cisco BE Embedded Virt. Enhanced 7x, BE6K/7K/CMS1K only	2	71,382	142,764
CON-ECMU-BE67KVHX	SWSS UPGRADES Cisco BE Embedded Virt. Enhanced 7x, BE6	2	56,096	112,192
ISDN PRI Gateway				-
C8300-2N2S-6T	Cisco Catalyst C8300-2N2S-6T Router	2	200,326	400,653
CON-SSSNT-C8302S6T	SOLN SUPP 8X5XNBD Cisco Catalyst C8300	2	200,845	401,691
MEM-C8300-8GB	Cisco Catalyst 8300 Edge 8GB memory	2	-	-
M2USB-16G	Cisco Catalyst 8000 Edge M.2 USB 16GB	2	-	-
C-RFID-2R	Cisco Catalyst 8000 Edge RFID - 2RU	2	-	-
C8300-RM-19-2R	Cisco Catalyst 8300 Rack mount kit - 19" 2R	2	-	-
C8300-NIM-BLANK	Cisco Catalyst 8300 Edge NIM Blank	2	-	-
C8300-SM-BLANK	Cisco Catalyst 8300 Edge SM Blank	4	-	-
C8300-PIM-BLANK	Cisco Catalyst 8300 Edge PIM Blank	2	-	-
C8300-FAN-2R	Cisco Catalyst 8300 Edge Fan Tray, 2RU	2	-	-
NETWORK-PNP-LIC	Network Plug-n-Play Connect for zero-touch device deployment	2	-	-
C-POE-COVER	Cover for empty POE slot on Cisco Catalyst Edge 8300	4	-	-
TE-R-SW	TE agent for IOSXE on Enterprise Routing	2	-	-

Annexure 1 to LOA ref: PROJ/LKO/22-23/LOA/016 dtd 26th September 2022				
Part Number	**Description**	**Qty**	**Unit Rate**	**Amount**
IOSXE-CTRL-MODE	IOS XE SD-WAN boot up mode for Unified image	2	-	-
SC8KBEUK9-176	UNIVERSAL	2	-	-
PWR-CC1-650WAC	Cisco C8300 2RU AC Power supply	4	-	-
CAB-IND	AC Power Cord (India)	4	-	-
DNA-P-T0-A-5Y	Cisco DNA Advantage On-Prem Lic 5Y - upto 25M (Aggr, 50M)	2	75,888	151,775
NIM-2MFT-T1/E1	2 port Multiflex Trunk Voice/Clear-channel Data T1/E1 Module	2	38,490	76,980
PVDM4-64	64-channel DSP module	2	53,484	106,969
NIM-PVDM-64	NIM with 64-channel DSP	2	53,484	106,969
SVS-PDNA-T0-A5Y	Solution Support for SW - DNA Advantage OnPrem Lic, T0, 5Y	2		-
Software Licenses on Subscription - 5 Years				-
A-FLEX-3	Collaboration Flex Plan 3.0	1		-
Initial Term - 60.00 Months | Auto Renewal Term - 12 Months | Billing Model - Monthly Billing | Requested Start Date - 25-Feb-2022 | Requested End Date - 24-Feb-				-
SVS-FLEX-SUPT-BAS	Basic Support for Flex Plan	1		-
A-FLEX-NUPL-P	NU On-Premises Calling Professional	51	15,523	791,698
A-FLEX-NUPL-A	NU On-Premises Calling Access	390	5,544	2,162,165
A-FLEX-PL-VM	On-Premises Unity Connection Add-on	50	4,989	249,471
A-FLEX-STD-CUBE	CUBE Standard Trunk Session License	60	6,209	372,556
A-FLEX-SRST-E	SRST Endpoints (1)	492		-
A-FLEX-P-PRO	Unified Communications Manager Smart License - Pro (1)	51		-
A-FLEX-P-ACC	Access Smart License (1)	390		-
A-FLEX-P-UCXN	Unity Connection Smart License (1)	101		-
A-FLEX-P-ER	Emergency Responder Smart License (1)	543		-
A-FLEX-SW-12.5-K9	On-Premises & Partner Hosted Calling SW Bundle v12.5 (1)	1		-
A-FLEX-FILESTG-ENT	File Storage Entitlement	1020		-
A-FLEX-PROPACK-ENT	Pro Pack for Cisco Control Hub Entitlement	51		-
A-FLEX-MSG-NU-ENT	Messaging Named User Entitlement (1)	51		-
Call Recording Solution				-

Annexure 1 to LOA ref: PROJ/LKO/22-23/LOA/016 dtd 26th September 2022				
Part Number	**Description**	**Qty**	**Unit Rate**	**Amount**
CLB-SAAS-AGENTS	SolutionsPlus: Calabrio Workforce	1		-
CLB-SUB-CR	Call Recording Subscription	25	19,284	482,088
IP Phones				-
CP-7811-K9=	Cisco UC Phone 7811	350	4,409	1,543,281
CON-SNT-P7MK91M8	Cisco UC Phone 7811SNTC-8X5XNBD	350	1,723	603,215
				-
CP-8865-K9=	Cisco IP Phone 8865	51	21,126	1,077,418
CON-SNT-P8TK96T9	Cisco IP Phone 8865SNTC-8X5XNBD	51	7,899	402,860
				-
CP-8800-V-KEM=	8800 Series Video KEM, 28 Button	1	11,311	11,311
CON-SNT-P8EEM0E8	8800 Series Video KEM, 28 ButtonSNTC-8X5XNBD	1	4,309	4,309
Analog Voice Gateway				-
VG400-4FXS/4FXO	Cisco VG400 Analog Voice Gateway	10	85,112	851,124
CON-SSSNT-VG4004FO	SOLN SUPP 8X5XNBD Cisco VG400 Analog Voice Gateway	10	68,651	686,513
SL-VG400-UC-K9	Unified Communication License for VG400 Series	10		-
CAB-IND	AC Power Cord (India)	10		-
PWR-VG400-AC	AC Power Supply for Cisco VG400	10		-
SVG400UK9-176	Cisco VG400 Series IOS XE Universal Image	10		-
ACS-4220-RM-19	19 inch rack mount kit for Cisco ISR 4220 & VG400	10		-
CDR Software & With Reporting Functionality				-
Call Billing	Telesoft CDR Software	Lot	732,000	732,000
				-
				-
Professional Services Onsite Support				-
Installation	Installation & Project Management - One Time	Lot	370,000	370,000
Services	L2/L3 Support Activities for 5 Years Terms (Excluding the BAU Scope)	Lot	420,000	420,000
Total				**14,544,224**
GST @ 18%				2,617,960
Grand Total Incl. GST @ 18%				**17,162,185**

adani™

LETTER OF AWARD

Date: 03rd January 2023
Ref. NO.: PROJ/LKO/22-23/LOA/028

M/s. Godrej & Boyce Mfg. Co. Ltd
APM Mall, 4th floor, Shyamal Karnavati 100 Ft. Road,
Satellite, Ahmedabad-380015, Gujarat, India

Kind Attn: Mr. Jay Jain (Gujarat Head)

Subject: Letter of Award for Supply, Installation, Testing & commissioning of AV Solution at Lucknow International Airport Limited.

References.:
1. Your Final email Proposal dtd 02nd January 2023

Dear Sir,

With reference to the above and subsequent discussions, we are pleased to issue this Letter of Award ("LOA") for Supply, Installation, Testing & commissioning of AV Solution at Lucknow International Airport Limited to you as per the technical specifications contained in tender documents, addendums and amendments issued, discussion between us and the agreed scope of work

Based on the above and the understanding reached between at Lucknow International Airport Limited and Supplier/Contractor we are hereby pleased to issue this LOA on the following terms

1. **LOA Price:** We, at Lucknow International Airport Limited pay a sum of **INR 66,74,672 (Rupees Sixty-Six Lakhs Seventy-Four Thousand Six Hundred and Seventy-Two only)** including GST as applicable, towards supply, installation, testing, commissioning (SITC, as per agreed scope and detailed price BOQ is attached as per the attached Annexure 1).

   towards completion of your responsibilities under this LOA in terms of the Project, as per the price mentioned above. The LOA price is on fixed rate basis, shall be fixed for the tenure of the LOA and subject to variation only on account of the variation in the scope of work for completion of the Project & as per agreed terms and conditions.

2. **Scope of Works:** Supply, Installation, Testing & commissioning of AV Solution, detailed scope of works is attached as Annexure 2 to this LOA

3. **Taxes and Duties**: The LOA price set out above includes all the applicable taxes and duties.

4. **Terms of Payment:** All payments shall be released within Thirty (30) days from the date of submission of clear invoice duly certified by Lucknow International Airport Limited representative

   - **Supply, Services & Licenses:** 100% on pro rata basis against supply of respective material at site
   - **Installation, Testing & Commissioning:** 100% on pro rata basis against completion and acceptance of installation, Testing & Commissioning works at site

5. **Effective Date:** 03rd January 2023

6. **Schedule of completion:** SITC works shall be completed within 04 - 06 weeks from the effective date.

7. **Liquidated damages (L.D.):** It will be applicable at 0.5% per week delay and part thereof maximum up to 5% of the total basic contract value after agreed completion schedule.

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Registered Office: Adani Corporate House, Shantigram, Nr Vaishno Devi Circle, S G Highway, Khodiyar, Ahmedabad 382 421, Gujarat, India

8. This LOA is subject to the terms and conditions contained herein, in the tender documents, general Conditions of Contract (GCC) and such other conditions that have been agreed to by the parties by the way of the addenda issued to the tender and tender deviations – agreed between the parties as referred above

9. **Limitation of Liability:** The vendor's liability shall be limited to the maximum 100% of contract value and no consequential damage shall apply except for liabilities incurred in cases of fraud and breach of mutually agreed terms.

10. **Defect Liability Period:** 36 months from the date of handover and acceptance to LIAL's Engineer in Charge.

11. We, Lucknow International Airport Limited, will be issuing a formal purchase order (PO) in this regard soon and until the finalisation and execution of such contract, the terms of this LOA and GTC shall govern the understanding between the parties in respect of the Project and the Supplier/Contractor is required by Lucknow International Airport Limited to commence the Project in accordance with the References above-mentioned

12. **Governing Law and Jurisdiction:** This LOA Contract shall be interpreted, construed and governed by the Laws of India. Jurisdiction shall be Ahmedabad

13. The Contractor shall perform their obligations in terms of this LOA in accordance with applicable law and the instructions of Lucknow International Airport Limited

A Formal Purchase Order (PO) is under preparation and will be issued in due course of time. Till then this LOA is being issued to enable you to start the work.

Please acknowledge and send us one copy of this LOA duly signed and stamped on each page as a token of its unconditional acceptance.

For, Lucknow International Airport Limited

Rahul Bhatkoti

Rahul Bhatkoti (Jan 7, 2023 11:02 GMT+5.5)

Authorized Signatory
Rahul Bhatkoti
Chief Airport Officer

For, Godrej & Boyce Mfg. Co. Ltd

GODREJ & BOYCE MFG. CO. LTD. AHMEDABAD BRANCH

Authorized Signatory

Enclosures:
Annexure 1: Price break up
Annexure 2: Scope of works
Annexure 3: GTC and other related documents

Lucknow International Airport Ltd
(Formerly known as Adani Lucknow International Airport Ltd)
First Floor, Terminal 1
CCS International Airport
Lucknow 226 009
Uttar Pradesh, India
CIN: U63030GJ2019PLC109814

Tel +91 522 243 6022
Fax +91 522 243 2883
adaniairports@adani.com
www.adani.com

Registered Office: Adani Corporate House, Shantigram, Nr Vaishno Devi Circle, S G Highway, Khodiyar, Ahmedabad 382 421, Gujarat, India

LETTER OF AWARD

7th September 2022
Ref. NO.: PROJ/LKO/22-23/LOA/015

ICAD AIRPORTS PVT. LTD. (Consultant)
Advant Navis Business Park Building
Noida sector 142, U.P., India, Pin-code - 201 305.

Kind Attn: Mr. Feroz Mehdi (Director International Operations)

Subject: Letter of Award for System Integrator Consultancy Services at Lucknow International Airport Limited, Lucknow (LIAL).

References.:

1. Enquiry email dtd 3rd August 2022
2. Initial Techno commercial proposal email dtd 24th August 2022
3. Final Techno commercial proposal email dtd 02nd September 2022

Dear Sir,

With reference to above references, and subsequent discussions, we are pleased to issue this Letter of Award for System Integrator Consultancy Services at Lucknow International Airport Limited, Lucknow.

Based on the above and the understanding reached between LIAL and the Consultant we are hereby pleased to issue this LOA on the following terms:

1. **LOA price:** We, LIAL agree to pay a sum of INR **1,14,28,583**/- (**Rupees One Crore Fourteen Lakhs Twenty-Eight Thousand Five Hundred and Eighty-Three Only**) including GST @ 18%. (Detailed price break up as per annexure 1) towards consultancy service for agreed scope towards completion of responsibilities under this LOA in terms of the Project, as per the price mentioned above.

The LOA price is inclusive of all expenses and is on fixed rate basis, shall be fixed for the tenure of the LOA and subject to variation only on account of the variation in the scope of work for completion of the Project & as per agreed terms and conditions.

2. **Scope of Works:** Scope of Works is attached as Annexure - 2.

3. **Taxes and Duties:** The LOA price set out above includes GST @ 18% & all other taxes and duties.

4. **Terms of Payment: '-** All payments shall be released within thirty (30) days from the date of submission of clear invoice duly certified by Airport Operator Engineer in Charge and as per below mentioned Milestone.

   a. 80% - Monthly payment on staff utilization at site
   b. 20% on successful Project Completion & handover to LIAL's Engg. In charge.

5. **Schedule of Completion**: The completion time shall be as per attached Annexure 1 to this LOA.

6. **Commencement Date:** 7th September 2022

7. **Liquidated damages (L.D.):** It will be applicable at 0.5% per week delay and part thereof maximum up to 5% of the total basic contract value after agreed completion schedule.

8. This LOA is subject to the terms and conditions contained herein, in the tender documents and such other conditions that have been agreed to by the parties.

9. **Limitation of Liability:** The liability shall be limited to the maximum 100% of contract value and no consequential damage shall apply except for liabilities incurred in cases of fraud and breach of mutually agreed terms.

10. **Warranty/ defect liability**: NA.

11. LIAL will be issuing a formal Service order (SO) in this regard soon and until the finalization and execution of such Order, the terms of this LOA and GTC (Annexure-3) shall govern the understanding between the parties in respect of the Project, and the Consultant is required by LIAL to commence the Project in accordance with the references above mentioned.

12. **Governing Law and Jurisdiction:** This LOA Contract shall be interpreted, construed and governed by the Laws of India. Jurisdiction shall be Ahmedabad.

13. This LOA is issued to you, in duplicate. You are requested to return to us a duplicate copy of this LOA duly signed and stamped on each page as a token of your unconditional acceptance of the terms set out herein.

Thanking you,
Yours faithfully,

For, Lucknow International Airport Limited	**For, ICAD AIRPORTS PVT. LTD. (Consultant)**
Balvir Bhatia Balvir Bhatia (Sep 7, 2022 19:31 GMT+5.5)	
Authorized Signatory **Balvir Singh Bhatia** **Chief Airport Officer**	**Authorized Signatory**

Enclosures:
1. Annexure 1: Price and work schedule
2. Annexure 2: Scope of Works
3. Annexure 3: General Terms & Conditions

Lucknow International Airport Ltd
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Annexure 1 to LOA ref:PROJ/LKO/22-23/LOA/015 dtd 7th September 2022					
Sr No.	**Description**	**Location**	**No. of Months**	**Amount/Month**	**Amount**
1	Technical Director	offsite	0.5	894,425	447,212
2	Project Manager	onsite	8	279,508	2,236,062
3	Document Controller	offsite	1.5	67,082	100,623
4	Quality Controller	offsite	2	167,705	335,409
5	ICT Lead	onsite	6.5	139,754	908,400
6	Interface Manager/Special Systems Lead	onsite	8	167,705	1,341,637
7	SME(Incl Security systems Mgr)	onsite	4	447,212	1,788,850
8	Test Manager		6	279,508	1,677,047
9	PPS Lead	Onsite	RO	355,000	optional
10	Site Office expense				850,000
Total Consultancy Cost					**9,685,240**
GST @ 18%					1,743,343
Total Incl. GST @ 18%					**11,428,583**

Note: the above prices are valid till the end of June 2023. However, if we require services after June 2023 then the additional monthly charges @ INR 8,65,000 Per/Month + GST shall be applicable

Annexure 17

adani

Ref No: LIAL/Projects/MVVNL/2023/0366/1194

Date: 24-Feb-2023

To,
The Managing Director,
Electricity Urban Distribution Division,
Head Office, 4-A, Gokhale Marg
Lucknow (Uttar Pradesh)

अधीक्षण अभियन्ता/निदेशक
मध्यांचल विद्युत वितरण निगम
प्राप्तकर्ता के हस्ताक्षर
दिनाँक 27.2.23

Project: Construction of New Integrated Passenger Terminal Building at CCSI Airport, Lucknow.

Subject: Power connectivity of 10.3 MVA load through two independent 33 kV lines express feeder to cater newly proposed T-3 Terminal- Reg.

Ref: 1931–प्रनि/म0वि0वि0नि0लि0/वि0भार0स्वी0 दिनाँक: 25.06.2019

Dear Sir,

Reference may please be made to subject matter and letter as referred above, vide which Electrical load demand 10.3 MVA was sanctioned under commercial category HV-1 for under construction new Integrated passenger terminal building at Chaudhary Charan Singh International Airport, Lucknow.

LIAL would like to convey that construction of the new Integrated passenger terminal building is now at an advanced stage and is planned to be commissioned by October 2023. However, commissioning is going to be in 3 phases and activity to be performed for commissioning shall commenced from April 2023 and would continue till end of September 2023.

In view of the above, LIAL hereby request MVVNL to release the electrical maximum demand power in three phases as,

- Phase-1: Maximum Demand of 2.5 MVA by April 2023
- Phase-2: Maximum Demand of 7.5 MVA by September 2023
- Phase-3: Maximum Demand of 10.3MVA by December 2023

LIAL shall be grateful for the release of electrical maximum demand power in accordance with the above-stated planned phases.

Thanking You,
Yours Sincerely,
For Lucknow International Airport Ltd,

Rahul Bhatkoti
Chief Airport Officer, LIAL
CCSI Airport, Lucknow

Encl. : Load Sanction copy.

Lucknow International Airport Ltd
(Formerly known as Adani Lucknow International Airport Ltd)
First Floor, Terminal 1
CCS International Airport
Lucknow 226 009
Uttar Pradesh, India
CIN: U63030GJ2012PLC109814

Tel +91 522 243 6022
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adaniairports@adani.com
www.lucknow.adaniairports.com

Registered Office: Adani Corporate House, Shantigram, Near Vaishno Devi Circle, S. G. Highway, Khodiyar, Ahmedabad – 382 421

Ref: NCC/AAI-LIAL-LKO/585/2022-2023 Dated: 17th March'23

To,
The Chief Airports Officer
Lucknow International Airport Limited
CCS International Airport
Lucknow - 226009

Kind Attn: Shri Rahul Bhatkoti/ Shri Abinash Kumar Bhaiya

Project: Construction of New Integrated Passenger Terminal at CCS International Airport, Lucknow

Subject: Project progress for New Integrated Terminal-3 (Phase I)

Dear Sir,

This has reference to our monthly progress discussion, and we are pleased to inform you that the operationalization of T3 (Phase I) is going as planned and is scheduled to be completed by September 2023. In this regard, please find below the status of the workmen force on site, material delivery at the site of the major items, the construction schedule plan for Phase I, and EHS statistics.

Manpower Strength – Almost 3000 people are working at site.

Material Status of Delivery at site –

	Type of Materials	Delivery at site
A	**Architectural Structure**	
	Water Proofing material, TMT Steel, Structure Steel, Liner Sheet, Top Sheet, Deck Sheet, Kota Stone, Elevated Road Bearing,	Almost 100% complete
	Granite Stone, Façade Glass	More than 60% complete
	Other items are false ceiling, doors and windows, expansion joint	More than 40% completed.
B	**MEP**	
	Electrical - DG Sets, DG cooling towers, 33 EV Transformers, 11 EV Transformers, 11 EV Panels, 33 EV Panels, LT Panels, HT & LT Cable, UPS supply	All except LT panels and lighting fixtures 100% completed. a. LT Panel 67% completed. b. Lighting fixtures procurement under progress.
	Fire Fighting Pumps – Pumps, Sprinklers, various MS pipes ranging from 25 mm Dia to 300 mm Dia	100% completed except fire pumps. Expected delivery of fire pumps by April'23.

S.K. 17/3/23

NCC Limited
(Formerly Nagarjuna Construction Company Limited)
CIN : L72200AP1990PLC011146
Regional Office : Ansal API, Sector - C 2/183, Sushant Golf City
Near St. Joseph International School, Shaheed Path, Lucknow - 226 030
Web : www.ncclimited.com

(2611) 17-03-23 02:00PM

	Type of Materials	Delivery at site
	HVAC – HWG, Chillers, Cooling Towers, Axial Fans, AHU, HVAC pumps, Twin Pump	95% completed
	Airport IT – PAVA, DAS, Fire Alarm System, Cable Tray	60% delivery completed except cables
	STP & WTP	100% delivery completed
	VHT	100% delivery completed

Construction completion programme

Activity Schedule	Finish Date
Issue of Drawings	April 2023
Subcontracting of Civil Works, Structural Steel Works, MEP Works	April 2023
Procurement of Civil Works, Structural Steel Works, MEP Works	June 2023
Construction Phase 1	
T3 Building Major works	August 2023
Service yard including WTP, STP and Chiller Plant etc.	April 2023
Elevated road	May 2023
Grade level roads	June 2023
Wearing coarse and markings	July 2023
External MEP works	July 2023
Other works	August 2023
ORAT	September 2023
Commercial date of Operation of T3	October 2023

EHS Statistics - There have been no reports of dangerous occurrences or fatalities to date.

Thank you, and we will always assure you of our best services.

For **NCC Limited,**

S.K.M 17/8/23

S K MAHADEVAN
GM (Tech.)

Copy to: Shri. Minendra Kumar Srivastava – Project Director - Egis India Consulting Engineers Pvt. Ltd.

Annexure 19

IATA Guidance on Airport Fuel Storage Capacity - EDITION 1

May 2008

International Air Transport Association
Montreal - Geneva

IATA Guidance on Airport Fuel Storage Capacity

Edition 1

May 2008

International Air Transport Association
Montreal - Geneva

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Acknowledgements

IATA thanks all the participants and contributors to the development of guidance material on Airport Fuel Storage Capacity. Special thanks go to the Members of the Working Group for all their effort and assistance in developing this document and to Amin Ebrahim of Airport Authority Hong Kong for providing the worked example on the fuel storage capacity for the Hong Kong International Airport.

Members of the Working Group

Name	Organization
Nikolaos Kontaxis	Olympic Fuel Company S. A.
Kyriakos Gennadis	Olympic Fuel Company S. A.
Jon Drapkin	Heathrow Hydrant Operating Company Limited
Paul Workman	Skytanking
Ryutaro Nambu	Japan Airlines
David Zanussi	Northwest Airlines
Lasantha Subasinghe	IATA

TABLE OF CONTENT

IATA Guidance on Airport Fuel Storage Capacity

1 Introduction

The aim of this Guidance is to suggest a thought process and provide a general reference for assessing airport fuel storage capacity.

Fuel supply reliability has a major impact on financial and operational viability of flights. Airport fuel infrastructure forms a vital part of the fuel supply chain. While at most airports the fuel facility appears to be adequate, some airports are perceived to have insufficient or excessive facilities. In case of supply disruptions, insufficient capacity could result in non-availability of jet fuel. Insufficient storage capacity may also add pressure on ensuring fuel quality. The need to ensure fuel quality and safety could result in restrictions in fuel availability or even non-availability of jet fuel when storage capacity is insufficient. The knock-on effect of non-availability of jet fuel or even restrictions in availability is huge: consequential damages may arise from cancelled flights, diversions, payload limitations, tankering, and techstops for refuelling. On the other hand, excessive capacity could result in higher charges. There is always a trade-off, and it is essential to strike the right balance between storage capacity, operational reliability and cost.

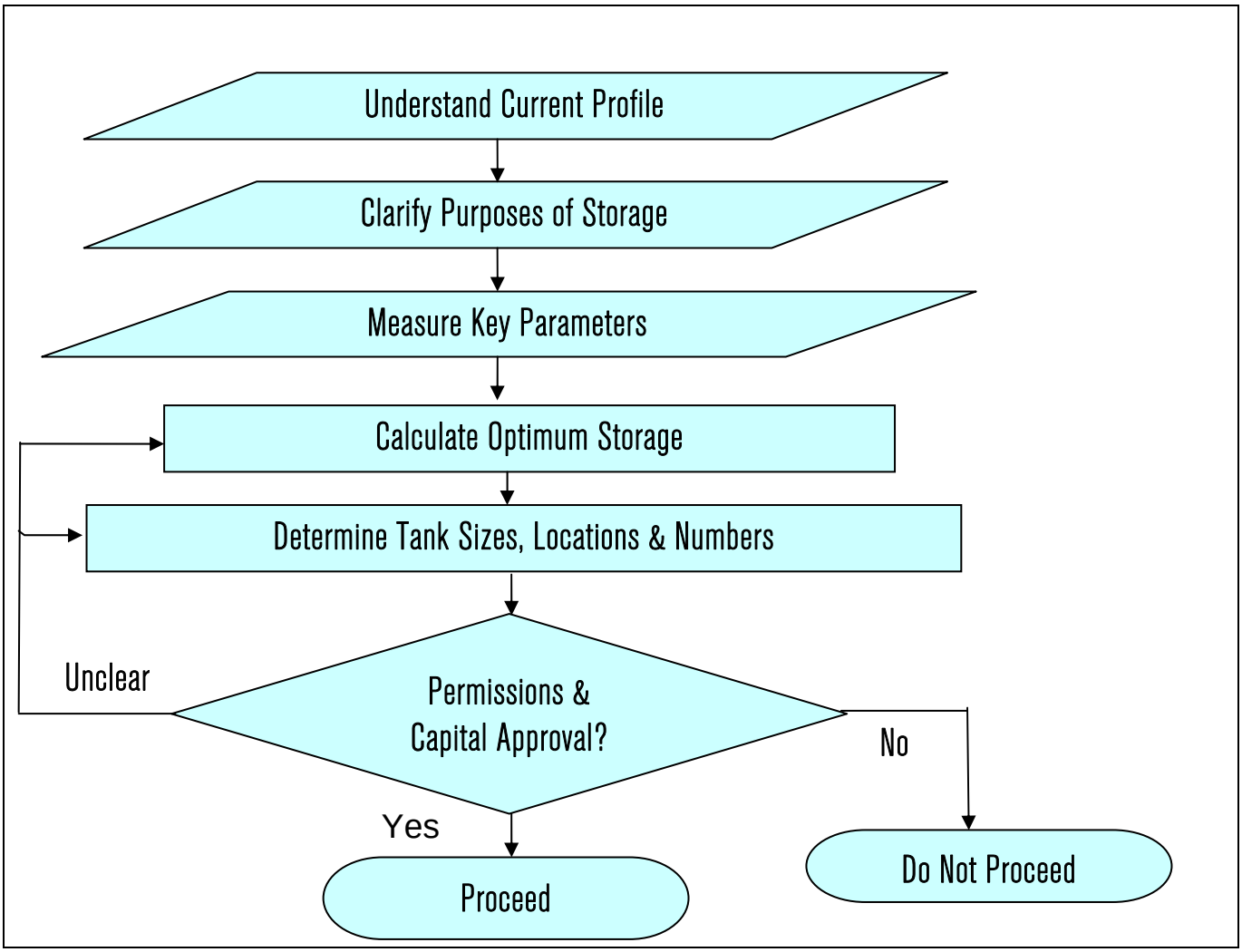
In reality, determining the adequate level of storage capacity is a complex task. Each airport has unique fuel supply and demand situations. Constraints not quantifiable may defy optimisation by mathematical models. Stakeholders have different priorities, often difficult to reconcile. Yet it is worthwhile to define a framework of thought process for better communication among stakeholders and regulators, and for informed opinions by them. Although this Guidance cannot guarantee an optimal solution, certainly it will give perspective, add dimension, and offer checklists for a better solution.

Sections 2 – 8 of this document provide a “long list” of many of the issues that may be relevant at any airport. The worked examples that are given at appendix 2, 3 and 4 aim to help readers identify the main purposes and hence the priorities at their specific airports.

Users of this guidance material should note that this material focuses on capacity only. It will also be essential that the final plan takes full account of safety, quality control and engineering considerations. Once the optimum capacity has been determined, it will therefore be essential to seek expert safety, quality control and engineering advice to develop specific projects.

2 The Process

Shown below is a schematic process of facility size determination:



3 Understand Airport's Current Profile

Before embarking on the quantification exercise, it is important to fully understand each of the following:

1. Demand forecast (current average daily/monthly, peak daily/monthly and demand profile during the day.
2. The supply modes (road tank trucks (bridgers), pipeline, rail cars, barges, etc) and capacities.

3. Fuel receipt operating hours of the supply modes for fuel delivery to the airport depot
4. Operating hours of the Airport Depot
5. Airport Depot Offloading facilities, restrictions, etc (e.g. number of off-loading islands in place, size of pipeline receiving station, etc)
6. Specific operational needs in the said Depot, e.g. if fuel receipt mode is dedicated to Jet A-1, then you need at least 3 tanks (one for aircraft refuelling, one for receiving and one for settling/maintenance, etc). If the fuel receipt mode is NOT dedicated to Jet A-1, then you need extra tank(s) and additional time for fuel recertification (it takes more time and you cannot use the fuel in the tank under test), etc.

4 Purposes of airport storage

Having understood the current profile, the next step is to clarify the purpose of airport storage. A draft "Checklist" of potential purposes grouped by key areas is as follows. It is suggested that users of this guidance material use this checklist to determine which are the key purposes for their specific airport and focus their attention on ensuring their storage is adequate for those purposes. It is very unlikely that every one of the following possible purposes will apply at any single airport.

Demand

- To accommodate current demand
- To accommodate future demand growth
- Ullage for unexpected demand reductions

Supply

- To accommodate normal current supply
- Buffer for supply schedule
- Cover against significant supply interruptions
- To accommodate future supply developments

Stock management

- To allow for day-to-day stock fluctuations
- To allow for seasonal variations in stock
- To provide a facility to re-blend unbatched (untested or uncertified) fuel (if relevant at the airport in question)

- To provide an appropriate level of redundancy in case part of the infrastructure fails.

Quality Control

- To allow for settling time & quality control checks for recertification
- Maintenance requirements (preventive and breakdown)
- To allow for recirculation and filtering of product from any tank

Regulatory Requirements

- Compulsory stocks, if imposed by the State
- Time allowed for Customs requirements

5 Key Measurable Parameters when determining the level of stockholding capacity

The next step is to quantify key measurable parameters for each of the purposes that were identified for the airport in question. It is not necessary to quantify measurable parameters for purposes that are not relevant to the airport in question.

Table 1 below provides an example of a potential purpose and the measurable parameters relevant to it. A more detailed draft "Checklist" of the measurable parameters that are relevant to each of the potential purposes defined in section 3 above is attached at Appendix 1 to this document.

Issue	Potential Purpose	Measurable Parameter (Do not quantify if purpose not relevant at this airport)
1. Demand	1.2 To accommodate future demand growth	1.2.1 Planning horizon and the airports growth potential
		1.2.2 Average day/month demand, peak day/month demand
		1.2.3 Opportunities for incremental expansion of storage capacity
		1.2.4 Confidence in obtaining suitable locations and land for future expansion

Table 1

6 Calculate Optimum Storage

It is recommended that users of this guidance material adopt a two-stage approach to determining the amount of storage quantity that is required in their location.

The first stage is a high-level review. In the event that this indicates that the current storage quantity is approximately correct, it may be appropriate to take no further action. If, however, the high-level review indicates that the current quantity may not be correct, users may wish to invest time, money and effort in conducting an optimisation study, as outlined in section 6.2 below.

6.1 Stage 1 - High-Level Review of Necessary Amount of Storage

To conduct the high-level review, users of this material should identify the most important of the measurable parameters from the answers that they have entered in the "Checklist" at Appendix 1. In this context, the most important parameters will be those that have the largest impact on the amount of storage quantity required. It will be important to select a relatively small number of items – typically two-to-four parameters.

It is recommended that users assess the number of days of useable storage capacity that could be required to accommodate reasonably common levels for each of these parameters. (As an example, if Customs normally take one day to release a fresh batch of fuel, but extend this to two days several times each year and three days once every few years, then it would be reasonable to include two days in the calculation).

It will then be necessary to add up the number of days of storage assessed as being reasonably required for each of the factors under consideration. In assessing the total amount of storage required, it is recommended that users take account of the fact that it is unlikely that the worst case will be encountered on every parameter at the same time. As an example, consider the case just described in which Customs usually take one day and two days have been allowed in the calculation. Suppose further that supply is by ship and on average requires one day's stock be held at the airport, with three days being included in the calculation to allow for extreme weather events that occur a few times a year. Suppose as well that quality control requirements typically take a day, with two days being included in the calculation to allow for occasional batches of off-spec fuel. The sum of the extreme cases for all three parameters would be two days for Customs plus three days for supply plus two days for quality control, making seven days, but users are advised to think about how likely it is that maximum stock would need to be held for all three parameters at the same time. As a "rule of thumb", if there are three or more parameters, the total difference is unlikely to need to be more than 85 % of the sum of each of the individual differences. In this case, the user might therefore be satisfied that, for instance, six-and-a-half days stock would in practice be sufficient. This example is summarised in the table below.

	Parameter	Average Stock Required for this Parameter	Max Stock Required for Worst Reasonably Foreseeable Occurrence for this Parameter	Difference between Average and Maximum
	A	B	C	D
1	Parameter 1	1	2	1
2	Parameter 2	1	3	2
3	Parameter 3	1	2	1
4	Total (Average) [B1+B2+B3]	3		
5	Total (Difference) [D1+D2+D3]			4
6	85% of Total (Difference) [D5x0.85]			3.4
7	Overall Total (B4+D6)			6.4

Table 2

Note: As a "rule of thumb", if there are three or more parameters, the total difference is unlikely to need to be more than 85 % of the sum of each of the individual differences

In the event that users of this guidance material are satisfied that the current storage capacity is sufficiently similar to the indicative level suggested by this calculation, it may be appropriate to take no further action. If, however, the high-level review indicates that the current storage capacity is inadequate, it is recommended that an optimisation study be conducted, as outlined in the section below.

6.2 Stage 2 – Detailed Modelling

In order to determine the optimum amount of storage, it will be necessary to develop an optimisation model. Each airport is different, so it is not possible to provide a generic model. All models will need to concentrate on the defined key purposes for the airport in question and should avoid analysing purposes that are not relevant to that airport. Depending on the complexity of the airport in question, it may be possible to do this as a straightforward spreadsheet or more complex models such as simulation exercises and/or statistical analysis may be required.

The optimum position in any model is likely to be the one that minimises the total cost of:

(a) building and operating tanks and keeping fuel in them; plus
(b) disruption costs caused by any inadequacies in tankage capacity.

More details on modelling are given in the worked examples that are attached.

7 Operational Considerations, Finance & Permissions

Operational, financial considerations & necessary permissions that have been identified are listed below. It is advised that input be obtained from your technical and financial specialists in addressing these issues.

7.1 Operational Considerations

- Determine number of separate tank farms
- Determine location(s) of tanks.
- Determine number of tanks (For continuous operation, need at least 3 tanks. If fuel unbatched, need at least 1 additional tank).
- Determine optimum size of each tank
- Compliance with codes & standards, such as Separation distances, emergency fire water & bund capacity.
- Determine logistics for storage to aircraft transportation
- Determine availability of workforce
- Determine customs requirements
- Determine maintenance requirements

7.2 Finance & Contractual Considerations

- Fuel owner obligation for minimum daily stock
- Quantify costs, including cost of capital
- Determine lowest cost funding options
- Confirm project meets financial criteria
- Ensure project is financially viable taking account of lease length, depreciation period, funding structure etc.
- Confirm funding.
- Compulsory stock obligations

7.3 Permissions

- Land availability
- Planning permission
- Regulatory approval (e.g. Seveso)
- Environmental requirements
- Other Relevant Legislation

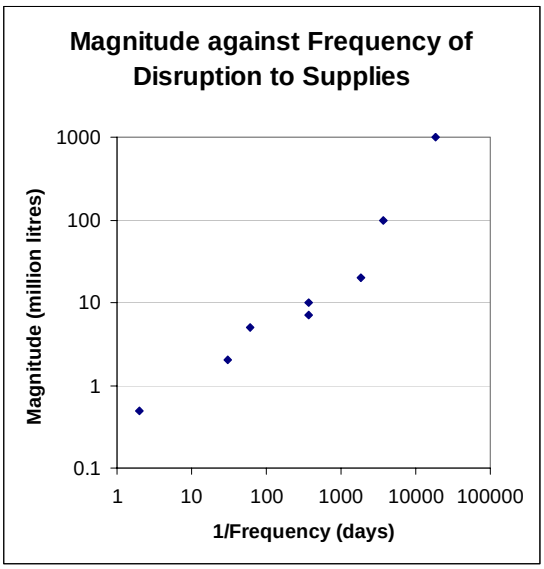
8 Consultations & Transparency

It is clear that airlines have more confidence in the adequacy of fuel infrastructure at their home base airports than at foreign airports. One of the reasons for such a view could be that the airlines are more engaged with the home base fuel infrastructure provider and hence receive more information than from fuel infrastructure providers at other locations.

To improve the situation, IATA strongly recommends that the fuel infrastructure manager conduct regular meetings with airline stakeholders and provide information on supply reliability, demand fluctuations, and storage capacity - current and in the mid-term. Agreement with the airlines is particularly important when plans are being developed for expansion of the facilities.

9 Disruption to Supply and Contingency Planning

It is not feasible to build facilities that would withstand all disruptions. Raising design limits (safety factors and margins) could lower the chance of events above such limits, but construction and operating costs would inevitably increase, often by exponential order. The chart below shows the risk to supply assessed at London Heathrow Airport.



The chart demonstrates that while the probability of a 100 million litre disruption is limited to once every 10 years, a 5 million litre disruption could occur 6 times a year. Similar relations between the magnitude and the probability may apply to any airport worldwide. Risk assessment and cost/benefit trade-off analysis are essential in striking a balance unique to individual airports. Different parameters yield strikingly different solutions.

It is also physically infeasible and economically inefficient to protect airport fuel storage against all conceivable forms of supply disruptions. Hence it is prudent to determine a risk threshold that is reasonable and agreeable to all stakeholders in determining storage capacity and to put in place a fuel contingency plan to mitigate the risk of stock out.

10 Suggested approach and next steps

The suggested approach for anyone seeking to determine the optimum storage for their airport is to:

- Understand the airport's current profile
- Clarify the purposes of storage relevant to that airport
- Quantify the measurable parameters that are applicable to those purposes
- Calculate Optimum Storage
- Review Operational Considerations, Finance & Permissions

Finally communication with all stakeholders during the process and when final results are known is strongly encouraged.

Appendix 1: Draft checklist of the measurable parameters that are relevant to each of the potential purposes defined in section 3

Issue	Potential Purpose	Is potential purpose relevant at this airport?	Measurable Parameter (Do not quantify if purpose not relevant at this airport)	Quantification of Measurable Parameter (Do not quantify if purpose not relevant at this airport)
1. Demand	1.1 To accommodate current demand	Yes / No	1.1.1 Average day / month demand, peak day/month demand	
	1.2 To accommodate future demand growth	Yes / No	1.2.1 Planning horizon and the airports growth potential	
			1.2.2 Average day/month demand, peak day/month demand	
			1.2.3 Opportunities for incremental expansion of storage capacity	
			1.2.4 Confidence in obtaining suitable locations and land for future expansion	
	1.3 Ullage for unexpected demand reductions	Yes / No	1.3.1. Frequency and impact of weather considerations (e.g. hurricanes / typhoons)	
			1.3.2 Frequency & scale of major changes in demand	
2. Supply	2.1 To accommodate normal supply schedule	Yes / No	2.1.1 Standard quantity of a batch by delivery method used (i.e. pipeline batch, ship cargo size, block train, truck size)	
	2.2 Buffer for supply schedule	Yes / No	2.2.1 Understand Supply Infrastructure (including off-airport storage)	
			2.2.2 Understand pipeline schedules	
			2.2.3 Understand size of tankers, railcars, etc	
			2.2.4 Understand off airport storage	
	2.3 Cover against significant supply interruptions	Yes / No	2.3.1 Supply Infrastructure (including off-airport storage)	
			2.3.2 Security of supply (i.e. how many supply routes, highest % of total airport supply from any one route, what % of lost supply can be made up by spare capacity on alternate routes, how long to restore 'lost' supply?)	
			2.3.3 Frequency & scale of major supply interruptions	
			2.3.4 Availability of fuel contingency plan for airport community	
			2.3.5 Scope & impact of contingency plan (known at Heathrow as the "allocation system")	
3. Stock management	3.1 To allow for day-to-day stock fluctuations	Yes / No	3.1.1 Quantify normal variability in supply and demand.	
	3.2 To allow for normal stock fluctuations within a day	Yes / No	3.2.1 Quantify normal variability in stock levels within each day	
	3.3 To allow for normal airport operations	Yes / No	3.3.1 Quantify any individual stock holdings by Suppliers	
			3.3.2 Quantify the need for a strategic reserve, if any	
			3.3.3 Hydrant/non hydrant operation	

Issue	Potential Purpose	Is potential purpose relevant at this airport?	Measurable Parameter (Do not quantify if purpose not relevant at this airport)	Quantification of Measurable Parameter (Do not quantify if purpose not relevant at this airport)
	3.4 To allow for seasonal variations in stock	Yes / No	3.4.1 Quantify normal seasonal variations in supply, demand and stock levels	
	3.5 To provide a facility to re-blend unbatched fuel at the location (if relevant)	Yes / No	3.5.1 Does this location receive unbatched fuel?	
			3.5.2 What quantities of unbatched fuel are received and in what frequencies?	
			3.5.3 What is the expected frequency of needing to re-blend and in what quantities?	
			3.5.4 Need to determine how many additional tanks will be required.	
			3.5.5 Expected frequency and impact of receiving off spec cargos?	
	3.6 To provide a level of duplication in case part of the facility fails	Yes / No	3.6.1 Understand current facility	
			3.6.2 Understand risk of failure of part of the existing facility.	
			3.6.3 Understand security risks.	
4. Quality Control	4.1 To allow for settling time & quality control checks	Yes / No	4.1.1 How many tanks are there currently?	
			4.1.2 Required settling time.	
			4.1.3 Time taken to perform quality control checks.	
			4.1.4 Any limitation on when own staff / lab can perform quality control checks (i.e. is this 24 hours, 7 days a week?)	
			4.1.5 Is fuel receipt continuous?	
	4.2 Maintenance requirements	Yes / No	4.2.1 Types of maintenance performed at airport (e.g. tank cleaning)	
			4.2.2 Frequency & duration of each type of maintenance.	
			4.2.3 Understand legal obligations in this area	
			4.2.4 Impact on storage of each type of maintenance (e.g. 1 tank out of service at a time)	
5. Regulatory Requirements	5.1 Compulsory stocks, if imposed by the State	Yes / No	5.1.1 Understand legal obligations in this area	
			5.1.2 Quantity of stock that the State requires to be held at the airport.	
	5.2 To provide sufficient time to meet Customs requirements	Yes / No	5.2.1Understand legal obligations in this area	

Annex 2

Worked Example – London Heathrow Airport

1. Airport's Current Profile

Heathrow is currently limited to 480,000 ATM's per Annum. At present the airport caters to around 670 flights per day on average.

1.1. **Fuel Demand:** In 2008 the fuel demand is forecast to be 8 billion litres. The bulk of demand comes from medium, long and ultra-long haul flights - in 2007, only 8% of the demand came from short-haul flights. There is relatively little seasonal variation – demand in the busiest and quietest weeks is typically 10% above or below the annual average. Growth is strong and BAA and British Airways demand forecasts show fuel demand doubling by 2030.

1.2. **Supply & Offloading Facilities:** There are three pipeline supply routes into the airport, plus deliveries by train. Heathrow had a facility for receiving deliveries by road from late January 2006 until the end of September 2007 and is aiming to relocate it by the end of 2008.

1.3. **Current Storage:** There are two fuel tank farms at the airport, the Perry Oaks installation which serves terminals 1, 2, 3 and 5 and the Sandringham Road Depot, which serves terminal 4 and the Cargo Area. Following completion of the HAFCO tank farm in 2005, useable storage capacity at Heathrow is currently 56 million litres. This will drop to 52 million litres when two tanks known as the "interim storage tanks" are removed from service. Target midnight stock is 34 million litres.

1.4. **Fuel Distribution:** Fuel is delivered to aircraft at Heathrow via hydrant systems. There is one that serves terminals 1, 2 & 3 (also known as the Central Terminal Area or CTA Hydrant). Another serves Terminal 4 and the Cargo Area. A third system delivers fuel to the Terminal Five stands.

1.5. **Product diversity:** Following the loss of Buncefield in December 2005, supply into Heathrow in the summers of 2006 and 2007 was not adequate to meet unconstrained demand and some of the steps taken to increase supply resulted in Heathrow receiving "unbatched" or "uncertified" fuel. The planning assumption for the Heathrow study, however, was that supply will be adequate to meet demand by the time additional storage is built at Heathrow so no allowance has been made in the calculations for receipt of "unbatched" or "uncertified" fuel.

1.6. **Fuel Contingency Plan:** An airline industry agreed voluntary fuel contingency plan is available. The main objective of the plan is to minimize disruptions to passengers and flights.

2. Purposes of Fuel Storage at LHR

Four main purposes were identified for having fuel storage at Heathrow.

- **Purpose 1**: The first was to **enable appropriate quality control checks to be carried out on the fuel.** Specifically, fuel is received at the airport on a continuous basis, but each time the fuel "parcel" changes (which happens several times per day), the fuel needs to be allowed to settle in a tank for a defined period of time before it can be sampled, tested and released for use. In addition, quality control procedures require fuel to be sampled and tested and retention samples taken at various other times. The result is that

the storage needed to be adequate to allow each tank farm at all times to have at least one tank receiving fuel, one tank containing fuel being settled and one tank available to deliver into the fuel hydrant.

- **Purpose 2**: The second very important reason for having tanks at Heathrow was **to allow for normal fluctuations in stock levels**, both within a day and between one day and the next. In uneventful periods, stocks in 2007 typically fluctuated by 8 million litres within a day and the midnight stock level typically fluctuated by 14 million litres within a month. Heathrow needs to have adequate fuel in its storage tanks and sufficient additional capacity in the tanks to be able to cope with current and future fluctuations of this nature.

- **Purpose 3**: The third purpose of fuel storage at the airport is **to provide a level of buffer stock to be able to deal with operational hiccoughs.** A study conducted for HHOpCo in April 2006 identified the typical spread of different sizes of supply interruptions, ranging from relatively small one (with impacts of around 0.5 million litres each) that typically occur once every couple of days through to massive events such as the loss of Buncefield that can be described as "once in 50 year events". One of the main aims of the Heathrow study was to provide a rational basis for determining the sizes and frequencies of events that it is worth providing for and, by association, the ones for which no provision should be made.

- **Purpose 4**: The final aim of storage at Heathrow was that it should be built at an appropriate rate **to accommodate future demand growth**.

3. Key Measurable Parameters

Potential Purpose	Measurable Parameter (Do not quantify if purpose not relevant at this airport)	Quantification of Measurable Parameter (Do not quantify if purpose not relevant at this airport)
1.1 To accommodate current demand	1.1.1 Average day / month demand, peak day/month demand	Average throughput in 2007 was 20.2 million litres per day. Average throughput over the summer period was 21.2 million litres per day.
1.2 To accommodate future demand growth	1.2.1 Planning horizon and the airports growth potential	Planning horizon is through to year 2030. For growth potential, see item 1.2.2.
	1.2.2 Average day/month demand, peak day/month demand	BAA's jet fuel forecast shows average day demand in 2030 as 40.7 million litres, with a summer peak of 43.3 million litres. British airways have produced an independent forecast of 43.1 million litres per day.
	1.2.3 Opportunities for incremental expansion of existing storage capacity	None.
	1.2.4 Confidence in obtaining suitable locations and land for future expansion	There are significant constraints in land availability at Heathrow.
2.1 To accommodate normal supply schedule	2.1.1 Standard quantity of a batch by delivery method used (i.e. pipeline batch, ship cargo size, block train, truck size)	Supply changes are expected to have taken place by the time that additional tanks are built, but exact details are not known, so the modelling assumptions are that each pipeline supply route will deliver a third of the airport's demand and all routes will deliver batched fuel.
2.2 Buffer for supply schedule	2.2.1 Understand Supply Infrastructure (including off-airport storage)	Heathrow currently receives fuel via three pipeline supply routes, plus trains. It is aiming to be able to receive road deliveries again from the end of 2008.

Potential Purpose	Measurable Parameter (Do not quantify if purpose not relevant at this airport)	Quantification of Measurable Parameter (Do not quantify if purpose not relevant at this airport)
	2.3.3 Frequency & scale of major supply interruptions	"Supply events" included in the modelling were "once every ten year", "once every five year" and two types of "once a year" events, with current impacts of 100 million litres, 20 million litres 10 million litres and 7 million litres respectively. The sizes of each event (but not their frequencies) are assumed to increase in proportion to fuel demand.
	2.3.4 Availability of fuel contingency plan for airport community	An industry agreed voluntary fuel contingency plan is available.
	2.3.5 Scope & impact of contingency plan (known at Heathrow as the "allocation system")	When a "supply event" occurs, the maximum daily stock loss is 1/3 of total supply and the "allocation system" is expected to reduce demand down to match available supply in 14 days
3.1 To allow for day-to-day stock fluctuations	3.1.1 Quantify normal variability in supply and demand.	Supply is normally distributed with a standard deviation that is 0.07 times throughput. Demand is normally distributed with a standard deviation that is 0.19 times throughput.
3.2 To allow for normal stock fluctuations within a day	3.2.1 Quantify normal variability in stock levels within each day	Currently typically 8 million litres.
3.3 To allow for normal airport operations	3.3.3 Hydrant/non hydrant operation	Hydrant operation.
3.4 To allow for seasonal variations in stock	3.4.1 Quantify normal seasonal variations in supply, demand and stock levels	Summer / winter demand are typically 10% above / below the annual average. Stock levels vary on a daily basis rather than seasonally.
3.5 To provide a facility to re-blend unbatched fuel at the location (if relevant)	3.5.1 Does this location receive unbatched fuel?	Planning assumption is that Heathrow will be receiving only batched fuel by the time new tanks are built.
3.6 To provide a level of duplication in case part of the facility fails	3.6.1 Understand current facility	Heathrow has two tank farms and three hydrant systems.
4.1 To allow for settling time & quality control checks	4.1.1 How many tanks are there currently?	Six at Perry Oaks (excluding the Interim Storage tanks). Nine in the Cargo Depot.
4.2 Maintenance Requirements	4.2.2 Frequency & duration of each type of maintenance.	Each tank is visually inspected every year and cleaned every three years.

4. Optimum Storage Calculation

Current requirement for additional useable jet fuel storage

The oil industry typically works to a benchmark of seeking sufficient storage capacity at a pipeline-supplied airport depot to be able to hold approximately three days' demand. The airline industry has confirmed that they were comfortable with a similar benchmark. The Heathrow study team, aware of these benchmarks, but also recognising that there were serious space constraints at Heathrow, decided to conduct its own analysis in order to be confident of the results.

In practice, HAFCO and British Airways each developed separate optimisation models and then compared conclusions.

Each of the models calculated firstly the expected frequencies of small scale disruptions and the resulting expected tankering costs and secondly the frequencies of stock-outs and the disruption costs that would be expected to follow and then compared these numbers against the expected cost of building and operating additional tankage. In general terms, the greater the useable capacity of the tankage at the airport, the lower are the expected costs of stock-outs and operational tankering, but the higher are the costs of building and operating the tanks. The optimum position is the one at which the total expected cost is minimised.

The British Airways model was based on simulation techniques and looked in particular at two variables - the time that the airline community would have to be able to prepare for an impending stock-out and at the ongoing cost of tactical tankering required to deal with small-scale disruptions. In this model, the optimum position is the point at which the expected frequency of stock-outs multiplied by the expected cost of each stock-out (which is itself a function of the amount of time available to the airline community to react to an impending stock-out) plus the expected reduction in tactical tankering costs are equal to the cost of building and maintaining the tanks plus costs of holding additional stock. The BA model took as an input that additional capacity would be added in pairs of tanks, with each tank having a useable capacity of eight million litres.

HAFCO's model used statistical analysis. As with the BA model, this one also assessed the tankering costs that arise from small-scale disruptions. The HAFCO model took as a given that the allocation system would reduce demand down to meet available supply within 14 days and used inputs from two UK-based airlines to estimate the expected cost of a stock-out. It calculated the optimum position as being the one at which the marginal cost of building and operating additional tankage is just equal to expected marginal costs of the stock-outs plus tankering. The HAFCO model calculated the required useable capacity to the nearest million litres.

British Airway's analysis shows that the airport currently needs four additional tanks, each with a useable capacity of 8 million litres (i.e. 32 million litres in total). HAFCO's analysis shows that the current requirement is 28 million litres, rising to 33 million litres by the summer of 2010. (Hence, at an average peak day demand of 24 million litres the total storage required at LHR is 3.5 days.)

Through a similar analysis it has been determined that the future useable storage capacity requirement at LHR is 97 million litres by 2030.

5. Location Analysis

A detailed study was undertaken to determine the locations for the future fuel tanks. As a first step a list of 16 locations were identified based on input from various stakeholders including the airport. The initial long-list was then reduced to a short list using ten selection criteria which included the estimated cost of constructing and operating additional tanks and a consideration of whether aircraft stands would be impacted. The short list was then analysed in more detail with input from specialists in areas such as COMAH, engineering and planning law.

The final conclusion of the study is that a bund and two additional fuel tanks of 13 million litre useable capacity each need to constructed as soon as possible on the current stand 596 to support terminals 1, 2, 3 & 5 and that provision needs to be made in the airport's plans for staged construction through to 2030 of six further tanks of the same size in the same area of the airport, plus three smaller tanks for the proposed third runway and two smaller tanks near the Sandringham Road depot.

6. Consultations & Transparency

HHOpCo and HAFCo the fuel facility provider meets the airlines on a regular basis to discuss matters related to costs, investments, throughput and charges. This particular exercise to determine the current and future storage requirement was carried out by a task group comprised of HHOpCo, HAFCo, BAA, two airline representatives, the AOC and IATA in a totally transparent manner. The details of the study and the outcomes are being shared with the airline community and all other stakeholders. It should be noted, however, that current land constraints at Heathrow mean that there may be challenges in gaining support from airline operational personnel for additional fuel tanks.

Appendix 3

Worked Example in OFC (at Athens International Airport)

Olympic Fuel Company S.A. (OFC) after international tender has been awarded by Athens International Airport (AIA) as the Fuelling Concessionaire, so to design, finance, build and operate the Airport Depot and the Hydrant Refuelling System for 23 years, starting in 2001.

This Guideline is used for the calculation of the OFC optimum storage. For simplification reasons and maximizing the benefits to the Guideline's users, the worked example is based on the following assumptions:

- Commencement of OFC operations: 2001
- Peak month/day: of 2001
- Fuel Supply mode: Pipeline (100%), though during 2001 and early 2004 fuel has been transported to OFC by road tank trucks (bridgers).

Step 1: Understand Airport's Current Profile (see Guideline/Article 3)

1. Demand Forecast

Fuel Volumes at AIA are affected by seasonality (see Figure 1: Average Daily Demand per Month in 2002 and 2007). OFC has to cover this fuel demand. Daily Volume to be used in the storage calculation is determined as 2000 m^3.

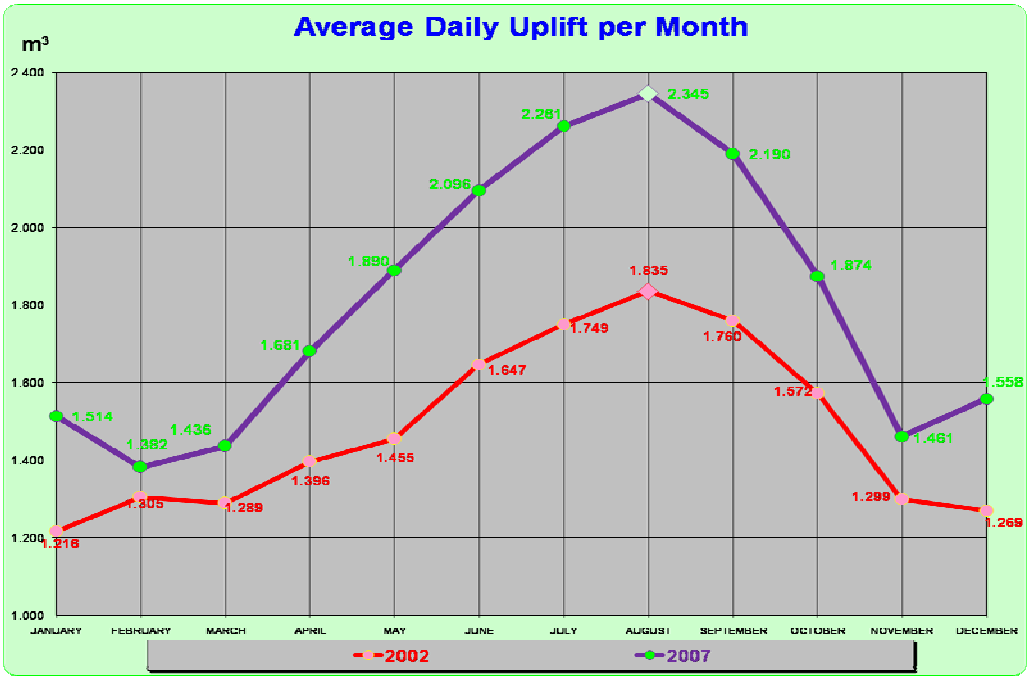


Figure 1: Average Daily Demand per Month in 2002 and 2007

As far as future demand evolution is concerned, this has been determined as 3 % annual increase.

2. Supply Modes

The fuel supply is provided by Jet A-1 dedicated pipeline interconnecting OFC with Hellenic Petroleum Refinery at Aspropyrgos, of a distance of 53km. The Refinery tanks are also dedicated to Jet A-1 and positively segregated from other fuel grades.

3. Operating Hours

Operating hours of AIA: 24 hours/day, 7 day/week. Consequently, OFC's operating hours are the same. Fuel supply can also performed in the same operating framework as above.

Customs and other Related Offices operating hours: Monday to Friday.

4. Fuel Receipt Technical / Operational Data

- Pipeline flow rate is 200m^3/hr with the capability to increase up to 300 m^3/hr.
- OFC inlet filters (FWS) can operate at least at 500 m^3/hr.
- OFC is also equipped with 6 Bridger offloading islands (used before pipeline construction), which are maintained operational, so to be used in case of Pipeline major shut down.

Step 2: Purposes of Airport Storage (see Guideline / Article 4)

a) To accommodate current and future demand (during the concession period).
b) To accommodate current and future supply schedule and interruptions.
c) To allow for day – to – day stock fluctuations.
d) To allow for all required Fuel Quality Controls (JIG, etc).
e) To allow for Maintenance (preventive and breakdown).
f) To satisfy Customs requirement to check/register the fuel quantities received before these quantities are released for aircraft refuelling.

Step 3: Identification of Key Measurable Parameters in Determining the Storage Capacity (See Guideline / Article 5)

Based on the above, the Key Measurable Parameters for OFC are the following:

1. Operational Stock to accommodate peak with daily demand: 3 days.
2. Emergency Stock to accommodate Pipeline interruption, without the need to activate bridger (truck) offloading: 3 days. This is the minimum number of days that are required either for the Pipeline for small repair works as for switching to bridger supply mode.
3. In addition to fuel quality control, there are also Customs related requirements. The receipt quantity is checked by Customs, to assure that volume departed from the Refinery tanks was received at OFC tanks. So, each pipeline transportation is checked by Customs. Since weekends are involved, then 2 days are envisioned.

Step 4: Checklist of the measurable parameters.

Potential Purpose	Measurable Parameter (Do not quantify if purpose not relevant at this airport)	Quantification of Measurable Parameter (Do not quantify if purpose not relevant at this airport)
1.1 To accommodate current demand	1.1.1 Average day / month demand, peak day/month demand	Average throughput in 2001 was 2000 m3 per day
		Average throughput over the summer season (July - August) was 2350 m3 (30% higher).
1.2 To accommodate future demand growth	1.2.1 Planning horizon and the airports growth potential	Till 2021 (end of concession)
	1.2.2 Average day/month demand, peak day/month demand	About 4000m3 per peak day 124000 m3 per peak month in 2021
	1.2.3 Opportunities for incremental expansion of storage capacity	Yes
	1.2.4 Confidence in obtaining suitable locations and land for future expansion	Available land for 4 additional tanks
1.3 Ullage for unexpected demand reductions	1.3.1. Frequency and impact of weather considerations (e.g. hurricanes / typhoons)	No
	1.3.2 Frequency & scale of major changes in demand	N/A
2.1 To accommodate normal supply schedule	2.1.1 Standard quantity of a batch by delivery method used (i.e. pipeline batch, ship cargo size, block train, truck size)	Pipelines receipts between 5000 to 9000 m3 per parcel
2.2 Buffer for supply schedule	2.2.1 Understand Supply Infrastructure (including off-airport storage)	1. Jet A-1 dedicated Pipeline.
		2. Possibility for trucks
	2.2.2 Understand pipeline schedules	Twice a week
	2.2.3 Understand size of tankers, railcars, etc	N/A
	2.2.4 Understand off airport storage	Two Refinery Jet A-1 dedicated Tanks -total capacity 17000 m3
2.3 Cover against significant supply interruptions	2.3.1 Supply Infrastructure (including off-airport storage)	Jet A-1 dedicated pipeline, Jet A-1 dedicated tanks at Refinery, alternative supply with bridger (truck)
	2.3.2 Security of supply	If Pipeline is interrupted, then trucks can be utilised within 3 days
	2.3.3 Frequency & scale of major supply interruptions	None up to now
	2.3.4 Availability of fuel contingency plan for airport community	No
3.1 To allow for day-to-day stock fluctuations	3.1.1 Quantify normal variability in supply and demand.	Current typical demand on peak season is 2500m3 on Fridays, Saturdays and Mondays. Supply is 4800m3 per day by pipeline.
3.2 To allow for normal stock fluctuations within a day	3.2.1 Quantify normal variability in stock levels within each day	600 m3
3.3 To allow for normal airport operations	3.3.1 Quantify any individual stock holdings by Suppliers	N/A
	3.3.2 Quantify the need for a strategic reserve, if any	N/A
	3.3.3 Hydrant/non hydrant operation	Hydrant operation

Potential Purpose	Measurable Parameter (Do not quantify if purpose not relevant at this airport)	Quantification of Measurable Parameter (Do not quantify if purpose not relevant at this airport)
3.4 To allow for seasonal variations in stock	3.4.1 Quantify normal seasonal variations in supply, demand and stock levels	July and August demand is typically 25-30% above the annual average
3.6 To provide a level of duplication in case part of the facility fails	3.6.1 Understand current facility	OFC has one tank farm and one hydrant system.
4.1 To allow for settling time & quality control checks	4.1.1 How many tanks are there currently?	4 tanks
	4.1.2 Required settling time.	2hours minimum
	4.1.3 Time taken to perform quality control checks.	1 hour
	4.1.4 Any limitation on when own staff / lab can perform quality control checks (i.e. is this 24 hours, 7 days a week?)	No
	4.1.5 Is fuel receipt continuous?	No
4.2 Maintenance requirements	4.2.1 Types of maintenance performed at airport	Tank cleaning (one tank at a time)
	4.2.2 Frequency & duration of each type of maintenance.	Each tank visually inspected annually. Cleaned every 3 years
	4.2.4 Impact on storage of each type of maintenance (e.g. 1 tank out of service at a time)	None. Still 3 Tanks in Operation
5.1 Compulsory stocks, if imposed by the State	5.1.1 Understand legal obligations in this area	N/A
	5.1.2 Quantity of stock that the State requires to be held at the AP	N/A
5.2 To provide sufficient time to meet Customs requirements	5.2.1Understand legal obligations in this area	2 business days for Customs clearance.

Step 5: Tabulation of OFC Worked Example

All the aforementioned calculations are input in the table below, in which size and number of tanks are shown. Additionally, Pipeline requirements are linked to fuel demand evolution. It is worthy to note that, based on worked example assumptions on volume future evolution, number of tanks are shown to require increase during the concession period, while the Pipeline flow rate has also to be increased.

OFC Case Study
for Optimum Tankage Sizing
And Pipeline Operational Requirements

Estimated Storage Capacity (3% Annual Increase)											Pipeline operational Requirements Per Week			
Year	Max daily demand	Emergency Stock (1)		Operational Stock		Required Stock	Pipeline Receipt		Total Quantity	Required Tanks (3)	Quantity (4)	Pumping Flowrate	Operating Hours	Operating Days (5)
	m^3	*Numbers of Days*	m^3	*Numbers of Days*	m^3	m^3	*Numbers of Days (2)*	m^3	m^3	*No*	m^3	m^3/*hour*	*hours*	*days*
2001	2.000	3	6.000	3	6.000	12.000	2	4.000	16.000	4	14.000	200	70	2,9
2002	2.060	3	6.180	3	6.180	12.360	2	4.120	16.480	4	14.420	200	72	3,0
2003	2.122	3	6.365	3	6.365	12.731	2	4.244	16.974	4	14.853	200	74	3,1
2004	2.185	3	6.556	3	6.556	13.113	2	4.371	17.484	4	15.298	200	76	3,2
2005	2.251	3	6.753	3	6.753	13.506	2	4.502	18.008	4	15.757	200	79	3,3
2006	2.319	3	6.956	3	6.956	13.911	2	4.637	18.548	4	16.230	200	81	3,4
2007	2.388	3	7.164	3	7.164	14.329	2	4.776	19.105	4	16.717	200	84	3,5
2008	2.460	3	7.379	3	7.379	14.758	2	4.919	19.678	4	17.218	200	86	3,6
2009	2.534	3	7.601	3	7.601	15.201	2	5.067	20.268	4	17.735	200	89	3,7
2010	2.610	3	7.829	3	7.829	15.657	2	5.219	20.876	5	18.267	200	91	3,8
2011	2.688	3	8.063	3	8.063	16.127	2	5.376	21.503	5	18.815	200	94	3,9
2012	2.768	3	8.305	3	8.305	16.611	2	5.537	22.148	5	19.379	200	97	4,0
2013	2.852	3	8.555	3	8.555	17.109	2	5.703	22.812	5	19.961	300	67	2,8
2014	2.937	3	8.811	3	8.811	17.622	2	5.874	23.497	5	20.559	300	69	2,9
2015	3.025	3	9.076	3	9.076	18.151	2	6.050	24.201	5	21.176	300	71	2,9
2016	3.116	3	9.348	3	9.348	18.696	2	6.232	24.927	5	21.812	300	73	3,0
2017	3.209	3	9.628	3	9.628	19.256	2	6.419	25.675	5	22.466	300	75	3,1
2018	3.306	3	9.917	3	9.917	19.834	2	6.611	26.446	6	23.140	300	77	3,2
2019	3.405	3	10.215	3	10.215	20.429	2	6.810	27.239	6	23.834	300	79	3,3
2020	3.507	3	10.521	3	10.521	21.042	2	7.014	28.056	6	24.549	300	82	3,4
2021	3.612	3	10.837	3	10.837	21.673	2	7.224	28.898	6	25.286	300	84	3,5

(1) Minimum 3 days to switch from Pipeline to trucks in case Pipeline is interrupted

(2) Max days for Customs Clearance

(3) Of 6000 m^3 each

(4) To be transferred every week

(5) Max allowed 5 days. 2 days for maintenance requirements

Note: Tank Volume

Total = 6000 m^3

Unpumpable (1,1) m = 600 m^3

Ullage = 200 m^3

So, Working Volume = 5200 m^3

Appendix 4

Worked Example – Hong Kong International Airport

1. Airport's Current Profile

The Hong Kong International Airport (HKIA) currently caters for 295,600 aircraft movements per annum, which translates into around 400 departing flights per day on average.

Fuel Demand: The bulk of the 2007 demand came from long and ultra-long haul flights. There is some variation in demand with the busiest day being Friday and busiest months being October and November due to flying out of Christmas cargo. Growth is continuing to be strong. In 2009 the fuel demand at HKIA is forecast to be about 7 million m^3.

Appropriate Quality Control Checks: All of the fuel is imported into Hong Kong with most coming from Singapore and other Asian countries. It is off loaded at Tsing Yi (in Hong Kong) for settlement, quality control and re-certification, then barged to Sha Chau aviation fuel receiving facility (AFRF), located 6 kilometres north of the HKIA. The remaining fuel coming from the refineries in China is directly barged to the AFRF. After quality testing at the AFRF, the fuel is pumped to the tank farm at the airport by subsea pipelines.

Reserve Requirements: The Hong Kong Government requires an aviation fuel reserve of 11 days of the projected demand to be maintained at HKIA.

Current Storage: There were 9 tanks (6 x 22,500 m^3 and 3 x 11,000 m^3). With an addition of 3 tanks of 17,000 m^3 in 2007, there are now 12 tanks.

Sustainable Capacity: The sustainable capacity of Sha Chau is about 16,800 m^3 per day. With the addition of a small receiving facility on the airport in 2006, the total sustainable capacity has been increased to 19,800 m^3 per day.

Fuel Distribution: Fuel is delivered to aircraft at HKIA via hydrant system and dispensers.

PAFF: It was anticipated that a Permanent Aviation Fuel Facility (PAFF) would be in place from day one of new HKIA opening but this was not possible at that time due to site selection issues, so a temporary AFRF at Sha Chau was built. PAFF is now anticipated to be in operation by end-2009.

Fuel Contingency Plan: An industry agreed fuel contingency plan is in place. The main objective of the plan is to minimize disruptions to passengers and flights.

2. Purposes of Fuel Storage at HKIA

Three main purposes were identified for having fuel storage at HKIA.

Purpose 1: The first purpose of fuel storage at the airport is **to provide an appropriate level of reserve.** Because Hong Kong does not have refineries nor direct feed by pipelines, it is dependent on fuel from overseas. The marine operations could be affected by weather condition and may cause supply interruption.

Purpose 2: The second purpose for having tanks at HKIA is **to allow for normal fluctuations in stock levels**, within the day, week and months. In uneventful periods, demand in 2007 typically fluctuated by almost 2,000 m^3 per day within a week. The average demand in October and November 2007 was around 17,500 to 18,000 m^3 per day respectively compared to the low

months of January and February 2007 when the average was around 16,000 to 16,300 m^3 per day respectively. HKIA needs to have adequate fuel in its storage tanks and sufficient additional capacity to be able to cope with current and future fluctuations of this nature.

Purpose 3: The final aim of storage at HKIA was that it should be built at an appropriate rate **to accommodate future demand growth** considering that the PAFF would be operational by end-2009. The average annual growth rate is about 6% for the last 7 years, and 8% over the last 3 years.

3. Key Measurable Parameters

Potential Purpose	Measurable Parameter (Do not quantify if purpose not relevant at this airport)	Quantification of Measurable Parameter (Do not quantify if purpose not relevant at this airport)
1.1 To accommodate current demand	1.1.1 Average day/month demand, peak day/month demand	Average throughput in 2007 was 16,800 m^3 per day. Average throughput over the autumn period was 5-6% higher.
1.2 To accommodate future demand growth	1.2.1 Planning horizon and the airports growth potential	Planning horizon is through to year 2047 including provision of PAFF.
	1.2.2 Average day/month demand, peak day/month demand	About 35,000 m^3 per day in 2030.
	1.2.3 Opportunities for incremental expansion of existing storage capacity	None required as the PAFF outside of the airport would cater for the future demand.
2.1 Buffer for supply schedule	2.1.1 Frequency & scale of major supply interruptions	In the last 50 years, there have been some cases of 2 successive tropical cyclones each of which could incur a supply outage of 3 days, (i.e. in which Tropical Cyclone Signal no.3 (T3) or above is hoisted), with a period of five clear days between one T3 down and the next T3 up. Reserve equivalent of 11 days uplift demand caters for that. Besides, ocean tankers will need to take shelter when a tropical cyclone is nearby.
	2.1.2 Availability of fuel contingency plan for airport community	An industry agreed voluntary fuel contingency plan is in place.
3.1 To allow for day-to-day stock fluctuations	3.1.1 Quantify normal variability in demand.	Current typical demand is 18,400 m^3 on Fridays compared to 16,500 m^3 on Tuesdays. Supply may vary from 12,500 m^3 per day to 25,000 m^3 per day depending on shipment schedule. Thus stock can vary as much as 14,400 m^3 per day.
3.2 To allow for normal stock fluctuations within a day	3.2.1 Quantify normal variability in stock levels within each day	See above
3.3 To allow for normal airport operations	3.3.3 Hydrant/non hydrant operation	Hydrant operation.
3.4 To allow for seasonal variations in stock	3.4.1 Quantify normal seasonal variations in supply, demand and stock levels	October and November demand is typically 5-6% above the annual average.
3.5 To provide a facility to re-blend unbatched fuel at the location (if relevant)	3.5.1 Does this location receive unbatched fuel?	Only batched fuel
3.6 To provide a level of duplication in case part of the facility fails	3.6.1 Understand current facility	HKIA has one tank farm and one hydrant system. The 11 days reserve requirement and equipment redundancy cover any unusual events.
4.1 To allow for settling time & quality control checks	4.1.1 How many tanks are there currently?	12 tanks
4.2 Maintenance Requirements	4.2.2 Frequency & duration of each type of maintenance.	Each tank is visually inspected every day, externally surveyed every year, cleaned every three years, and internally surveyed every 10 years.

4. Storage Capacity

The storage capacity of the aviation fuel at HKIA is determined by the inherent ability within the delivery system to replenish stock at a reasonable rate, following draw down during outages (when deliveries by vessels cannot take place, for example during the passage of tropical cyclones but the aircraft continue to uplift fuel for departures).

The unique situation applicable to HKIA aviation fuel system is based on:

(a) There is no oil refinery in Hong Kong.
(b) HKIA is not directly fed by aviation fuel pipelines, thus being dependent on aviation fuel from overseas, all of which is brought by ocean tankers and majority discharged at oil companies' depots at Tsing Yi, settled and re-certified before being barged to the AFRF at Sha Chau.
(c) There are two 6,000 dwt berths at the AFRF at Sha Chau due to limitations of water depth. This was supplemented in 2006 by a very small receiving facility at the airport to a total capacity of about 19,800 m^3 per day.
(d) Hong Kong is prone to tropical cyclones from end-April to early-November. In the last 50 years, there have been some cases of 2 successive tropical cyclones each incurring a supply outage of 3 days, (i.e. in which Tropical Cyclone Signal no.3 (T3) or above is hoisted), with a period of five clear days between one T3 down and the next T3 up. Barging operation will cease when T3 or above is hoisted.

The Hong Kong Government decided during the planning stage of the new airport in June 1993 that the aviation fuel reserve to be maintained at HKIA should be equivalent of 11 days projected demand.

With the Hong Kong Government decision and the open access arrangement at HKIA, it was decided to have 6 tanks of 22,500 m^3 and 3 tanks of 11,000 m^3 capacity, giving a total operational capacity of 168,000 m^3, in order to meet the large and small quantities of aviation fuel to be brought by over 10 suppliers,

As an average of 3 days of uplift demand is needed for operation, it is obligatory on each supplier to maintain 8 days minimum reserve at HKIA.

In 2005, the fuel suppliers, the operator, the airlines (even though they bear the additional cost of the new tanks) and the Airport Authority agreed on the need for the 3 additional tanks at the airport. Accordingly, 3 tanks of 17,000 m^3 each have been built and put into operation, giving a total capacity of about 219,000 m^3.

The attached Table gives the summary of just-in-time additions of infrastructure built at HKIA, based on the demand and supply.

From end-2009, the PAFF will come into operation. The PAFF would be able to accommodate up to 80,000 dwt tankers from overseas, thus the distribution terminal at Tsing Yi would not be needed. The PAFF would have 8 tanks with a total of 264,000 m^3 capacity and ultimately 12 tanks with a total of 388,000 m^3 capacity. HKIA will be fed directly by pipelines from the PAFF.

Table

Year	2003	2004	2005	2006	2007	2008	2009
Operational capacity of on-airport tanks (m^3)	168,000	168,000	168,000	168,000	168,000	219,000	219,000
Replenishment rate per sustainable capacity (m^3 per day)	16,800	16,800	16,800	16,800	19,800	19,800	19,800
Daily uplift demand (m^3)	10,809	13,405	14,778	15,682	16,824	18,000**	18,900**
Original reserve level (days)	11	11	11	10.7	10.0	11	11
Level of fuel stock after the passage of the 1st tropical cyclone (days)	8	8	8	7.7	7.0	8	8
No. of days required to replenish the tanks to 11 days reserve level	5.4	11.8	21.9	42.1	17.0	30.0	63.0
Level of fuel stock after the passage of the 2nd tropical cyclone which is 5 days apart (days)	7.8	6.3	5.7	5.1	4.9	5.5	5.2
No. of days required to replenish the tanks to 11 days reserve level	5.8	18.7	38.9	79.1	28.9	55.0	121.0

**Forecast figures

IATA welcomes your comments and feedback on this publication at:

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Annexure 20

Indian Oil Corporation Limited
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Bandra (E), Mumbai – 400 051
Tele : 26438085 / Fax : 2644 7760

Marketing Division

Ref : AV/GKM/03A

Date : 08.12.2022

To,
The Business Head- Jet Fuel
Adani Airports.

Dear Sir,

This is in reference to positioning of Aviation Fuel at the recently commissioned Open Access Airports at Lucknow and Ahmedabad.

As deliberated in the past, we again like to draw your attention to the current fuel storage facility available at these two airports (under Open Access) and our expectation for same in days to come.

It has been communicated that at Lucknow and Ahmedabad Open Access, OMCs can only store Jet Fuel equivalent to 2.5 and 3.5 days of sale. Notwithstanding the fact that Open Access has just recently been commenced by respective airport SPV of M/S Adani, we would like to state that such low level of storage allocated to us is an impediment for smooth operation and our Supply and Distribution network remains under pressure to ensure availability of product at these two Airports.

It is always desirable to have adequate storage at Open Access Fuel Farm, for following reasons: -

- Planned shutdown in refineries and pipelines
- Any unplanned interruption in backend Jet Fuel network of OMCs.
- Sudden VVIP/VIP movement at airports, or surge of traffic for some reason.
- Any other exigency, external or internal emergency.
- Open Access Fuel Farm being the single source of Fuel at these two airports, availability of adequate quantity of fuel is desirable.

As a standard practice, each OMC should be able to maintain a minimum of 5 days of coverage at any given point at the Open Access Facility. However, to have smooth operations at Open Access, we request M/s Adani Airports to ensure that storage equivalent to 8-10 days of sale should be given to each OMC.
We sincerely hope that you will take cognizance of the above and urgent steps would be taken to upgrade fuel storage at Adani Airports, as mentioned above.

Looking forward to your early response.

Yours sincerely

(J Sarkar)
GM (Aviation)

Annexure 21

AIRPORT COOPERATIVE RESEARCH PROGRAM

ACRP REPORT 120

Airport Capital Improvements: A Business Planning and Decision-Making Approach

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TRANSPORTATION RESEARCH BOARD

WASHINGTON, D.C.
2014
www.TRB.org

AIRPORT COOPERATIVE RESEARCH PROGRAM

Airports are vital national resources. They serve a key role in transportation of people and goods and in regional, national, and international commerce. They are where the nation's aviation system connects with other modes of transportation and where federal responsibility for managing and regulating air traffic operations intersects with the role of state and local governments that own and operate most airports. Research is necessary to solve common operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the airport industry. The Airport Cooperative Research Program (ACRP) serves as one of the principal means by which the airport industry can develop innovative near-term solutions to meet demands placed on it.

The need for ACRP was identified in *TRB Special Report 272: Airport Research Needs: Cooperative Solutions* in 2003, based on a study sponsored by the Federal Aviation Administration (FAA). The ACRP carries out applied research on problems that are shared by airport operating agencies and are not being adequately addressed by existing federal research programs. It is modeled after the successful National Cooperative Highway Research Program and Transit Cooperative Research Program. The ACRP undertakes research and other technical activities in a variety of airport subject areas, including design, construction, maintenance, operations, safety, security, policy, planning, human resources, and administration. The ACRP provides a forum where airport operators can cooperatively address common operational problems.

The ACRP was authorized in December 2003 as part of the Vision 100-Century of Aviation Reauthorization Act. The primary participants in the ACRP are (1) an independent governing board, the ACRP Oversight Committee (AOC), appointed by the Secretary of the U.S. Department of Transportation with representation from airport operating agencies, other stakeholders, and relevant industry organizations such as the Airports Council International-North America (ACI-NA), the American Association of Airport Executives (AAAE), the National Association of State Aviation Officials (NASAO), Airlines for America (A4A), and the Airport Consultants Council (ACC) as vital links to the airport community; (2) the TRB as program manager and secretariat for the governing board; and (3) the FAA as program sponsor. In October 2005, the FAA executed a contract with the National Academies formally initiating the program.

The ACRP benefits from the cooperation and participation of airport professionals, air carriers, shippers, state and local government officials, equipment and service suppliers, other airport users, and research organizations. Each of these participants has different interests and responsibilities, and each is an integral part of this cooperative research effort.

Research problem statements for the ACRP are solicited periodically but may be submitted to the TRB by anyone at any time. It is the responsibility of the AOC to formulate the research program by identifying the highest priority projects and defining funding levels and expected products.

Once selected, each ACRP project is assigned to an expert panel, appointed by the TRB. Panels include experienced practitioners and research specialists; heavy emphasis is placed on including airport professionals, the intended users of the research products. The panels prepare project statements (requests for proposals), select contractors, and provide technical guidance and counsel throughout the life of the project. The process for developing research problem statements and selecting research agencies has been used by TRB in managing cooperative research programs since 1962. As in other TRB activities, ACRP project panels serve voluntarily without compensation.

Primary emphasis is placed on disseminating ACRP results to the intended end-users of the research: airport operating agencies, service providers, and suppliers. The ACRP produces a series of research reports for use by airport operators, local agencies, the FAA, and other interested parties, and industry associations may arrange for workshops, training aids, field visits, and other activities to ensure that results are implemented by airport-industry practitioners.

ACRP REPORT 120

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The members of the technical panel selected to monitor this project and to review this report were chosen for their special competencies and with regard for appropriate balance. The report was reviewed by the technical panel and accepted for publication according to procedures established and overseen by the Transportation Research Board and approved by the Governing Board of the National Research Council.

The opinions and conclusions expressed or implied in this report are those of the researchers who performed the research and are not necessarily those of the Transportation Research Board, the National Research Council, or the program sponsors.

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FOREWORD

By Lawrence D. Goldstein
Staff Officer
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ACRP Report 120: Airport Capital Improvements: A Business Planning and Decision-Making Approach provides a guidebook to cost estimating for airport capital planning, supported by a spreadsheet-based cost-estimating model. The guidebook and the accompanying model are designed to help airport operators, aviation/transportation agencies, and other industry stakeholders understand cost-estimating practices, including risks and sources of uncertainty.

Annual airport capital investment needs have recently diminished somewhat but are still expected to average approximately $14 billion annually over the next several years (ACI North America: *Airport Capital Development Needs 2013–2017*). Working to meet this need, individual airports, state and local agencies, and the Federal Aviation Administration are all dependent on individual case-by-case engineering cost studies and the bid process when estimating, planning, and budgeting for airport capital improvement projects. The engineering, planning, and finance staffs at airports do not always have access to necessary and sufficient information to prepare accurate capital cost estimates. In particular, many smaller airports often do not have staff to perform these functions and must, as a result, rely on external consulting expertise.

An additional problem in preparing cost estimates is a lack of consistency, standardization, and accuracy across the airport industry. This often precludes comparisons of project cost estimates that, by necessity, must take into account variations in regional costs, state and local conditions, or varying levels of technical expertise. The result is a high risk of inaccurate cost estimates, which can cause project cancellations and inefficient distribution of capital funds at the state level. Further, unique conditions at any given airport make simple comparison with similar projects at other airports often difficult if not problematic. Experience indicates that increased availability of relevant data can facilitate the capital budgeting process and improve overall project cost estimating, project planning, and implementation, while resulting in a more efficient and effective approach to developing an airport capital improvement program.

ACRP Report 120 provides a model and database for estimating the cost of construction projects regularly proposed in an airport's capital improvement plan. The particular approach presented as an outcome of this effort applies parametric cost estimating, using historical cost data to determine cost-estimating relationships (CERs). The CERs are mathematical functions that link construction cost to independent variables that represent key cost drivers. The CERs were developed using multivariable regression analysis conducted on a database of historical cost data collected for this study.

The model supports construction projects representing both the horizontal domain (i.e., projects that are not buildings and are primarily related to the airfield) and the vertical

domain (i.e., buildings). The resulting analytical approach incorporates a spreadsheet-based cost model, with application to a total of eight project types. The model allows the user to enter airport information, project definitions, and cost drivers to generate a cost estimate. Cost estimates are also adjusted for inflation and geographical variations in construction cost at the state level. The cost model was assessed using statistical metrics of quality of fit, and validated using a case-study approach. Limited availability of historical cost data in a usable form presents the greatest challenge to implementing parametric cost estimating for airport construction projects and puts constraints on the robustness of the model. Building on the research, this guidebook includes recommendations for data collection practices intended to help overcome these constraints to support a more comprehensive and robust model in the future.

CONTENTS

Note: Photographs, figures, and tables in this report may have been converted from color to grayscale for printing. The electronic version of the report (posted on the web at www.trb.org) retains the color versions.

SUMMARY

Airport Capital Improvements: A Business Planning and Decision-Making Approach

This guidebook presents a cost-estimating approach that can be used to quickly and efficiently develop cost estimates for airport construction projects during the capital planning phase. The goal is to provide a model that produces consistent, standardized, and accurate cost estimates, employing a user interface that requires minimal training and cost-estimating experience. The guidebook describes the basic principles of cost estimating and the specific methodology applied—parametric cost estimating. This methodology uses multivariable regression analysis to derive mathematical relationships between construction cost and independent variables that describe key cost drivers.

This project includes an accompanying cost-estimating tool developed in Microsoft® Excel™. This tool can be used by airports to implement the proposed approach. It supports the preparation of cost estimates for eight different types of airport construction projects. Use of the tool requires no formal training in cost estimating and requires no software other than Microsoft Excel.

Background

The objective of this project was to develop and test an analytical approach to prepare cost estimates for airport construction projects, both in the horizontal and vertical domains. The proposed cost-estimating model is primarily intended for the capital planning phase, when uncertainty is high. At the same time, capital planning requires accurate cost estimates in order to optimize the use of scarce airport funding resources. This highlights the need for a standardized, consistent, and easy-to-use cost model, especially for smaller airports without extensive engineering resources.

Approach

The proposed approach was to use a parametric cost-estimating technique in which costs are correlated with observed data from historical construction projects. In this approach, multivariable regression analysis was used to model cost through mathematical functions known as cost-estimating relationships (CERs). The CERs model cost as a function of key cost drivers represented by candidate independent variables (CIVs). The variables are considered candidates because they are selected using subject matter expert input and are then tested for statistical validity and reasonableness.

The output of the model is a cost estimate for a single project or a portfolio of projects, with both a point estimate and a low-high range that takes into account the uncertainties and risks associated with cost estimating. The costs are adjusted for inflation and incorporate regional

2 Airport Capital Improvements: A Business Planning and Decision-Making Approach

variations in construction costs. The inputs to the model that are necessary to prepare a cost estimate are values for the cost drivers represented by the CIVs for the project type in question. The CIVs are the independent variables in the CERs, which represent the analytical component of the model. Additional data required to be entered by the user include the geographic location of the project and the proposed year of construction.

Cost-Estimating Tool

The historical cost data collected during the course of this study was filtered, analyzed, and implemented in a database. The cost database was used in the statistical analysis that resulted in the CERs that form the backbone of the cost model. A cost-estimating tool titled ACCE—the Airport Capital Cost Estimation tool—was implemented in Microsoft Excel. The tool incorporates CERs for eight different types of common airport construction projects. Six of these are in the horizontal domain and two in the vertical domain.

ACCE is provided as companion software to this guidebook. A quick reference guide is reproduced in Appendix B. The ACCE user interface is designed to guide the user through the necessary steps to develop a cost estimate. In the input step, the user enters contact information, airport information, and project-specific data. ACCE displays a running cost estimate, which is updated as the project's inputs are changed. When the inputs are finalized, the user can switch to the reporting module. The report generator allows for the preparation of a cost-estimating report which documents the input data and presents a low, high, and best cost estimate. Additional features allow for exporting and printing the results, as well as the ability to prepare what-if analyses by altering one or more project inputs.

ACCE can be used by airports of any size to prepare cost estimates for the construction project types supported by the tool. Note, however, that due to limitations encountered during the data collection phase, ACCE should be viewed as a proof-of-concept tool used primarily to develop initial cost estimates for planning purposes. Actual construction costs may differ substantially from the estimates provided by the model. The estimates produced by the software should not be used as the sole means to evaluate the cost of a proposed airport construction project.

Findings

The data collection resulted in the development of CERs for eight airport construction types. The CERs were validated both using statistical metrics describing quality of fit, as well as a case study validation analysis. The user interface provides a simple but effective mechanism for members of the airport community to interact with the cost model. While the model validation shows that the performance of the cost model varies, this is to be expected given the relative small size of the underlying database.

Although the project objective of producing a cost database and model based on parametric cost estimating has been met, the resulting model is limited in its scope and robustness. This guidebook includes recommendations for future work, focusing on addressing the limited availability of historical construction data in a usable electronic format. The recommendations provide guidance on future data collection efforts, including specific suggestions for the type of data to be collected.

CHAPTER 1

Introduction

Objective

As part of its capital planning and master planning activities, airports are required to prepare cost estimates for proposed construction projects. These are presented and distributed to a number of stakeholders, including governing boards, state and regional transportation agencies, and the regional offices of the Federal Aviation Administration (FAA). The cost estimates can be developed by the airports' own staff, with varying levels of expertise and experience, by external consultants, or by planners and engineers at other agencies. These estimates are typically developed prior to any significant feasibility, investigative or preliminary design work being performed. The resulting accuracy of the estimates is therefore mixed and as the projects move into the execution phase, the initial cost estimates are often far removed from the actual construction costs. In turn, inaccurate cost estimates can lead to outright project cancellations or inefficient distribution of limited airport capital funds.

The importance of managing construction cost estimating and the risks associated with inaccurate estimates are reflected in the financial markets' evaluations of airports. For example, one national credit rating specifically takes into account "risk and complexity of [an airport's] capital programs," including "level of construction risk in capital projects" (Krummenacker et al. 2011, p. 13). The main risk is identified as construction cost escalation caused by delay, with specific risk factors listed as follows:

- Scope changes between design and completion
- Outdated or inaccurate cost estimates
- Project complexity
- Material or labor cost escalations
- Poor bidding procedures
- Contractor management/oversight issues
- Environmental concerns
- Community concerns

Another source of uncertainty is the presence of geographical (i.e., regional) variations in construction costs. These can be substantial and are caused by a number of factors, including labor supply, raw material costs, access to transportation, energy costs, and regulatory standards, with an emphasis on environmental regulations. A cost-estimating model must be able to take regional variations into account, both during the development and calibration of the model and during the cost-estimating phase.

The existence of a standardized cost-estimating model should allow airports to mitigate some of these risks. At the same time, it must be recognized that a number of these risks cannot be addressed even by the most exhaustive cost-estimating model. For example, an otherwise

4 Airport Capital Improvements: A Business Planning and Decision-Making Approach

accurate cost estimate could be rendered ineffective by unusually demanding environmental regulations, fluctuations in market conditions, or inadequate construction management.

Only 139 of the 3,355 airports identified in the National Plan of Integrated Airport Systems (NPIAS) are classified as hub airports (FAA 2012). In other words, over 95% of airport sponsors represent non-hub commercial and general aviation airports, which tend to have no engineering staff on board. Consequently, most airports do not have any in-house cost-estimating experience or expertise. Even hub airports often rely on engineering consultants to provide cost-estimating and bidding services. Lack of access to cost-estimating expertise is another reason why there is a perceived need for a software-based cost model.

Investment decisions for large acquisitions within the FAA Air Traffic Organization require a benefit-cost analysis (BCA), in which a standardized cost estimate is compared against monetized benefits. This is not the case for the majority of airport capital projects and, consequently, the approach for developing airport capital cost estimates can vary considerably. The lack of a standard methodology and the limited cost-estimating resources available to airports result in substantial challenges. One challenge arises from substantial variation between the cost estimates obtained in the capital planning phase and the actual costs reported in the bidding phase or after the close-out of the construction projects. Airports also suffer because the resulting variations tend to be biased toward underestimating the overall cost. The potential result is that anticipated projects must be scaled back, delayed, or cancelled.

Cost estimates for airport capital improvement plans (ACIPs) are often first prepared during the development of the airport master plan, airport layout plan, or in support of the capital planning process of the relevant state aviation agency or the FAA. Often, the design data available at the time the first cost estimate is developed is limited to a conceptual layout, the approximate size, the location on the airport, and little else. The time frame for construction of the facility being estimated can vary from a few months to 20 years or more. At this point in the process, a rough order of magnitude estimate is the best that can be expected, due to the limited data available.

Airport projects are often complex: "Airport projects have a whole series of special systems which are seen nowhere else, on an enormous scale" (Merkel and Cho 2003). It is clear that two separate but related problems must be addressed: (1) improving the accuracy of the cost estimate as calculated from current and relevant cost data and (2) improving the specificity of the project scope and unique conditions which must be entered into the model by the user. The problems are linked: The accuracy of the result is completely dependent upon the specificity of the scope. The dual challenges of providing sufficient accuracy and specific scoping vary in their characteristics, depending on the type of project. Some project types have greater potential for significant deviations, and therefore more potential for improvement.

Before discussing cost estimating in more detail, it is necessary to clarify what the terms "horizontal" and "vertical" mean in the construction industry and how they relate to airport projects. Horizontal construction refers to projects that involve work on a road, bridge, traffic signal, water or sewer main, or any other improvement to land that is not a building (Massachusetts Certified Public Purchasing Official Program 2001, p. 2). Applied to airports, roads and bridges are substituted with runways and taxiways, traffic signals are substituted with airfield lighting, and so on. Examples of horizontal airport construction include runways, taxiways, aircraft aprons, security fences, and airfield lighting. Conversely, vertical construction is defined as work on a building. Examples of vertical construction on airports include terminal buildings, hangars, and facilities for storing airport equipment, such as snow removal equipment (SRE) and aircraft rescue and fire fighting (ARFF) vehicles.

The objective of this research project was to develop an interactive construction cost-estimating model and associated database for airport capital projects, along with a guidebook documenting

best practices for cost estimating and guidance on using the cost model and database. The model should cover common airport construction projects, both in the horizontal and vertical domains. It should make use of existing databases and take into account regional cost factors and inflation. Finally, it should be flexible in its use, for example, by allowing for database updates and the ability to generate reports in Excel, PDF, and other formats.

How to Use this Guidebook

This guidebook is designed to provide a practical approach for developing cost estimates for airport construction projects. The guidebook contains the following:

- Information and background material on cost estimating intended to expand the reader's knowledge base. The guidebook describes best practices for cost estimating, as well as specific material on the parametric cost-estimating approach. This material will also aid the reader who wants to understand the methodology used by the cost-estimating tool.
- A primer and quick reference guide to ACCE—the Airport Capital Cost Estimation tool. ACCE represents the implementation of the cost model and database developed as part of this project. The ACCE cost model is implemented as a self-contained Microsoft Excel application that accompanies this guidebook.
- Recommendations for future work, with a focus on overcoming limitations on data availability that constrain the effectiveness and robustness of the cost model as currently implemented.

The material in this guidebook is organized to provide a logical path leading up to the use of ACCE to support cost estimating for airport construction projects. This guidebook is organized as follows:

- Chapter 1 provides an overview of the guidebook, objectives, information for the reader, and background material.
- Chapter 2 covers the fundamentals of cost estimating, as applied to the airport domain. This chapter identifies best practices, as well as specific challenges to cost estimating in the horizontal and vertical domains, respectively.
- Chapter 3 provides detailed information on parametric cost estimating: the cost-estimating methodology that was adapted for this project. The chapter provides guidance on the selection of CIVs, the development of CERs, and testing and validating the resulting cost model.
- Chapter 4 describes the development of the historical cost database, including a description of the database structure, approaches to collecting data, as well as challenges and limitations.
- Chapter 5 is a guide to ACCE, the Microsoft Excel-based application developed to implement the cost model and database for this project. It describes how to define a project, what data needs to be entered by the user, how the tool should be used, and the meaning of the data contained in the output—the cost-estimating report. Particular attention is spent on how to interpret the results and identifying the limitations of the cost model.
- Chapter 6 summarizes lessons learned, drawing both on internal findings from the research project and results from the validation of the cost model. Recommendations for future work are also included in this chapter.

Reference material has been placed in appendices to the main guidebook. Appendix A contains detailed information on the CERs for each of the project types supported in the cost model. Appendix B contains the ACCE Quick Reference, which is a concise user guide to the cost model.

Note that a full understanding of the material in this guidebook is not necessary for the purpose of using ACCE. The information provided is intended to explain the selected cost-estimating methodology and how it is implemented in ACCE. It provides background material to help the user understand the inner workings of the model. This, in turn, should help the user better

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understand and explain the resulting cost estimates. For readers who are interested in quickly getting started with ACCE, the following sections are recommended:

- Chapter 5: ACCE—Airport Capital Cost Estimation Tool
- Appendix B: ACCE Quick Reference Guide

Who Can Use this Guidebook?

This guidebook can be used by all airports who are considering construction projects within their ACIP. While ACCE itself supports a specific subset of project types, the best practices presented in the guidebook apply more broadly.

When developing cost estimates, it will be useful to have participation and input from a broad range of functional areas at the airport. The areas of responsibilities that should be represented include the following:

- **Management:** Executive leadership, policy, overall compliance with airport mission.
- **Operations:** Operational and certification requirements, efficiency, safety.
- **Maintenance:** Maintainability and sustainment of infrastructure.
- **Emergency Response/Law Enforcement:** Operational and certification requirements, safety, security.
- **Planning:** Capital improvement planning, funding, land use compatibility.
- **Finance:** Finance, funding, airport use agreements.
- **Environmental:** Impacts on noise, wetlands, air quality, water quality, wildlife, other environmental areas of concern.

At larger airports, these functional areas may be represented by separate individuals or departments. Conversely, at a general aviation airport, the airport manager may be solely responsible for all of the listed functions.

The guidebook and accompanying cost model can also be used by decision makers and planners at regional, state, and federal agencies with oversight over airport funding. For example, state aviation planners can use the tool to validate cost estimates submitted by airports in their requests for state and federal funding.

The decision support tool requires certain hardware and software to be available. These include a computer running Microsoft Excel (version 2007 or later).

Related ACRP Projects

This study is one of several projects conducted within the Airport Cooperative Research Program (ACRP) intended to support airports in planning for and funding capital projects. While this particular study focuses on cost estimating, it is valuable for airports to be familiar with the broader literature on finance, BCA, and innovative methods related to capital planning. This emerging body of research includes the following ACRP projects:

- ***ACRP Report 21: A Guidebook for Selecting Airport Capital Project Delivery Methods.*** This ACRP report provides guidance on three different types of project delivery methods for airport projects: design-bid-build (DBB), design-build (DB), and construction manager at risk (CMR). The report provides a two-tiered decision support approach for selecting an appropriate method. The report describes the advantages, disadvantages, and cost efficiencies of each of the three methods. The two-tiered project delivery selection framework can be used by airport owners and operators to evaluate the pros and cons of each delivery method and

select the most appropriate method for their project. Tier 1 consists of an analytical delivery decision approach designed to help the user understand the attributes of each project delivery method. The goal is to decide whether the delivery method is appropriate for the airport's specific circumstances. Tier 2 uses a weighted-matrix delivery decision approach that allows airports to prioritize their objectives and, based on the prioritized objectives, select the delivery method that is best suited for their project. This report is useful for evaluating the effects that each delivery method has on the construction cost estimation process.

- ***ACRP Report 49: Collaborative Airport Capital Planning Handbook.*** This handbook provides guidance to those in the airport community who have responsibility for, and a stake in, developing, financing, managing, and overseeing the ACIP and the individual projects included in it. This guidance is useful to help to prioritize the projects in the ACIP, which influences the selection of project types to be modeled. It also creates a framework for using the ACCE tool in a collaborative fashion that results in constructive communication between internal and external stakeholders.

  The findings of *ACRP Report 49* were used in this project to refine the list of candidate projects for inclusion in the cost model. Two key principles were applied: (1) to focus on projects with high potential for reducing the uncertainty in cost estimating and (2) to focus on projects with potential for a high return-on-investment for the airport sponsor.
- ***ACRP Synthesis of Airport Practice 1: Innovative Finance and Alternative Sources of Revenue for Airports.*** This synthesis study discusses alternative financing options and revenue sources for funding capital projects. The report discusses existing and potential funding sources, newly developed revenue sources, and a review of privatization options. A solid understanding of funding availability is important, since there is a strong relationship between funding sources and the feasibility of including a project in the ACIP. The report may also help airports implement projects for which cost estimates have been developed using the ACCE tool.
- ***ACRP Synthesis of Airport Practice 13: Effective Practices for Preparing Airport Improvement Program Benefit-Cost Analysis.*** This synthesis study describes successful assessment techniques that can be used by airports in performing BCAs to quantify benefits for projects needing more than $5 million in Airport Improvement Program (AIP) discretionary funding. The synthesis includes a literature review, a review of BCAs submitted to the FAA for AIP funding, and an evaluation and summary of successful practices. While the focus is on the assessment of benefits, a framework for categorizing costs is presented. This study also provides a conceptual framework for how to use cost estimates to formally prioritize investments under consideration.

CHAPTER 2

Best Practices for Estimating Construction Costs

This chapter provides general guidance on cost estimating for airport construction projects. It discusses basic terminology, best practices, and challenges.

Basic Principles of Cost Estimating

Cost estimating is a dynamic process, encompassing interdependencies and integration with system engineering, benefit analysis, requirements, risks, schedule, and implementation planning. Lifecycle cost estimates include the total costs to acquire, implement, operate, maintain, technology refresh, and dispose of the proposed acquisition. The elements of such cost estimates include costs for both capital expenditures and recurring expenses for operations and maintenance. However, when developing construction cost estimates for an ACIP, only the initial capital expense is usually considered. This is because one main purpose of the ACIP is to align construction needs with the availability of capital funding. Many, if not most, of the sources for airport capital funds, including the federal Passenger Facility Charge (PFC) program and AIP, only provide funds for the initial planning, design, permitting, and construction, and not for recurring maintenance costs.

When a proposed investment consists of the procurement of commercial off-the-shelf (COTS) products, a cost estimate is relatively easy to obtain. This is because the cost can simply be determined by using the purchase price or a quote provided by one or more potential vendors. However, for anything other than a straightforward COTS procurement, cost estimating becomes much more complex. In the airport domain, construction usually requires significant planning, design, and engineering activities. Frequently, airport construction projects require facility needs analysis, site surveys, geotechnical investigation, environmental analysis, and permitting. Construction is usually preceded by site preparation activities, which can be extensive. Each of these cost elements can be complex enough to require substantial engineering and analysis. These cost estimates of construction and acquisition costs developed for ACIP are typically provided by the airport's engineer (in-house or through a consultant appointment).

More in-depth information and best practices are also available in existing reference material, for example, the U.S. Government Accountability Office's *Cost Estimating and Assessment Guide* (GAO 2009). FAA's guidance on BCAs for airport projects also covers cost-estimating principles (FAA 1999).

Benefit-Cost Analysis

The BCA is the broadest type of cost-estimating document and is used to justify specific capital planning decisions. The BCA is used to evaluate the lifecycle economic value of proposed

public investments. It works by comparing streams of economic benefits over time with streams of costs, and then expresses the difference in terms of a number of metrics. These metrics include the discounted net present value (NPV), benefit-cost (B/C) ratio, internal rate of return (IRR), and payback period. The BCA provides a straightforward and consistent way to compare, rank, and select among competing alternatives that may differ in timing and/or scale. The key issues addressed by a BCA for a proposed investment decision include the following:

- Whether the economic benefits of a proposed project justify its economic costs
- Which alternative should be selected
- What the priorities and schedules should be for the selected projects

A BCA is required for projects funded through AIP grants of at least $10 million, when paid for using discretionary funds or letters-of-intent. In practice, this means BCAs are not required for most AIP-funded projects. BCAs are also not required for projects paid through other funding mechanisms, such as bonds or PFC funding. Guidance for conducting BCAs for airport projects is provided by the FAA (1999) and in *ACRP Synthesis of Airport Practice 13: Effective Practices for Preparing Airport Improvement Program Benefit-Cost Analysis* (Landau & Weisbrod 2009).

Cost-Estimating Analyses

Cost-estimating analyses cover all other types of studies focused strictly on the development of cost estimates. There are four commonly used methodologies to develop cost estimates (American Association of State Highway and Transportation Officials 2009):

1. **Parametric estimates.** Parametric estimates are developed by applying CERs that relate an independent non-cost variable such as runway length to a dependent cost variable such as amount of site work required. CERs are developed by quantifying hypothetical relationships between independent and dependent variables based on engineering experience, developing a database of actual historic variables, and performing statistical analyses of the relationship between the independent and dependent variables.
2. **Estimating using historical bid prices.** This method uses data from recently awarded contracts as a basis for the unit prices on the project being estimated. Data from previously awarded projects is typically stored in a database for three to five years to provide historical data to the estimator. The more data that is available and the more effectively it is organized by project types, size, and locations, the better the estimate that can be produced. Unit prices are adjusted for specific project conditions in comparison to previous projects awarded. Adjustments are generally made based on the project location, size of the project, project risks, quantities, general market conditions, and other factors.
3. **Cost-based estimating.** Cost-based estimating is a method that relies on estimating the cost of each component to complete the work and then adding a reasonable amount for the contractor's overhead and profit. A cost-based estimating approach can take into account the unique characteristics of a project, geographical influences, market factors, and the volatility of material prices. Since contractors generally utilize a cost-based estimating approach to prepare bids, this method can provide more accurate and defendable costs to support the decision for contract award. Properly prepared cost-based estimates require significantly more in terms of effort, time, and skill to prepare than historical bid based estimating. For this reason, cost-based estimates are often prepared only for those items that comprise the largest dollar value of the project. In order to successfully implement cost-based estimating, the estimators must have expertise in construction methodologies including required equipment, manpower, material, and scheduling. Additionally, the nature of cost-based estimating requires that a significant degree of information regarding the project scope, size, materials, and systems has been developed. Therefore this method is usually implemented only after the design of the project has begun.

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4. **Risk/contingency analysis.** In addition to developing the most likely, or so-called "point," estimate, this method also addresses project risks and uncertainties. Using statistical techniques such as Monte Carlo analysis, risk analysis accounts for uncertainty surrounding the point estimate. The total risk-adjusted cost estimate for the project is derived by statistically adding the risk-adjusted costs for each of the contingent subelements that make up the project.

Parametric cost estimating was the approach used to develop the cost model presented in this guidebook. This methodology is described in detail in Chapter 3.

Summary of Best Practices

The science of cost estimating is relatively mature and there is a large body of knowledge documenting approaches and best practices. A summary of the most relevant best practices is presented below, organized by key reference works.

American Association of State Highway and Transportation Officials, *A Practical Guide to Estimating*

The American Association of State Highway and Transportation Officials (AASHTO) Technical Committee on Cost Estimating documents practical guidance on preparing final estimates, including recommended procedures and guidance on reviewing bids prior to award (AASHTO 2009). The guide draws on the expertise of AASHTO members and the agencies they represent to document the best practices in use by state agencies. This guide provides practical guidance on preparing final estimates. Of particular interest to this project is the discussion on the differences between cost estimation utilizing historical bid pricing and cost-based estimating. The guide contains an analysis and discussion of the importance of proper bid tabulation methods, as well as critical factors that affect cost estimating.

Government Accountability Office, *GAO Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, GAO-09-3SP

The U.S. Government Accountability Office (GAO) has released a guide designed to help federal, state, and local government agencies develop more reliable cost estimates for government projects of all sizes. While the focus of the report is on federal acquisition projects, it contains extensive guidance on how to produce well-documented, comprehensive, accurate, and credible estimates. The report constitutes an exhaustive primer on the art and science of cost estimating, identifying the processes, key stakeholders, and best practices. Also included in this report is a large number of case studies. One of the case studies is from the field of aviation, but it is related to an FAA air traffic management system, not airport construction. Additionally, the report incorporates a thorough discussion of the identification and application of data sources, but does not identify any specific data sources applicable to airport construction projects. Generally, the report does not identify specific cost-estimating models or software packages.

American Society of Professional Estimators, *Standard Estimating Practice*, 8th Edition

The American Society for Professional Estimators is one of two industry organizations identified by the U.S. Bureau of Labor Statistics as providing industry certification for professional cost estimating. This manual is a standard "how-to" guide for use by professional estimators

in the construction industry. It is updated on a regular basis to take into account new data and revised guidance.

Airports Today: Existing Cost-Estimating Practices

As part of the research process that resulted in this guidebook, a broad literature review and stakeholder survey were conducted. One of the objectives of this effort was to identify existing practices in the airport community for estimating costs for construction projects in both the horizontal and vertical domains. Existing practices use proven methodologies that draw on procedures and guidance published by a number of entities, particularly professional organizations and state agencies. Cost estimating for vertical projects has an added layer of structure through the use of standard classification schemes, such as those provided by the Construction Specifications Institute (CSI 2011).

The two primary methods used today are estimation through historical bid prices and cost-based estimating. The parametric estimation methodology, which is common for large-scale programs in the FAA Air Traffic Organization, has generally not been applied to airport construction projects. Risk/contingency analyses are applied but often in a simplified manner. Examples include the application of contingency factors to line item quantities or the total cost estimate. Approximately half of survey respondents reported using cost-estimating contingency factors. However, there appear to be few, if any, standards for using such contingency factors. The survey results indicate that these range from 0% (no contingency factor) to 25%, or even 50% for certain project types (e.g., airport security projects). Since overall contingency factors can be applied on top of contingencies for line item quantities, the cumulative contingency can be substantial. The lack of established standards in this area results in potentially large variations.

Existing methods appear limited in their ability to accurately account for unique project conditions. These can significantly affect the estimate and can result in wide variations from initial cost assumptions to actual costs incurred on a particular project. Environmental planning and cost of mobilization are examples of areas that have specifically been identified as difficult to quantify.

The cost-estimating procedures are backed up by cost data drawn from a number of data sources. The two most common data sources are past bid tabulations and commercially available products. The practice of storing past bid tabulations is common. The literature survey and industry stakeholder survey did not reveal any particular weaknesses in the application of these data sources. Moreover, a number of agencies maintain their own cost data and eight survey recipients indicated a willingness to share this type of information for this research project. Nonetheless, for the purpose of developing a comprehensive cost model, three specific challenges present themselves in regards to the availability of cost data:

- Many of the most commonly used data sources are proprietary and cannot readily be distributed as part of a publicly accessible model.
- Data maintained by public agencies is distributed across a range of state and regional agencies.
- There is no standard format for data and in many cases the data is stored in formats that are notionally electronic but essentially represent digital versions of printed documents.

Use of computer models for cost estimating does not appear to be a common practice for airport construction. It is less clear whether this is due to the cost of commercially available models, the lack of suitable models, or the challenges in airport construction cost estimating not being easily solved through computer modeling techniques. It does, however, indicate potential for

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the development of an airport-specific model, provided the challenges identified are carefully considered and appropriate solutions identified.

A major finding of the survey was that at small airports, construction cost estimating is primarily accomplished through consultants. The most commonly estimated airport construction projects include terminals, runways, taxiways, and airfield lighting. While the majority of respondents store historical construction cost estimates, they are mostly stored in hard copy format. When electronic formats are used, a range of formats exist—there is no accepted file standard. Only a minority of survey respondents reported that they use online data to develop construction cost estimates.

Challenges

All airports within the NPIAS maintain an ACIP including both vertical and horizontal projects. At smaller, general aviation airports, the needs tend to be well known, but the amount of funds available for airport improvements is often very limited. The typical general aviation airport often has much less AIP entitlement funds available than that which would be required to fund the multiyear list of capital projects in its ACIP. One unintended consequence is a potential pressure to keep cost estimates low. As an example, in order to keep a project viable and within funding limits, a low estimate may be used for capital planning, with the assumption that project scope can subsequently be cut in order to match available funds. This can create disconnects in the process for planning the use of limited funding and can result in the outright cancellations of projects.

Since capital planning is usually conducted at a regional or state level, weaknesses in the cost-estimating process can end up shifting or distorting priorities across an entire airport system. Although more detailed cost estimating would mitigate this risk, time and budget limitations typically prevent high-fidelity cost estimates in this phase of the cost-estimating process. One risk is that airports default to working with cost estimates that are based on little to no technical research and choose to direct their time and money toward needs that are perceived as more imminent and pressing. A parametric cost-estimating model, once established, can be utilized at low cost, taking relatively little time and effort to use. A benefit of this approach is that it has the potential for reducing some of the existing flaws in the cost-estimating process for capital planning.

The stakeholder outreach effort conducted as part of this project confirmed a general lack of formal cost-estimating procedures. For example, only 17.4% of respondents reported accessing online cost data for generating construction cost estimates and only 26.5% reported storing historical construction cost estimations. This suggests that many airports use educated guesses to establish initial cost estimates, with varying levels of credibility. Moreover, once an initial cost estimate is prepared, it can be hard to adjust the resulting number if it has been shared with funding agencies or provided as public information.

The results of these challenges are not always predictable and can lead to either overestimation or underestimation. The former can be just as problematic as the latter. In the case of overestimation, potential bidders can be influenced by publicly available budget levels that are not supported by sound cost-estimating practices. This can ultimately influence project costs, regardless of the level of refinement after the completion of the initial cost estimate.

To understand how to improve this process through the use of the cost model prepared for this study, a discussion of issues related to current cost-estimating practices is provided below. The discussion is categorized by horizontal and vertical project types, but it should be noted that many projects integrate both domains. Moreover, in many cases the basic procedures and lessons learned are similar and apply to both types of construction project.

Cost Estimating for Horizontal Projects

Current practices for the cost estimating of horizontal airport construction projects are primarily taken from two of the categories identified previously: historical bid pricing and cost-based estimating. For a typical horizontal airport construction project, there are basic items that define the scope of work (SOW). The FAA provides a series of Advisory Circulars that define these items in their most basic form, utilizing an alphanumeric coding system. Some typical items and their codes are shown in Table 1. With these basic items established, an engineer can begin to identify planning-level components that will compose an estimate by extracting design data from preliminary planning or preliminary engineering design documents.

In some cases the only data available is an aerial-view planning document, which will provide proposed limits of improvements. In this case, there is a high probability of developing an inaccurate cost estimate. Conversely, in some cases, there is an abundant amount of data available such as aerial topographic survey, planning-level project layout data (taxiway alignment, aircraft apron size and geometry, width and length of runway extension, etc.), environmental data, and basic soils investigation data. In this case, a higher level of accuracy is likely.

The process of extracting design data from planning or engineering documents is referred to as "quantity takeoff" (QTO). The engineer is figuratively taking off key pieces of data from the design plans to create a list of pay items and a SOW. This process is typically conducted utilizing computer-aided design software and the three-dimensional models that are created during engineering design. The quantity data is then input into a spreadsheet, which begins the next step, assigning unit prices to the various item quantities.

At this point, a cost estimate can be developed using one of the two methods referenced earlier, historical bid pricing or cost-based estimating. The most common method in use for developing estimates for transportation projects is to use historical bid costs (AASHTO 2009, p. 31). As described previously, this is a process by which estimators collect cost data from previous, similar projects and apply unit prices based on averaging the results. Adjustments are made where necessary for factors such as the following:

- Topographic survey
- Soil investigations
- Wetland delineation
- Wildlife assessment
- Historic preservation
- Archaeological findings

It is incumbent on the designer to make allowances for various contingencies for each of these types of data collection until such a time that this data becomes available. This early cost-estimating process is sometimes problematic for owners as it often yields total project costs that appear to be unaffordable. However, if the engineer and owner can properly communicate the design and planning assumptions to funding agencies, there is a much better chance of the cost-estimating

Table 1. FAA codes for horizontal airport construction.

Code	Designation/General Item Description
P	Pavements
D	Drainage
F	Fencing
L	Lighting
T	Topsoil/Seeding
M	Miscellaneous

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Table 2. Typical engineering design milestones for horizontal construction.

Estimating Milestones	Level of Design Involved
Planning Level	Basic geometry and project scope. Typically, no engineering alignments have been assigned. Right-of-way and data collection are not included.
30% Design	Basic horizontal geometry. Right-of-way and property acquisition process is being started.
60% Design	Refined horizontal geometry and initial vertical geometry. Initial site grading being started. Initial drainage and other major utility designs are being started. Right-of-way and property acquisition process is ongoing.
90% Design	Final draft of horizontal and vertical geometry. Final grading is ongoing. Remaining utility designs are started. Electrical lighting, signage, and marking design are ongoing. Initial quantity takeoff estimate is started.
100% Design	Geometry and grading is completed. Utility design is completed. Grading cross sections are generated. Right-of-way and property acquisition process is complete. Electrical lighting, signage, and marking design complete. Final quantity takeoff estimate is complete. Typical design details are finalized.
Bid Documents	Incorporate final owner and agency comments. Engineer assigns pay items and cross references all items of work on plans with specifications and proposal documents.

process being successful at later stages. If this communication is not well executed, the project is often cancelled prematurely.

Beyond planning-level cost estimating, other stages of cost estimating typically occur at various milestones, based on overall project progress. Table 2 lists typical engineering design milestones and the levels of design associated with each one. Note that these milestones should be viewed as examples. The definitions of these milestones can vary from project to project or state to state.

The challenge for owners and funding agencies is that budgetary decisions for ACIPs are made at the planning-level stage. This is the stage when the least amount of data is available. This puts pressure on owners and engineers to make worst-case scenario assumptions, which are designed to provide a high level of contingency within the estimate. It is at this point in the process where a project requires justified costs with adequate proof, as well as an explanation of the assumptions, in order to support reasonable outcomes as the project continues through the design process.

Cost Estimating for Vertical Projects

Existing construction cost-estimating practices for vertical airport construction projects can be understood by considering the following aspects:

- Types of project costs
- Method of organizing and allocating hard costs
- Method of assigning hard costs in relation to the stage of the project's completion
- Sources of hard cost and soft cost data
- Special conditions relevant to airport projects

These aspects are described in further detail in the following paragraphs.

The total costs to the sponsor of a vertical construction project are typically separated into two types: hard costs and soft costs. Hard costs represent those expenses related to the actual

construction of the building that are paid by the sponsor directly to a contractor or construction manager: material, labor, and fees (including overhead and profit). These hard costs typically represent 70% to 90% of the total cost of a vertical construction project. Soft costs include all other expenses necessary for the completion of the project that are not paid to the contractor or construction manager. These costs vary significantly depending on the unique characteristics for each project but generally include design fees for the architecture/engineering firm; costs of furniture and special equipment; fees incurred through local permitting agencies, utilities, and inspections; land acquisition costs; expenses incurred as part of a public procurement process; and administration costs incurred by the sponsor to oversee and administer the project in accordance with public requirements. Both types of costs must be considered when establishing a total budget for the project.

A key factor in accurate cost estimating is a standardized method of organizing and allocating costs. The construction industry has adopted a generally accepted format for cost estimating of vertical construction projects that is common across applications and used for both publicly and privately funded projects. CSI develops and maintains an organizational system that allocates all construction work into one of multiple categories (CSI 2011). Although some minor variations exist, the majority of architects utilize the CSI system of categorization when developing plans and specifications.

Under this standardized format, every major item of work is allocated to a particular category (termed "division of work"), which corresponds to a particular trade contractor. For example, all carpentry work on a project is categorized and defined under Division 6, electrical work under Division 16, etc. For larger projects, each division is further broken down into subcategories (termed "sections of work"). Using the example of carpentry (Division 6), rough carpentry is further categorized under Section 6100, finish carpentry as Section 6200, etc. By defining individual items of work using a standardized and detailed organizational format, a clear and standardized method of communication between the architect and the contractor is utilized in order to construct the project in accordance with the sponsor's expectations.

Originally developed to organize and standardize the definition of the work within the architect's construction documents, this same format has proven to be effective in organizing and standardizing the cost-estimating process. By utilizing the same categorization system, a more direct correlation between item of work and cost of work is achieved in a format easily understood by all parties. Other benefits of the system include the following:

- CSI categorization can be performed at any stage of the project design—from the earliest concept drawings through detailed design to construction—and as a post-construction audit.
- The system is easily expandable for more complex projects, or conversely can be collapsed to address smaller or simpler projects.
- Direct correlation of cost item to work item reduces misunderstandings and oversights of portions of the project by the estimator.
- Standardization allows for comparison to other past and current projects, and facilitates the creation and maintenance of a project cost information database.

However, there are limitations to the CSI allocation system that must be addressed. The CSI system does not provide a method to estimate soft costs. Also, the CSI system does not account for special circumstances that could affect the overall hard cost for the project, including escalation, phasing of the project, temporary work, special local conditions (i.e., a remote island location that would place a premium on transportation of materials and labor), and reasonable contingencies to account for the level of completion of the project documents.

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These additional cost factors are applied according to the experience and knowledge of the estimator.

Current industry practices include performing cost estimates of vertical construction projects at various stages of development during design. As for horizontal projects, estimates are typically performed during initial planning and at the 30% design, 60% design, and 100% design levels. The later estimates benefit from the greater level of detailed design and thus are usually more accurate. However, as described previously, project budgets are usually established during the very early stages of design and, sometimes, prior to any design work being completed. In these instances, arriving at a reasonable project budget is challenging.

It is typically advisable not to establish a project budget prior to any design or feasibility planning work being performed. However, this practice is not uncommon and is usually done with limited involvement from a design or construction estimating professional. Oftentimes the cost of a similar project constructed some years in the past and at a different location is used for budgeting. Because every project has varying conditions which affect cost and because of volatility in material and labor prices over time, this method is unreliable in establishing a reasonable project budget.

Where some initial design work or feasibility planning has been performed, a "square foot cost" method is often utilized to establish the project budget. At this stage, usually between the initial project planning and the 30% design stage, the project location, overall size of the building in square feet, and functions that the building will accommodate have been established. With this information, an overall cost per square foot is selected based on a database of projects that are in the same geographic region, accommodate the same functions, and incurred project conditions similar to those expected.

Cost databases are maintained by a number of organizations within the construction industry, the most well known and possibly most often utilized is *RSMeans Square Foot Costs Book*, which is updated annually (Reed Construction Cost, Inc. 2011). The accuracy of this method is dependent on the relevance of the precedent projects, the accuracy of the cost database, and the judgment of the estimator, especially in regards to the unique conditions of the project being estimated that differentiate it from the precedent projects.

For projects that have developed the design to the 60% level, most of the major risk factors to project cost, such as existing site conditions and local permitting hurdles, have been vetted through research and field investigations. There is also enough information contained in the documents to utilize the CSI method for allocating cost items, and material and labor unit costs can be established. As the documents are not complete, estimators apply a contingency factor to their estimate to account for the level of detail still under development. The proper contingency factor is established based upon the judgment of the estimator.

For estimates developed at the 90% or 100% levels, industry practice is to perform QTOs for each type of material used on the project, as defined in the construction documents. Unit costs for labor and material are then applied to each work item. The amount of detail provided at the 90% and 100% level, combined with the considerably short time frame between this estimate and the start of construction, usually result in a relatively low variance between the estimated cost and the actual construction bids received.

Hard cost databases are maintained by individual cost-estimating firms and through commercial providers of construction cost data. These databases are constantly updated and are used to create plausible estimates for each type of material and labor that may be used for a particular project. They are also adjusted according to geographic region. The databases do not provide guidance or methods as to cost adjustments necessary for unique project characteristics,

including those characteristics that are unique to airport projects. Soft cost databases are not prevalent in the industry. Instead, estimates of soft costs are usually developed by the sponsor, with the assistance of an architect or engineer.

Certain airport projects have unique characteristics that over time have resulted in variations on standard cost-estimating methods. In some cases, these alternative methods have proven to be effective. Examples include the following:

- **Parking garages:** At the planning through 30% design level, the industry has developed a metric of unit cost per space as an effective method for preliminary estimating for these structures. Databases are informally maintained by consulting firms specializing in this form of structure. The relative simplicity of the building type allows this metric to be reasonably accurate even at the early stages of planning and design. Key factors include the type of structural system, architectural treatment, and lobby amenities.
- **Terminal buildings:** At the planning through 30% design level, the standard unit cost per square foot method is applied. However, the unit cost varies for individual areas of the terminal, since some areas represent significantly higher cost per square foot than others. For example, public lobby space is significantly more expensive than office and support space. Also, baggage handling and security space costs must take into account the high costs of specialized equipment.

Airport projects also pose a number of special project conditions for which a standard and reliable method of establishing cost impacts is currently not prevalent in the industry. These conditions include:

- **Permitting:** Local permit requirements and processes vary considerably. Additionally, construction at public-use airports oftentimes utilizes federal funding sources. In these cases, federal requirements, which are in addition to state and local requirements, must be followed in relation to environmental permitting. As construction cannot proceed until all permits are completed, an extended federal permitting process can result in extended project schedules. These procedures also require public hearings and notification that can result in additional time spent and soft costs incurred responding to public input.
- **Operational continuity:** Many airport projects are renovations or expansions or involve some impact to ongoing airport operations. As airports must remain fully operational during construction, additional costs are often incurred related to phasing, temporary construction, and protection of passengers and employees during construction.
- **Security:** All airport property is designated as being either "airside" or "landside." Airside refers to areas of the airport for which special security access is required. These areas generally correspond to the Security Identification Display Area (SIDA). All personnel working in these areas must be pre-screened by the airport, obtain special training, and receive a SIDA identification badge before being allowed access. This process is both costly and time consuming, and results in increased costs to the contractor. In addition to the screening and badging of the labor force, many airports require any material deliveries to be searched prior to accessing the airside work area. Some projects, especially terminal building renovations, involve construction on both sides of the SIDA access barrier as part of the same project. Here, costs are incurred to relocate and maintain temporary SIDA barrier locations in order to allow for the work to proceed without affecting the flow of passengers and ongoing airport operations. The high level of technology used in establishing these barriers makes relocation quite expensive.
- **Federal safety requirements:** In addition to the security measures outlined previously, an airside project triggers additional safety requirements in accordance with FAA and Transportation Security Administration (TSA) regulations.

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- **Soft costs:** Many airport projects are renovations or expansions or involve some impact to ongoing airport operations. As airports must remain fully operational during construction, significant additional soft costs will be incurred related to phasing, temporary construction, and protection of passengers and employees during construction.

Vertical projects pose a significant challenge to early stage cost estimates. These are estimates developed prior to a design being initiated as part of a capital program. The complexity of these projects can result in significant variations of unit costs within particular areas of the project. Such elements are typically not fully understood until later in the design process. Therefore, early stage estimates for complex vertical projects are better supported by historical total-project-cost data for projects of similar size, scope, complexity, and cost-driver characteristics.

CHAPTER 3

Parametric Cost Estimating

The parametric cost-estimating methodology consists of developing mathematical relationships between cost, the dependent variable, and a number of independent variables that are hypothesized to be the drivers for the cost. Strengths of the parametric cost-estimating technique include the following (GAO 2009, p. 108):

- Is reasonably quick
- Encourages discipline
- Provides a good audit trail
- Is objective, with little bias
- Has cost-driver visibility
- Incorporates real-world effects

Linear regression is the most widely used technique to develop parametric cost models. Historical values of dependent and independent variables are used to model a linear relationship between these variables. Once the model has been developed and tested, it can be used to make predictions, by letting the independent variables take on hypothetical values. In simple linear regression, the value of a single dependent variable is predicted from the value of a single independent variable. In this case, linear regression is equivalent to finding the best-fitting straight line through the historical data points. In multivariable regression analysis, multiple dependent variables are used. In this study, construction cost is regressed against several independent variables that represent the cost drivers for the project type in question.

The steps for implementing an airport construction cost-estimating model using parametric cost estimating include:

1. Identify CIVs for inclusion in the data collection process.
2. Develop CERs.
   a. Collect historical data and normalize to account for inflation and geographical variation.
   b. Hypothesize algebraic CERs for each project type, linking project cost to CIVs.
   c. Conduct statistical analysis of hypothetical CERs.
   d. Refine CERs and select most appropriate CER for each project type.
   e. Embed mathematical relationships into cost model.
3. Test and validate the cost model.

This process is described in more detail in the following sections.

Identifying Candidate Input Variables

The first step in the process used to derive the cost model is the selection of CIVs. These represent the key independent variables that are hypothesized to drive the costs of a particular construction project type. They are referred to as candidate variables because their inclusion in

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the model is based on a hypothesis of a relationship between cost and cost driver. During the model development, the selection of CIVs is altered in an iterative manner, until a cost model is derived that is robust and meets the target statistical metrics of quality of fit. CIVs selected for use in a parametric cost-estimating model should meet the following criteria:

- They should have a logical relation to the project type.
- They should have a causal relationship to the construction cost.
- The value of variable should be quantifiable both during the collection of historical data and when using the cost model to prepare cost estimates.
- The variables should, preferably, be continuous variables.

Continuous variables are variables that have numerical values that can take any value within an allowable range formed by a minimum and maximum variable. In the case of a continuous variable, a value of two is twice as large as a value of one and a value of four is twice as large as a value of two. Examples of continuous variables include runway length, aircraft weight, floor space, and so on.

In contrast, discrete variables include variables such as airplane design group, which can take on the values I through VI, or two-state variables such as "yes/no." The fundamental problem with discrete variables is that one cannot tell with any mathematical certainty what the ratio is between terms such as "large," "medium," and "small." For example, if "large" is not twice "medium" and "medium" is not twice "small," the meaningfulness of the resulting mathematical model cannot be clearly stated.

The CIVs that were originally taken into consideration for inclusion in the data collection process are identified in the following list, along with brief explanations justifying their inclusion.

- **Aircraft approach category:** This value identifies the airport category (from A to E) based on the approach speed of the critical aircraft (design aircraft). The critical aircraft is usually taken to mean the most demanding aircraft that generates at least 500 annual operations.
- **Airplane design group:** This value identifies the airport category (from I to VI) based on the wingspan of the critical aircraft.
- **Airport size:** This value would be used to identify the overall complexity of the airport and could be represented by using a single continuous variable such as acreage, number of runways, maximum runway length, number of operations per year, or a discrete variable such as the Airport Reference Code.
- **Area:** This is a general sizing variable that would be used to support the cost estimates of new or renovated buildings or airport elements such as pavement surfaces and runway safety areas.
- **Federal Aviation Regulations (FAR) Part 139 category:** This category (from I to IV) determines the ARFF capabilities needed. The class is based on whether the airport has scheduled or non-scheduled service and whether it serves small or large air carrier aircraft. It applies only to commercial air carrier airports certified under FAR Part 139.
- **Discrete frequency:** This variable would be used to help estimate the cost to install weather reporting equipment.
- **Drainage type—above ground or below:** This two-state variable would be used to help estimate the cost to construct parking lots.
- **Obstruction type—equipment, tree, or ground:** This three-state variable would be used to characterize obstructions that would be removed as part of an airport improvement.
- **Height:** This variable would be used for estimating the cost to construct certain airport buildings.
- **Length:** This CIV, usually expressed in linear feet, would be used as a primary variable for estimating the cost of projects such as perimeter fencing.
- **Load rating:** This variable would be used to identify the maximum load that would regularly be placed on a runway by an aircraft. The rating is a combination of the maximum takeoff weight of the critical aircraft and the landing gear configuration.

- **Number of floors:** This variable would be used for certain airport buildings.
- **Number of intersections:** This variable would serve as a high-level proxy for the amount of signage associated with new runway, taxiway, or apron construction (see also "signs per intersection").
- **Number of navigational aids:** This variable would serve as a quantity variable which would be applied to the average cost per navigational aid (NAVAID) to reasonably estimate the total cost of all required new NAVAIDs.
- **Number of obstructions:** This variable would serve as a quantity variable which would be applied to the average cost to remove a typical obstruction to reasonably estimate the total cost to remove all required obstructions.
- **Number of spaces:** This variable would be used to estimate the construction cost of an airport parking lot and/or airport parking garage.
- **Number of systems:** This variable would be applied to new security systems, and also potentially to help estimate the cost of new NAVAIDs or certain guidance systems.
- **Number of vehicle gates:** This variable would be used to help estimate the cost to implement new security access systems and the cost to install perimeter fencing.
- **Runway approach type:** This three-state discrete variable would be used to determine the runway pavement markings required. The three states are visual, non-precision instrument, and precision instrument.

There is a direct relationship between the number of historical observations required to develop statistical meaningful CERs and the number of independent variables. Due to the extensive possible interactions between the CIVs, the number of required historical data points increases exponentially with the number of variables. For this reason, the number of CIVs must, in practice, be limited to those cost drivers that have the greatest influence on cost. There are a number of other variables not included as CIVs that have the potential to impact project cost. This is especially true for vertical construction projects, which by their nature involve a higher degree of complexity. The data collection and statistical analysis of the CERs were used to determine that the correct balance between data availability and number of variables has been reached.

The selection of CIVs (and project types) was an iterative process. The final list of CIVs is described in Chapter 4. A number of the originally proposed CIVs were not included in the model. The final selection was driven either by lack of data or other methodological reasons, such as the desire to limit the number of discrete variables.

Developing Cost-Estimating Relationships

This step involves identifying and recording interactions between the project cost and the cost drivers represented by the CIVs. An interaction between driver variables exists when the effect of one is conditioned on the value of one or more of the others. These interactions are modeled as CERs, which are mathematical expressions of the relationships between construction cost and the CIVs. These CERs are developed through statistical analysis, using multivariable regression. In some cases, the number of data points and/or a data set that exhibits odd variances may prohibit the development of statistically valid CERs. In these cases, a CER may not be able to be developed or adjustments may be required to the functional specification or choice of CIVs. For this reason, particular care must be used when selecting the CIVs to try to only include variables expected to be causal factors.

The fundamental statistical technique used in linear regression is called least squares regression. There are several computerized least squares regression programs or modules. This study used the Analysis Toolpack, an add-on to Microsoft Excel. Least squares regression was chosen because the mathematical formulas used to minimize the variance have explicit formulas and the resulting

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formulas are linear. This method of linear regression fits a straight line through each data set to minimize the sum of the squares of the differences between the data points and the fitted line.

The process for developing the CERs included the following steps:

1. Develop hypothetical CER using airport planning, engineering, and subject matter expert (SME) input.
2. Develop a database of historical CIV values.
3. Plot data against CIVs to visually identify trends.
4. Test dependent variables against independent variables individually using statistical software.
5. Select promising independent variables.
   a. Test combinations (i.e., interactions between CIVs).
   b. Analyze statistical metrics:
      i. Logic
      ii. Coefficient of variation
      iii. Adjusted coefficient of determination (adjusted R^2)
      iv. F-statistic
      v. T-statistic
      vi. Robustness
      vii. Outliers
6. Refine and finalize CERs.

The first step involves identifying and recording potential interactions between cost and the CIVs. An interaction exists when cost is affected by the value of one or more CIVs. Throughout the process, particular care was taken to identify causal factors, based on knowing and understanding the real-world effects of a potential cost driver.

To illustrate the first step in this process, consider a hypothetical CER to estimate the cost of constructing or rehabilitating a runway. Assume that the following hypothetical CER was developed in consultation with airport engineers and SMEs on horizontal airport construction:

$$\textit{Cost} = f(\textit{Area, MTOW, GearConfig, PvmtType, FreezingIndex})$$

where

Area is the surface area of the runway pavement to be constructed, measured in square feet (sq. ft.).
MTOW is the maximum certificated takeoff weight of the design aircraft, measured in pounds (lbs.).
GearConfig is the landing gear configuration, given by one of the following: single wheel, dual wheel, dual tandem wheel, or double dual tandem wheel.
PvmtType is the pavement type, given by one of the following: asphalt (i.e., hot mix), portland cement concrete (PCC), or hybrid.
FreezingIndex is the design freezing index value, measured in degree-days.

Testing and Validation

The simplest and most commonly used statistical measure of the statistical fit between the dependent and independent variables is called the coefficient of determination. This represents the portion of the total variation in the dependent variable that is explained by variation in the independent variables. The coefficient of determination is commonly called "R-squared" and is denoted by R^2. A value of one indicates perfect correlation between the dependent and independent variables, whereas a value of zero indicates no detected correlation. However, note that correlation does not necessarily imply a causal relationship.

Table 3 provides a summary of statistical metrics that can be used to test the quality of fit and statistical significance of the model, along with rules-of-thumb for satisfactory performance. More detailed explanations of the statistical measures identified in Table 3 follow:

- **Logic:** Logic is used to develop hypotheses that are tentatively advanced to account for particular facts. Hypotheses are testable ideas or testable questions on some phenomenon of interest. The hypothesis can then be tested by collecting and analyzing data using inferential statistics.
- **Coefficient of variation:** This is the ratio of the standard deviation of a data set to its mean. This is a relative measure of the amount of dispersion there is in the statistical sample represented by the data set.
- **Adjusted R^2:** R^2 is also referred to as the coefficient of determination. This measures how much of the variability in the data is accounted for by the model (in this case, the CER). This is an indication of how well the outcomes are predicted by the model and measures overall quality of fit. Adjusted R^2 corrects the coefficient of determination to account for the fact that it otherwise appears to improve as more independent variables are added to the model.
- **F-statistic:** The F-statistic is used to test the overall regression analysis for the existence of a statistically significant relationship between the dependent and the independent variables.
- **T-statistic:** This is the ratio of a CIV's coefficient to its standard error. The ratio can also be expressed as a confidence level that demonstrates the probability that the coefficient is a significant predictor of the independent variable.
- **Robustness:** A measure of whether the statistical model is unduly influenced by small variations in the underlying data.
- **Outliers:** An outlier is a data point that is abnormally distant from the remainder of the statistical sample represented by the data set. These are usually excluded from the data set, since they may be caused by errors in the data or misunderstandings in the data collection process. A specific example might be a grant that is described as funding a runway construction project, but which in fact only funded the design phase. The cost for a design-only project would be much lower than the cost of the associated construction.

CERs should be elected based on quality of fit, statistical significance, and robustness of selected cost drivers. These qualities are sometimes traded against one another. Depending on the hypothesis undergoing test, the data can span a wide range of values, which can affect the robustness of the model. Other times, the data set may be confined to a more limited set in order to exclude statistical outliers. This reduces the variability of data (measured by the resulting F-statistic), tightening its prediction interval (measured as a function of the t-statistics associated with each CIV). This also helps match the engineering logic behind the proposed CER.

Table 3. Statistical metrics for assessing linear regressions.

Measure	Criteria	Explanation
Logic	Make engineering sense	Valid estimator of cost because of causality
Coefficient of variation	CV < 20%	CER is a tight predictor of costs
Adjusted R^2	$R^2 > 0.90$	Good correlation between cost and cost drivers
F-statistic	F-Ratio > F* @ 90% CI	Regression equation is a better predictor of cost than the mean (average cost)
T-statistic	t > t* @ 90% CI	Correlation between cost and the independent variable is too great to have occurred by chance
Robustness	DF/N > 0.6	Data points are not excessively influential
Outliers	No statistical outliers	No obvious data homogeneity

Notes: CI = confidence interval; DF = degrees of freedom; N = number of observations, "*" is used to indicate critical value at a specified level of statistical significance (i.e., 90%)

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Each CER must be evaluated both statistically and subjectively, based on its applicability to the project type in light of other cost drivers and their effects on cost. Ease of collecting data should also be taken into account. In some cases, no statistically valid relationship may be able to be developed, due to the lack of correlation between cost and the proposed CIVs.

An additional technique that can be used to evaluate the accuracy and usefulness of a CER is case study validation. This consists of reserving data points from the data collection effort or, alternatively, collecting additional data strictly for use in the case study validation. The independent variables associated with each reserved data point are then entered into the CER, to calculate predicted costs. The predictions are then compared to the actual costs from the collection of case studies. If the CER predicts the actual costs of the reserved data within a reasonable range, the confidence in the CER's predictive ability is increased. After the case study validation is completed, the data reserved for this purpose can be incorporated into the database and used to update the model.

CHAPTER 4

Developing an Airport Cost Database

As described in Chapter 3, parametric cost estimating relies on developing mathematical relationships between costs and cost drivers using historical cost data for previously completed projects. Consequently, a key step in implementing a cost model using the parametric cost-estimating technique is the establishment of a historical cost database. The following sections describe the analytical framework behind the development of the database used for this project. The discussion covers the selection of projects to be included, the database structure, data sources, the collection of data to populate the database, and the inclusion of adjustment factors for inflation and regional variations.

Candidate Project Types

The list of candidate airport construction projects was derived using a combination of sources and considerations, including the following:

- AIP and American Recovery and Reinvestment Act (ARRA) grant histories for general aviation and non-hub airports.
- Survey responses from the industry stakeholder outreach effort.
- Recommendations from *ACRP Report 49: Collaborative Airport Capital Planning Handbook.*
- Input from the airport construction SMEs.
- Technical feasibility of encoding each project type in cost model.
- Data availability.

AIP and ARRA grant histories served as the starting point. Five-year grant histories for fiscal year (FY) 2005–2009 were used as a starting point (FAA 2011). These were filtered to focus on general aviation and non-hub airports. A relatively low number of project types account for the majority of projects funded. In order to constrain the database scope to a feasible level, the 75th percentile was selected as an initial cut-off point (as measured by the amount of federal funding). Non-construction projects, such as planning studies and land acquisition, were eliminated from consideration.

The candidate list was then augmented by comparing the initial list against survey responses obtained as part of the industry stakeholder outreach effort. Specifically, the list of candidate projects was augmented using responses to the survey question "What are the most common types of construction projects that you estimate?" Key findings from *ACRP Report 49: Collaborative Airport Capital Planning Handbook* (Cullen et al. 2011) were used to further refine the list of candidate projects. Two key recommendations from this study were applied:

- Focus on projects with high potential for reducing the cost-estimating uncertainty
- Focus on projects with high potential for return-on-investment (ROI) for the airport sponsor

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Table 4. Candidate project types.

ro e t pe	are o ro e ts	are o ur e esponses
Horizontal Construction Projects		
Airfield signage	N/A	2. 0%
Construct or rehabilitate taxiway	2.0 %	0. 0%
Construct parking lot	N/A	N/A
Construct, expand, or rehabilitate apron	9. %	. 0%
Construct, extend, or rehabilitate runway	6. 2%	. 0%
Improve runway safety area	.00%	. 0%
Install airport visual system	.69%	N/A
Install NAVAIDs	. %	. 0%
Install perimeter fencing	.0 %	2. 0%
Install weather reporting equipment	. %	N/A
Rehabilitate runway lighting	2. 2%	0.20%
Remove obstructions	.00%	2. 0%
Runway pavement marking	N/A	2. 0%
ecurity access systems	N/A	N/A
Vertical Construction Projects		
Construct ARFF facility	N/A	.60%
Construct, expand, or rehabilitate terminal building	.2 %	0. 0%
Construct parking garage	N/A	2. 0%
Construct RE building	. %	. 0%

Note: N/A = not available.

The list was reviewed and edited by the airport construction SME members on the team. For example, the AIP category "Construct Building" was expanded to include a list of specific vertical construction projects. A similar approach was employed to identify security-related projects, which otherwise are not adequately captured by the AIP and ARRA grant histories. The list was also reviewed for feasibility of implementation in the cost-estimating model. Table 4 represents the resulting initial list of candidate projects. The list identifies the project type, the percentage share of the AIP and ARRA grant histories, and the percentage share of survey responses.

During the course of the development of the cost model, this list was updated and refined in an iterative process. Projects were modified, added, or removed, driven primarily by data availability and feasibility of implementation. Parametric cost estimating relies on multivariable regression analysis, a statistical technique that, in general, yields more robust results with a large sample of data. Several project types were eliminated from inclusion in the model because of the lack of sufficient data. Table 5 lists the final selection of project types supported in the model, including the final number of data points (i.e., historical projects) collected.

Table 5. Final project types.

Project Type	No. of Observations
Horizontal Construction Projects	
Construct or rehabilitate taxiway	2
Construct or rehabilitate apron	29
Construct, extend, or rehabilitate runway	
Install perimeter fencing	2
Install precision approach path indicator	0
Install weather reporting equipment	
Vertical Construction Projects	
Construct ARFF facility	2
Construct RE building	2

Selection of Candidate Independent Variables

The final selection was driven by hypothesized relationships between cost and cost drivers, availability of data, and methodological reasons such as the desire to limit the number of discrete variables. The CIVs that were included in the cost database are identified below, along with brief explanations justifying their inclusion:

- **Area:** This is a general sizing variable used to support cost estimates for pavement surfaces (i.e., pavement area) and buildings (i.e., floor area).
- **Landing gear configuration:** A discrete variable that describes the landing gear configuration of the design or critical aircraft. The landing gear configuration affects the distribution of an aircraft's weight and the resulting load on the pavement. Used to support cost estimates for pavement surfaces.
- **Length:** General sizing variable used to support cost estimates for fencing projects.
- **MTOW:** The maximum takeoff weight (MTOW) of the design or critical aircraft. Affects pavement load and is used to support cost estimates for pavement surfaces.
- **Number of systems:** This is a quantity variable that is applied against the average cost of a single installation of a visual or navigation aid. This is used in support of projects that may be installed in multiple locations on the airport, such as precision approach path indicator (PAPI) installations.

As described previously, the number of data points required increases with the number of CIVs included in the CERs. The final list of CERs was selected to achieve a balance between data availability and the number of hypothesized cost drivers.

Historical Construction Costs

Historical construction costs are included in the database in order to establish a statistical relationship between cost and the cost drivers represented by the CIVs identified for each project type. In order to create CERs that are universally applicable, they must be controlled for both inflation and regional variation. Since year-to-year changes in prices affect the purchasing power of the funds used, construction must be normalized in order to use historical observations spanning a multiyear period. Similarly, since the CERs incorporate historical data across a broad range of geographical locations, costs must be normalized to take into account regional variations in the cost of construction.

Adjusting for Inflation

Inflation data is used to control for variations in price levels across a broad range of project implementation dates. Since construction costs generally increase over time, all historical data are inflation adjusted. FY 2014 was selected as the reference year. This is an arbitrary choice but ensures that all cost data in the model have a common basis in terms of price level. Both input data used to determine the CERs and output data (i.e., cost estimates) are internally adjusted to FY 2014 price levels. This inflation adjustment is conducted at a national level; a separate geographic adjustment is included to take into account regional variations in cost (see the following subsection).

There are a number of commonly used indices available for adjusting inflation. Some of these are specifically intended for construction projects. Of these, a commonly used reference is the commercially developed RSMeans Construction Cost Index. However, in order to make the cost-estimating model freely distributable, cost indices that are not in the public domain were ruled out from consideration. Also, forecasts are generally not available for construction-specific cost indices. The cost-estimating model requires both historical and predictive inflation factors. For these reasons, the U.S. Bureau of Labor Statistics Consumer Price Index (CPI) and Gross Domestic

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Product (GDP) deflators provided by the Office of Management and Budget (OMB 2012) were used. CPI was used to inflation adjust historical data; whereas the OMB's forecast of GDP deflators is used to inflation adjust cost estimates for planned projects.

Adjusting for Regional Variations

Construction costs can vary considerably by geographic location due to a number of factors, including transportation costs, utility costs, the cost of construction materials, the general price level of labor, and indirect costs due to regulatory processes such as permitting and environmental studies. A cost-estimating model must therefore be able to account for regional variations in price levels. This is particularly true if a national cost model is developed from historical data that spans a large number of geographic locations.

A challenge in compensating for regional variations is selecting the appropriate geographic unit. State-level adjustments allow for correcting a substantial amount of geographic variation. Correcting for variation at the state level is intuitive even to non-experts but can fail to account for more detailed variation, for example, at the county level or between urban and rural areas. While this argues for using a geographic unit with a finer level of distinction than state boundaries, in practice it is difficult to obtain construction-specific geographic adjustment factors without relying on commercial sources. For this reason, state-level factors published in the Department of Defense Facilities Pricing Guide (DoD 2011) were selected. These cover construction subject to Davis-Bacon wage requirements, which is generally relevant for airport construction projects that involve federal funding programs such as AIP grants or PFC funding. These adjustment factors specifically include airfield construction and provide separate rates for each state for construction and sustainment costs.

To normalize the cost data, a single state must be selected as an arbitrary reference point. All historical cost data are adjusted using adjustment factors that measure price levels relative to this state. When cost estimates are developed for future projects, initial calculations are conducted using the same reference state. In the final step, the cost estimates are converted to prices for the state in which the planned construction is to be conducted. While the choice of the reference state is arbitrary, for practical reasons, a state with price levels close to the national average is usually chosen. For this modeling effort, the State of Kansas was selected as the reference state. The adjustment factors for Kansas are 94% for construction and 91% for sustainment, relative to the national average (DoD 2011, p. 36).

Database Structure

Establishing a functional and efficient database structure is a critical step in ensuring the database serves its purpose. The database structure should be functional in that it should capture all the relevant data needed to conduct the analysis. It should be efficient in that it should avoid duplication and should be easy to interpret and analyze.

In the case of the cost model, a simple tabular form with one table for each project type was used. The database was implemented in Microsoft Excel for the sake of simplicity. While a number of dedicated database applications are available, these are preferred only when either a very large database is developed or when the database consists of many nested tables with relationships that link data between tables. In this particular application, the size of the database is relatively small (the final database consisted of a total of 255 observations). Moreover, the only links that exist between data tables are the links to the adjustment factors for inflation and regional variation, as well as a table of landing gear configurations.

Table 6. Database structure.

istori al Constru tion ata a les	
Project Type	*Data Table*
Construct or rehabilitate taxiway	Taxiway
Construct or rehabilitate apron	Apron
Construct, extend, or rehabilitate runway	Runway
Install perimeter fencing	Fencing
Install precision approach path indicator	A I
Install weather reporting equipment	eather
Remove on-airport obstructions (vegetation)	On-airport Veg Removal
Construct aircraft rescue and fire fighting facility	ARFF
Construct snow removal equipment building	RE ldg
n illar ata a les	
Data	*Data Table*
Inflation adjustment factors	Inflation
Regional variation adjustment factors	Geographic Adj
Landing gear configuration	Landing Gear

The basic database structure is summarized in Table 6. The database consists of two main parts—historical construction data and ancillary data. The construction data portion of the database contains nine separate data tables, one for each project type. Note that while the project type "remove on-airport obstructions (vegetation)" is included in the database, no CER was developed for this project type and it is not represented in the final cost-estimating model. In addition, there are three tables for ancillary data.

The construction data tables share a similar structure, which consist of two basic parts. The first part is identical for each project type and consists of an identifier, location information, and basic project information such as a project description, year of construction, and total project cost. The structure of this portion of the construction data tables is shown in Table 7.

The second part of the construction data tables consists of the values for the CIVs for the project in question. Since each project type has different CIVs, the structure and number of fields vary from project to project. As an example, the structure for the runway construction project type is shown in Table 8.

Table 7. Structure of construction data tables—basic project data.

iel	Exa ple
Record identifier	Data oint CETR 9
Airport FAA identifier	MV
tate	MA
roject description	hift Runway 6-2 0 Northeast
ear	20 0
Total project cost	, 9 , 6

Table 8. Structure of construction data tables—CIV values.

Project Type: Constru t exten or re a ilitate run a	
iel	*a le*
avement area	0,000 F
MTO of design aircraft	9 ,000 lbs.
Landing gear configuration	Dual wheel (D)

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Data Collection

The parametric cost-estimating methodology relies on multivariable regression analysis, a statistical technique that results in a mathematical relationship between a dependent variable and several independent variables. In this application, the dependent variable is construction cost and the independent variables are the cost drivers represented by the CIVs. The goal is to include as many explanatory factors as possible, so that all of the key variables that affect construction cost are included. However, the more independent variables that are included in the functional form of the regression model, the greater the sample of historical observations must be. In other words, there is a tradeoff between the explanatory power of the model and the amount of data that is available and can be collected.

In the original model specification, the proposed CERs typically included five to six CIVs for each project type. For example, the runway CER included the following CIVs: pavement area, MTOW, landing gear configuration, pavement type, and design freezing index value. However, due to limited availability of data, the proposed CIVs had to be revised so as to include fewer independent variables. The process for identifying data sources, collecting data, and the outcomes of the data collection effort are described in the following subsections.

Data Collection Methodology

The research plan for this project called for a data collection process that, whenever possible, relied on automated data retrieval processes. The focus of the data collection plan was to identify pre-existing, electronic data sources in spreadsheets and database formats. However, the stakeholder survey and the initial review of available data revealed several significant challenges in populating the database with construction costs and CIV values:

- Data is often stored in the PDF format, which is nominally an electronic format but cannot be used to automatically populate a database.
- In cases where construction project data is available in a usable electronic format, such as Microsoft Excel spreadsheets, the data usually does not include values for the required CIVs.
- Projects funded through federal grants often include several bundled construction projects, making it difficult or impossible to separate costs for specific projects.
- Federal grant histories only list the federal share and not the total construction cost.

These findings required a significant departure from the original plan of importing existing databases of cost and CIV values to form a comprehensive database. Instead, the data collection relied primarily on data entered manually, supplemented by some use of data in Microsoft Excel format. To facilitate manual data collection, spreadsheet templates were developed. Two separate data collection templates were developed, one for horizontal and one for vertical construction projects. The templates matched the structure of the cost-estimating database, by including a series of sub-templates, one for each project type. For each historical observation, fields for basic descriptive information were provided, such as a project description, location, and year of completion. Other data fields were used to store values for construction costs and the CIV values required for the proposed CER for the project type in question.

Data Sources

The following data sources were identified and used in the data collection phase:

- Project data history from individual airports, including:
  - Data submitted by members of the ACRP Project 01-19 panel.
  - Data submitted by the survey recipients.
  - In-house data provided by the airport construction SMEs who participated in the study.

- Ancillary databases:
  - FAA, Airport Engineering Division, Aircraft Characteristics Data.
  - FAA, National Flight Data Center, Facilities Table.
  - FAA, National Flight Data Center, Runways Table.
  - FAA, Terminal Area Forecasts.
- AIP/ARRA grant histories.
- Manual collection of project close-out information at state departments of transportation and aviation agencies.
- Web searches, media articles, and other sources.

The AIP/ARRA grant histories include project descriptions, locations, and construction cost information for nearly 20,000 projects. However, they generally do not include any information on the required CIV values. The grant histories were therefore of very limited value in developing CERs. They were, however, useful for estimating the total number of projects that could potentially be incorporated into the historical construction cost database.

In addition to these sources, a number of data sources were identified and reviewed, but were ultimately not used in the database development. These included AIP annual reports and airport bond statements. These sources provided useful background information, but did not include data in a usable electronic format. While they included some CIV values in narrative form, incorporating this data would have required extensive manual processing and follow-up.

CIV Reduction

The number of observations required for each project type in the database was primarily driven by the number of CIVs in the associated CER. Given the difficulties in obtaining data in suitable electronic format, the number of CIVs was reduced from the original model specification. The CERs that were carried forward to the model validation phase were reduced to no more than three CIVs, focusing on the primary causal cost drivers. In particular, most discrete CIVs were eliminated, due to the limitation of incorporating variables that do not take on continuous values.

In some cases, CERs feature CIVs that are functionally related and that can possibly be represented by a single variable. An example of the possibility of reducing the number of CIVs is landing gear configuration—a CIV identified as a potential cost driver for pavement projects. Landing gear configuration is included as a CIV because the pavement design depends on the pressure exerted by an aircraft through a tire's contact patch. The pressure is a factor of both the aircraft's weight (i.e., MTOW) and landing gear configuration. However, since the variation in aircraft landing gear design within any one type of configuration is relatively limited, it is possible to estimate factors for converting the MTOW for one specific landing gear configuration to another configuration. Such conversion factors have previously been published by the FAA, as shown in Table 9.

Table 9. FAA factors for converting between landing gear configurations.

o Con ert ro	o	Multipl
ingle wheel	Dual wheel	0.
ingle wheel	Dual tandem	0.
Dual wheel	Dual tandem	0.6
Double dual tandem	Dual tandem	.0
Dual tandem	ingle wheel	2.0
Dual tandem	Dual wheel	.
Dual wheel	ingle wheel	.
Double dual tandem	Dual wheel	.

ource: FAA (99), p. 2 .

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These multipliers allow for the conversion from any combination of MTOW and a specific landing gear configuration to a single-wheel-equivalent MTOW. As an alternative to using this FAA guidance, it is also possible to derive conversion factors empirically by examining the relationship between the MTOW specified for different landing gear configurations for a broad range of aircraft models. As an example, Figure 1 shows the relationship between MTOW in the dual wheel (DW) landing gear configuration and MTOW in the dual tandem wheel (DTW) configuration for all aircraft models in the FAA Airport Engineering Division's aircraft characteristics data table. The data suggests a conversion factor of 1.84 (compared to a factor of 1.7 per the FAA guidance in Table 9).

Results of Data Collection

Due to the limited data availability described previously, the data collection was conducted in several rounds, establishing an iterative process. After the supplemental data collection and elimination of partial data points, the number of total data points for use in CER development encompassed a total of 255 observations. This was sufficient to support CER development for all of the project types identified in Table 6, with the exception of "Remove on-airport obstructions (vegetation)." With only four observations collected, this project type was removed from further consideration. The results of the data collection are summarized in Table 10.

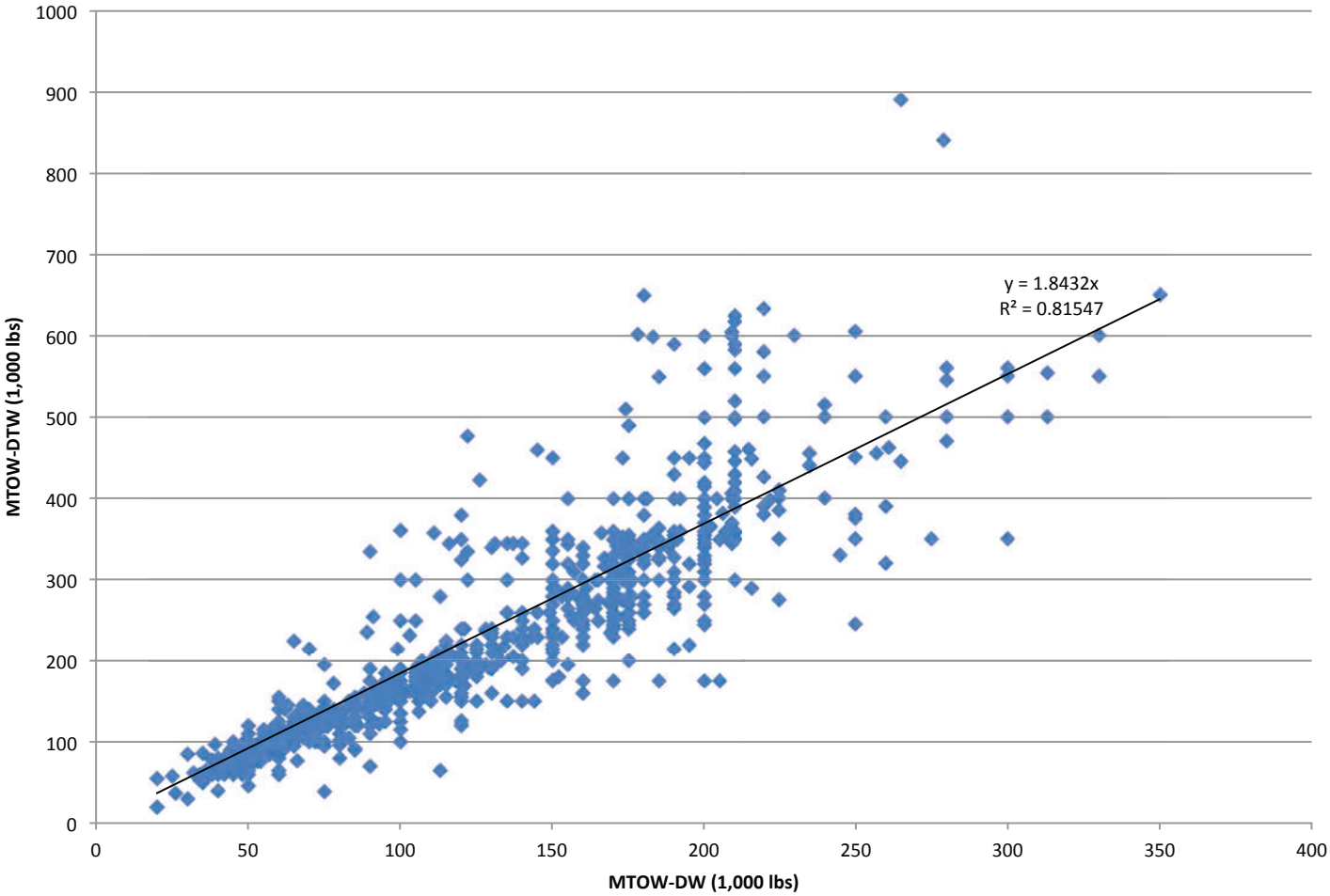

Figure 1. Relationship between MTOW in DW and DTW landing gear configurations.

Table 10. Results of data collection.

ro e t pe	otal ata oints Colle te	otal ata oints se	iel
or o tal o tr ct o Project			
Construct or rehabilitate taxiway	2	22	.0%
Construct, expand, or rehabilitate apron	29	22	.9%
Construct, extend, or rehabilitate runway		0	62. %
Install perimeter fencing	2		.0%
Install A I	0		0.0%
Install weather reporting equipment		2	90. %
Remove on-airport obstructions (vegetation)			
ert cal o tr ct o Project			
Construct ARFF facility	2	2	9. %
Construct RE building	2		.6%
ll Project			
otal	2		

The data set was analyzed for statistical outliers, which were removed prior to performing the multivariable regression analysis that establishes the CERs. Outliers were detected by identifying abnormal unit costs (i.e., cost per square foot of pavement), as well as other anomalies. For some observations, the project description did not provide sufficient clarity in regards to the scope and nature of the project. For example, in some cases, it was unclear from the description whether the cost was limited to a single project type or multiple project types covered by the same federal grant. Data points with problematic project descriptions were also removed as statistical outliers. Table 10 indicates how many of the collected data points were retained for CER development, as well as the overall yield (i.e., the share of data points that were actually used). The resulting CERs, along with plots of predicted versus actual cost for each data point used in the CER development, are documented in Appendix A.

CHAPTER 5

ACCE—Airport Capital Cost-Estimation Tool

Before Getting Started with ACCE

To ensure a smooth experience with ACCE, some preparations are necessary before running the application. These preparations include the collection of information that constitutes inputs to the cost-estimating approach. Since airport capital planning involves management, policy, planning, finance, and safety functions at the airport, the inputs should be vetted with relevant personnel and/or departments. Alternatively, ACCE can be run in a group setting to allow consensus discussion on the subjective inputs to the tool while it is being used.

Some of the inputs required by ACCE should be collected prior to starting. This includes the definition of the construction project(s) under consideration, consisting of a project description, planned construction year, and values for the cost drivers that are used in the CER for the project in question. It may also be useful to have a printed reference copy of the quick reference guide for ACCE, especially when using it for the first time. The guide is reproduced in Appendix B.

ACCE Work Flow

The user interface is designed to ensure all relevant information is displayed and associated input is requested in a guided, logical sequence. This keeps the interface simple and allows a user to navigate intuitively through the tool. The input screen of the ACCE tool is divided into four sections (see Figure 2):

1. **Contact information:** This section allows the preparer to enter identifying information, including name, organization, e-mail, and a phone number. This information is optional.
2. **Airport data:** In this section, the user specifies airport information including three-letter FAA airport identifier, the state, and an airport description. Airport location information is used to geographically adjust cost estimates and to identify the project location.
3. **Project input:** This includes project-specific information such as the construction type and all relevant CIV values.
4. **Cost estimate:** This provides a running display of a range of cost estimates, identified as a low, most likely, and high estimates. If the project inputs are modified, the cost estimate is updated. Once the user is satisfied with the inputs, a report can be generated from this section.

Airport Data

Airport data is necessary primarily to account for the regional variation in project cost. Having an airport identifier is also useful as a reference to help identify the cost estimate. This is particularly useful when cost estimates are generated for several different airports. The airport data section requires the three-letter FAA identifier to be entered, the two-letter state identifier,

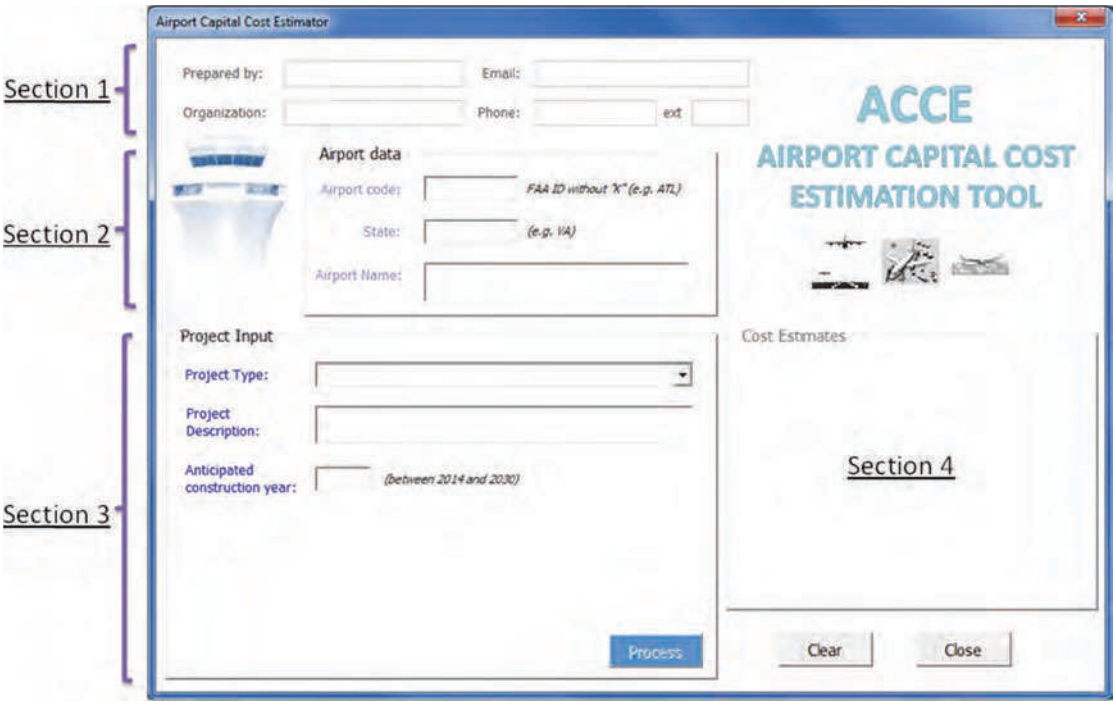

Figure 2. ACCE main user interface.

and the name of the airport. For NPIAS airports, the three-letter FAA code identifier is sufficient, as the remaining information is automatically retrieved and populated by ACCE.

Project Input

The cost model supports a total of six horizontal and two vertical construction projects. Each project type requires a specific set of input variables needed to apply the CER in order to derive a cost estimate. The drop-down menu in the project input window allows the user to specify the project type of interest. Once the project type has been selected, input fields are created for entering values for all the CIVs associated with that project type's CER. Table 11 lists the possible user selections for the project input window, including the project types and the associated independent variables for each.

Output: Cost-Estimating Report

Once the inputs have been finalized, a cost-estimating report can be generated. A sample cost-estimate report is shown in Figure 3. The tool generates cost estimates including low, most likely, and high estimates. The most likely estimate is determined by the CER and the CIV input values provided by the user. The low-high range is developed using the statistical metrics associated with the CER associated with the project type in question. CERs that feature a high quality of fit against the historical data have narrower low-high ranges than those that have a fit of lower quality.

The tool presents cost estimates both in base year (i.e., FY 2014) dollars and in nominal (i.e., then-year) dollars corresponding to anticipated construction year. The nominal dollar cost estimate is prepared using predicted GDP deflators to adjust for changes in prices. The cost-estimating report shows the percentage adjustment used to convert FY 2014 dollars to nominal dollars. For projects with a planned construction year of FY 2014, only the base year cost estimate is shown.

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Table 11. Project input selections.

Project Type	Category	Input 1	Input 2	Input 3	Input 4
ARFF Facility	Vertical	Year	Combined floor area (sq. ft.)		
Apron	Horizontal	Year	Pavement area (sq. ft.)	Design aircraft MTOW (lbs.)	
Automated Weather Observing System	Horizontal	Year			
Perimeter Fencing	Horizontal	Year	Length (ft.)		
PAPI	Horizontal	Year	Number of systems/ runway ends		
Runway	Horizontal	Year	Pavement area (sq. ft.)	Design aircraft MTOW (lbs.)	Landing gear configuration
SRE Building	Vertical	Year	Combined floor area (sq. ft.)		
Taxiway	Horizontal	Year	Pavement area (sq. ft.)	Design aircraft MTOW (lbs.)	

Interpreting the Results

The cost-estimating report contains five distinct elements, which should all be taken into consideration when interpreting the results:

1. **Inputs:** This section summarizes the inputs that were used to generate the cost-estimating report. This includes the contact information for the preparer, the airport data, and the project-specific inputs, including the user-entered CIV values. The airport data is used to

Airport Capital Cost Estimation Tool: Report

Report Name	ASH FY2020 CIP
Report Description	Extend Runway 14/32
Name of Preparer	Elena Smith
Organization	Nashua Airport Authority
Phone number	(603) 123-4567, Ext. 1200
Email	emith@flyash.com
Date Created	1/28/14 8:48 AM
FAA Airport ID	ASH
State	NH
Airport Name	Boire Field
Project Type	Runway
Project Description	Extend Runway 1 /32
Planned Year of Construction	2020
Pavement Area	145,000 Sq. Ft.
Design Aircraft MTOW	120,000 lbs.
Landing gear configuration	Dual tandem (DTW)

Output

	Cost Estimate	Low Estimate	High Estimate
FY2014$	$2,100,000	$1,600,000	$2,700,000
FY2020$	$2,400,000	$1,800,000	$3,000,000

Inflation 2014 to 2020: +11.2%

Disclaimer: *This cost model is a proof-of-concept tool developed as a research project under the Airport Cooperative Research Program. Actual costs may differ significantly from the estimates provided here. These cost estimates are intended for initial planning purposes only and should not be used as the sole means to evaluate a proposed project.*

Figure 3. Sample cost-estimating report.

determine the adjustment for regional variation (based on the state the airport is located in). However, the airport location should also be considered when interpreting the resulting cost estimate. In particular, unique characteristics about the airport can affect the validity of the cost estimate. Examples include airports that are located remotely (e.g., island airports) or in environmentally sensitive surroundings (e.g., tidal marshes), which can substantially increase construction costs.

The values entered for the CIVs are critical in understanding the cost estimate, as the project cost is directly linked to these values through the CER. The project description provides context to the project. While this is an optional field that allows for free-form entry, a well-crafted project description can provide important context to allow for a critical and thorough evaluation of the resulting cost estimate.

The CERs were developed through a statistical analysis of a wide range of historical values for the CIVs. It was assumed that cost is a linear, well-behaved function within these ranges of values. While the model allows for user entry of CIV values that fall outside the range used to develop the CER for that project type, the resulting cost estimate will fall outside of the range used to validate the model. In these cases, a warning message is displayed (see Figure 4) and the resulting cost estimate should be viewed as uncertain.

2. **Most likely cost estimate:** The term "most likely cost estimate" (simply labeled "Cost Estimate" in the output table) is intended to emphasize that cost estimating is a stochastic science. In other words, every cost estimate is inherently uncertain and should be viewed as a range consisting of a random distribution of possible estimates. The most likely value in that distribution is generally accepted to be the best cost estimate. However, in interpreting the results, it is important to keep in mind that the most likely cost estimate is just one point in a range of possible values.
3. **Cost estimate range:** A range of cost estimates is formed by specifying the most likely cost estimate, as well as low and high estimates. These three values form a simplified representation of the underlying random distribution that makes up the output of the cost model. The low and high estimates are determined by adding and subtracting a percentage offset to the most likely cost estimate. The percentage value applied to create the range is computed using a rule-of-thumb that draws on the standard error resulting from the linear regression analysis used to develop the CER in question. Since the standard error measures the amount of scatter in the historical data about the best fit, the percentage range will vary by project type. Project types that have a CER where historical cost estimates closely match predicted cost estimates will tend to have a more narrow difference between the low and high estimates. Table 12 shows the resulting percentage values used to establish the low and high estimates.
4. **Inflation-adjusted cost estimate:** The base year for the cost model is FY 2014 and all cost estimates are displayed in FY 2014 dollars. However, for projects with a planned construction start beyond FY 2014, the cost estimate is also shown in inflation-adjusted dollars for the construction year in question. The base year results allow for comparing the costs of different

Project Type	Runway
Project Description	Extend Runway 14/32
Planned Year of Construction	2020
Pavement Area	**120,000 Sq. Ft. *****
Design Aircraft MTOW	120,000 lbs.
Landing gear configuration	Dual tandem (DTW)
***** Warning: This input value falls outside the range of data used to develop the cost model. The resulting cost estimate projects into an area that has not been validated and may be inaccurate.**	

Figure 4. Warning message for CIV values outside range used to develop CER.

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Table 12. Values used to establish low and high cost estimates.

ro e t pe	o i an e
Construct or rehabilitate taxiway	±2 .9%
Construct or rehabilitate apron	±2 .2%
Construct, extend, or rehabilitate runway	±2 .9%
Install perimeter fencing	± . %
Install A I	± . %
Install weather reporting equipment	± 0.6%
Construct ARFF facility	± .9%
Construct RE building	±6. %

projects regardless of scheduling. The nominal (i.e., then-year) results allow the airport to account for the general increase in price levels over time. Such increases can be significant: For example, price levels 10 years beyond the FY 2014 base year are projected to increase by nearly 20%.

5. **Disclaimer:** Each cost-estimating report generated by ACCE is accompanied by a disclaimer (Figure 5). The purpose of the disclaimer is to remind the user that the ACCE model was developed as a proof-of-concept tool, using a cost database limited in scope and through an applied research project within the ACRP. The cost estimates developed through ACCE are inherently uncertain, both because of the statistical method used, which is based on a sample of historical cost data with random variation, and because of limitations in both the data and the methodology. Prior to using cost estimates developed in ACCE for airport planning and development purposes, it is important that the user fully understands the limitations of the results.

To allow for a proper interpretation of the results and to understand the underlying limitations, a set of checklists follow—one each for the horizontal and vertical construction domain, respectively. The purpose of these checklists is to help identify factors that could cause the cost estimate to be either unusually high or low. They provide a mechanism for evaluating the uncertainty of the cost estimate through a self-assessment process to be conducted by the user after preparing a cost-estimating report using ACCE. If the responses to the checklists indicate the presence of several risk factors, the user should lean toward the high range of the cost estimate and/or seek an alternative estimate.

Checklist for Horizontal Projects

Existing Conditions

- Will the project be planned on a site that has evidence of previous environmental hazards such as contaminated soil, asbestos, lead paint, or the presence of threatened or endangered species, historic structures, or other unforeseen existing conditions? This may require special

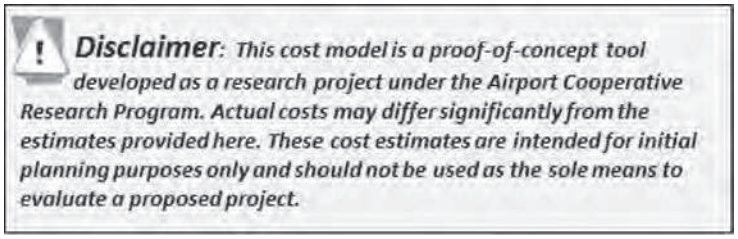

Figure 5. Cost model disclaimer.

environmental studies, stakeholder negotiations, and mitigation initiatives, resulting in additional on- or off-site improvements or in-lieu fee transfer of funds. If so, an allowance for the related costs must be added to the estimate provided by ACCE.
- If this is a large pavement project, is the airport located far from the nearest asphalt or concrete supply plant? If so, the higher range of the estimate generated by ACCE is likely more reflective of the final cost.
- Is this project located on an island? If so, the higher range of the estimate generated by ACCE is likely more reflective of the final cost.
- Will the FAA require more than 60% protection from frost for the pavement design? Generally, 60% is the standard for cold-weather regions; however, in extremely cold climates, an increase in this value to 80% is sometimes required. If so, the higher range of the estimate generated by ACCE is likely more reflective of the final cost.
- Is the project located in a hot-weather region where grass is difficult to grow and maintain year round? This may require alternative site stabilization in areas between runways and taxiways, such as local stone products or hardscaping. The stone must be properly sized to prevent foreign object damage hazards, which increases cost. If so, the higher range of the estimate generated by ACCE is likely more reflective of the final cost.
- Is this project located in an urban community? Projects that have sensitive socio-economic factors can add time to construction due to public outreach requirements, restricted work hour requirements, and restricted work area requirements. If so, the higher range of the estimate generated by the ACCE is likely more reflective of the final cost.
- Will there be other construction projects ongoing near the project at the same time? This may result in more favorable bids and unit prices due to economies of scale. If so, the lower range of the estimate generated by ACCE may be more reflective of the final cost.

Project Scope

- Will the project be a combination of two or more separate project types? If so economies of scale may exist. If combining estimates generated by ACCE for projects occurring simultaneously, the lower range of the estimate is likely more reflective of the final costs.
- Will the project include non-standard materials such as warm-mix asphalt, underground stormwater treatment systems, or artificial turf? If so, the higher range of the estimate generated by ACCE is likely more reflective of the final cost.
- Will the project require newer, environmentally friendly technologies such as light-emitting diode lighting, solar-powered lighting, pervious pavement, or low volatile organic compound paint? If so, the higher range of the estimate generated by ACCE is likely more reflective of the final cost.
- Will the project provide improvements to technology infrastructure that is ancillary to the core project scope, such as airfield lighting touchscreen control panels, new access control hardware or software, new utility metering, stormwater collection, or outlet improvements? If so, the higher range of the estimate generated by ACCE is likely more reflective of the final cost.
- Will the project include many different trades of work? For example, if a project includes site work, paving, metal work, concrete work, electrical work, security work, and carpentry work, there is an increased chance that there will be multiple subcontractors reporting to one prime contractor. This has the potential to increase cost due to increased management oversight, as well as multiple levels of overhead and profit. If so, the higher range of the estimate generated by ACCE is likely more reflective of the final cost. Conversely, if a project scope is limited to a runway mill and overlay with minor supporting site work, the lower range of the estimate generated by ACCE is likely more reflective of the final cost.
- Will the FAA and the relevant state aviation/transportation agency support the use of polyvinyl chloride (PVC) conduit for all runway and taxiway electrical conductor circuits? In some regions, this is justified in order to protect wiring from damage by fire ants, reduce maintenance costs, or improve safety. The use of PVC conduit can add a significant amount of cost

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to runway and taxiway projects. If so, an allowance for the related costs must be added to the estimate provided by ACCE.

Specific Project Conditions

- Will the project start in the fall within a cold-weather region? If a project starts late within a cold-weather region, there is potential the project mobilization cost will increase due to multiple start and stops. It is typical that an airfield pavement project will be temporarily shut down in November and restarted in May to avoid final paving, topsoil, and seeding activities in cold conditions. If so, the higher range of the estimate generated by ACCE is likely more reflective of the final cost.
- Is the project being constructed at a very busy airport? Cost of construction increases for an airport with high numbers of operations, especially when commercial operations dominate. High levels of activity can require construction phasing plans, which add time and cost to construction. If so, the higher range of the estimate generated by ACCE is likely more reflective of the final cost.
- Is there a risk associated with weather delays and damage due to severe weather events such as tropical storms, hurricanes, floods, or tornados? While difficult to predict, if a project is located in an area known to be subject to these weather hazards, the higher range of the estimate generated by ACCE is likely more reflective of the final cost.
- For pavement projects, will the project include a simple mill and overlay of existing pavement versus a full-depth reconstruction? If so, the lower range of the estimate generated by the ACCE is likely more reflective of the final cost.
- For pavement projects, will the project include replacement of an existing airfield lighting system such as taxiway or runway lights? If so, the higher range of the estimate generated by ACCE is likely more reflective of the final cost.
- For perimeter fence projects, will the fence serve as both a security fence and a wildlife deterrent fence? The FAA and U.S. Department of Agriculture have recently increased design requirements for wildlife deterrent fencing. Also, wildlife deterrent fencing is more likely to be located in wetlands or other environmentally sensitive areas. If so, the higher range of the estimate generated by ACCE is likely more reflective of the final cost.

Project Jurisdiction

- Will this project involve frequent coordination with the TSA or U.S. Immigration and Customs Enforcement? If so, the price of construction may result in significant increased costs due to added facility requirements and the application of non-standard facility layout requirements. Facility foundation plans and other supporting utility items can be affected by changes in wall locations, elevator shaft locations, and baggage handling support columns. If so, an allowance for the related costs must be added to the estimate provided by ACCE.
- Will the project have sources of funding from multiple agencies such as the FAA, Economic Development Administration, TSA, or state agencies? This may create additional delineations of work and/or present a construction phasing burden to the sponsor, contractor, and inspecting team. If so, the higher range of the estimate generated by ACCE is likely more reflective of the final cost.
- Are there deed restrictions or existing protective land overlays on the proposed project site? For example, is there a regional or district water protection overlay within an area where stormwater improvements are proposed? This may create added requirements and/or administrative and legal costs related to mitigation initiatives. If so, an allowance for the related costs must be added to the estimate provided by ACCE.
- Will any agency or municipality require special construction considerations such as energy-efficient vehicle fleets or idling restrictions for construction equipment? This will add cost to the project related to alternative fuel equipment or work site restriction. If so, the higher range of the estimate generated by ACCE is likely more reflective of the final cost.

Checklist for Vertical Projects

Existing Conditions

- Is the proposed site for the new building cleared of obstructions and level? If not, an allowance for this work must be added to the ACCE estimated value.
- Does an existing structure need to be demolished to make way for the new building? If so, an allowance for this work must be added to the ACCE estimated value.
- Do existing underground utility lines—including steam tunnels, NAVAIDs, power, water, sewer, fuel, communications, and security—require relocation to make way for the new building? If so, an allowance for this work must be added to the ACCE estimated value.
- Where existing structures and/or utilities are required to be removed, has a hazardous materials assessment survey (asbestos, PCB, lead paint, etc.) been performed? If not, it is recommended that this be performed prior to finalizing a cost estimate for the project, as hazardous materials remediation can represent a significant additional cost as well as a potential delay to the project schedule. Such impacts may be significant enough to reconsider the location of the new building.
- Have geotechnical borings and soils analysis been performed and analyzed? If not, it is recommended that this be performed prior to finalizing a cost estimate for the project, as unsuitable (organic) soils, contaminated soils, and rock/ledge would need to be removed and replaced with structural fill, resulting in a significant additional cost as well as a potential delay to the project schedule. Such impacts may be significant enough to reconsider the location of the new building.
- Has a comprehensive site survey been performed? If not, it is recommended that this be performed prior to finalizing a cost estimate for the project, as potential cost/schedule impacts related to underground utilities/structures and property boundaries can be revealed and estimated.
- Is the project site in an area where archaeological resources may be present? If so, it is recommended that the local and/or state historic commission be consulted regarding their potential requirements for study prior to proceeding with construction, as this could impact the project schedule.

Project Scope

- Is the proposed project a renovation? If so, has an existing conditions assessment been performed in relation to code deficiencies which may be required to be addressed as part of a renovation? If not, it is recommended that this be performed prior to finalizing a cost estimate for the project. Examples include structural, energy efficiency, and accessibility (ADA) upgrades which may be triggered by the local building code and increase the intended scope of the renovation. Such impacts may be significant enough to consider demolition and new construction rather than renovation.
- Is the proposed project an addition to an existing building? If so, has an existing conditions assessment been performed in relation to code deficiencies in the existing building which may be required to be addressed as part of an addition? If not, it is recommended that this be performed prior to finalizing a cost estimate for the project. A significant size addition may require code-related upgrades to the existing building even if such upgrades are not desired by the owner. Such impacts may be significant enough to consider construction of a separate new building rather than an addition.
- Does the existing and/or new building contain tenant spaces? If so, a number of considerations come into effect:
  - If the tenant will be displaced, temporary facilities to allow the tenant uninterrupted operations may be required.
  - If the tenant lease includes a clause which limits disruption from noise or vibration, certain construction activities may need to be limited to occur after hours.

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  - If the tenant requires special infrastructure (i.e., power, grease trap, ventilation, etc.), facilities (i.e., hazmat storage), or fit-out of furnishings and equipment (i.e., cooking/kitchen equipment), it is recommended the costs associated with these items be negotiated between tenant and airport prior to finalizing a cost estimate for the project.
- Are the required utility connections (power, water, gas, sewer, and telecommunications) available directly at the proposed building location? If not, extension of the primary utility lines to the building location may be required as part of the project, and consultation with the utility companies to establish additional costs is recommended prior to finalizing a cost estimate for the project.
- Are there any separate but related "enabling" projects that must occur for this project to proceed? If so, the capital plan should clarify if these enabling project costs are to be included in the cost of this project, or are to be addressed separately. Examples include relocation of a security fence, construction of new space for current occupants of a building scheduled to be demolished, construction of a new access road, etc.
- Does the new facility require purchase of any special equipment, technology, or infrastructure which is beyond that typically provided as part of this type of facility? If so, the higher range of the estimate generated by ACCE is likely more reflective of these special equipment costs.
- Will the project include all new furniture, computers, communications equipment, appliances, and the like? If so, the higher range of the estimate generated by ACCE is likely more reflective of these added costs.
- Will the airport need to engage the services of a professional moving company to relocate their furniture, materials, and operational items from an existing facility into the new facility? Will any of these items need to be placed in off-site storage during construction? If so, the higher range of the estimate generated by ACCE is likely more reflective of these moving and storage costs.

Specific Project Conditions

- Is the airport located in a remote area where construction labor and materials are in limited supply, or where physical access to the airport is challenging (i.e., an island location). If so, the higher range of the estimate generated by ACCE is likely more reflective of these remoteness costs. In this instance the airport may consider setting the project schedule so that the majority of work occurs during periods of the year where access to the airport is least challenging and therefore least expensive.
- If the airport is located in a cold-weather climate, will major portions of the exterior construction be performed during winter months? If so, the higher range of the estimate generated by ACCE is likely more reflective of these winter-conditions costs. In this instance the airport may consider modifying the project schedule to avoid exterior construction work during cold-weather months.
- Will temporary facilities be needed for operational staff during construction? In cases of a major renovation, or where the demolition of an existing building is required to occur prior to the new building being ready for operations, some form of temporary facility is needed to maintain operations until the new building is complete. If so, an allowance for this work must be added to the ACCE estimated value.
- Will the project be phased in order to accommodate both construction and ongoing airport operations within the same general area? Limiting the physical areas where construction work may proceed to various time periods is very common with airport projects, but does involve cost premiums. If so, the higher range of the estimate generated by ACCE is likely more reflective of these winter-conditions costs.
- Does a critical completion date exist for the project? Furthermore, must the project be completed within an accelerated time frame? If so, the higher range of the estimate generated by ACCE is likely more reflective of this accelerated schedule.

- Does the project involve airside construction? If so, the higher range of the estimate generated by ACCE is likely more reflective of these security/operational costs, as airside projects require more extensive security and operational restrictions. In this instance the airport may consider relocating the SIDA barrier temporarily to allow for the project site to be designated as occurring landside throughout construction.

Project Jurisdiction

- Are any federal or state environmental permits required? It is recommended that this be determined prior to finalizing a cost estimate for the project, as both state and federal environmental permit processes can last a year or longer and incur significant consultant fees.
- Are any special local variances, hearings, or approvals required? Local approvals which can sometimes impact a project cost and/or schedule include the following:
  - Local design review board: Many communities have regulatory design standards (sometimes related to historic districts), which are often more appropriate to residential and/or small commercial developments than to functional and secure airport facilities.
  - Conservation commission: Stormwater drainage, rare species habitats, and wetlands habitat are common considerations.
  - Zoning board: Airport buildings are often larger than typical buildings in small communities, and thus require zoning exemptions and/or special permits.
- Will any special mitigation measures be required by local authorities in order to obtain approval for the project? It is recommended that this be determined prior to finalizing a cost estimate for the project, as certain mitigation measures can significantly impact both cost and schedule. Examples include creation of a replacement habitat elsewhere on airport property, noise/visual barriers between the project location and abutters, and purchase of adjacent properties.

There are of course numerous other considerations which could affect project cost and schedule and which are unique to each airport. The preceding checklists are intended to assist the airport in anticipating and planning for potential issues in advance, thus assisting in a more predictable process of design and construction which would more closely align with the estimates developed by ACCE.

CHAPTER 6

Lessons Learned

An accurate cost estimate is recognized by practically all stakeholders as being a significant contributor to successful airport capital improvement planning. Access to reliable cost estimates helps ensure optimal use of limited airport investment funds and reduces the risk of project cancellations or cutbacks. At the same time, there are a number of recognized risks that affect the quality of any cost estimate, no matter how sound the underlying methodology is. These include scope changes, volatility in material costs, uncertainty in mobilization costs, environmental issues, community concerns, the inherent complexity of airport systems, contractor management issues, and poor implementation of best practices.

The literature review and stakeholder survey conducted for this study describe the current practices for estimating costs for airport construction projects in both the horizontal and vertical domains. In general, existing practices utilize well-established and proven methodologies. The methodologies draw on procedures and guidance published by a number of entities that provide relevant resources, particularly professional organizations and state agencies. Cost estimating for vertical projects has an added layer of structure through the use of standard classification schemes.

The two primary methods used for estimating airport project costs are estimation through historical bid prices and cost-based estimating. All existing methods are limited in their ability to accurately account for unique project conditions. Such uncertainties can significantly affect the estimate and can result in wide variations between initial cost assumptions and the actual costs incurred on a particular project. To account for such risks, contingency analyses are often applied, but usually in a simplified manner. A typical method is the inclusion of a percentage multiplier to line item quantities and/or an overall contingency factor that is applied to the final cost estimate. There are few, if any, standards for applying such contingency factors. The stakeholder outreach effort conducted for this project indicates that the numerical values used can vary greatly. Since overall contingency factors can be applied on top of contingencies for line item quantities, the cumulative contingency can be substantial. The lack of established standards in this area results in potentially large variations.

Use of computer models for cost estimating is not currently a common practice for airport construction. It is less clear whether this is due to lack of availability of suitable models or whether the challenges in airport construction cost estimating are not easily solved through computer modeling techniques. It does, however, indicate the potential for the development of an airport-specific model, provided the challenges identified previously are carefully considered and the appropriate solutions are identified. Lessons learned through the course of this study, potential solutions to some of the challenges, and recommendations for future work are discussed in the following sections.

Challenges to Developing an Airport Cost-Estimating Model

The literature review and industry stakeholder survey conducted as part of this study addressed existing sources of cost data. The practice of storing past bid tabulations is common and a number of agencies maintain their own cost data. Nonetheless, for the purpose of developing a comprehensive cost model, several significant challenges related to data availability exist:

- Many of the most commonly used data sources are proprietary and cannot readily be distributed as part of a publicly accessible model intended for delivery through the ACRP.
- Data maintained by public agencies are distributed across a range of state and regional agencies and stored in inconsistent formats.
- There is no standard format for data and in many cases the data is stored in formats that are notionally electronic but essentially represent digital versions of printed documents (e.g., the PDF format). This precludes automated transfer of historical cost data into a comprehensive cost database.
- Even when cost data is available, data for the key cost drivers represented by the CIVs is often not. For example, for a pavement project, the amount of asphalt or concrete required is usually included, but quantified as volumes. Key cost drivers such as the pavement surface area, design aircraft MTOW, landing gear configuration, and design freezing index are usually not included.
- Historical grant information often contains several projects that have been bundled together in such a way that prevents costs and CIV data to be separately identified and assigned to specific project types.

The main challenge in developing an effective cost model for airport projects using parametric cost-estimating methodology is in fact the availability of a sufficiently large and rich set of historical data. Assembling a cost database that is sufficiently rich in both quantity and variation across geographic locations and project types would address a number of the challenges identified previously. The potential benefits of expanding the cost database are many and include the following:

- Each project type is represented by a unique CER, requiring its own data set. Expanding the data collection would enable cost modeling support for additional project types.
- CERs incorporate independent variables that represent cost drivers and that have a causal relationship with cost. Lack of data limits the number of cost drivers that can be included, reducing the explanatory power of the CER. Variables that are not included but that affect cost result in unexplained variation and less accurate models. Expanding the number of historical observations would allow the inclusion of additional CIVs in the CER, thereby improving the model's ability to predict cost.
- Linear regression is based on statistical samples, which inherently have some random variation. This random variation introduces errors in the resulting cost model. Increasing the number of observations reduces the errors due to random variation in the sampling process.
- Similarly, in the case of a small sample, it is more likely that the results are biased because of lack of variation. For example, if the database is small and contains a disproportionate number of observations from a particular geographic region or type of airport, the likelihood is greater that the model will be biased due to lack of variation in the data. The database should be sufficiently large to ensure variation across geographic locations, urban versus rural communities, and types of airports.
- The larger the database, the less likely it is that user-entered inputs will fall outside the range of the historical observations used to develop the CER in question. As described in Chapter 5, when the CIV input values fall outside the range of historical CIV values used in the cost modeling, the cost estimate is generally more uncertain.

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Future Work

As described previously, future work on the development of a cost model for capital planning purposes should first and foremost focus on expanding the database. This section includes specific recommendations for future data collection practices. These are based on lessons learned during the implementation of the ACCE cost model, as well as recommendations by the research team's airport construction SMEs.

Initiating an effort to expand the data collection requires addressing a number of challenges. These include establishing a framework for collecting the data, establishing support from the airport community, obtaining necessary resources, and creating standards for collection of historical cost and project data. While identifying solutions to some of these challenges is beyond the scope of this study, the key issues that need to be addressed include the following:

- **Organization:** For an expanded data collection effort to be implemented, ideally a framework should be established that can engage a large number of airport participants across the United States. This is necessary to ensure that the resulting database has sufficient number of observations, which is currently the biggest limitation in implementing the parametric cost-estimating method. It would also provide sufficient regional variation, preventing biases due to smaller and more narrowly focused samples. While there are a number of potential options to establish an organization framework, it is not possible to predict the exact makeup. Key stakeholders would likely include trade and industry organizations, state aviation agencies and their umbrella groups, and the Airports organization of the FAA.
- **Resources:** The resources required for this effort would depend on the framework and implementation of an expanded data collection program. The effort would require development of standards, a mechanism to collect data, and management and development of the database. A potential option for an initial effort would be a voluntary pilot project. However, a full implementation of an expanded data collection effort may require identifying a source of project funding.
- **Data collection:** Prior to initiating an expanded data collection effort, standards must be established for the type of data to be collected, including definitions for each field in the database. This is required in order to ensure that the right type of data is collected and that data from different airports, projects, and regions shares consistent definitions. One of the lessons learned in this project is that it can be very difficult and resource intensive to retroactively fill gaps in the database. For this reason, it is important to invest sufficient resources upfront, to ensure that effective and comprehensive data standards are established. These standards should balance the need for a rich data set to support the cost model development with ease of data collection. If the data requirements are too onerous, the data collection will suffer from an insufficient number of submitted projects. It is important to keep in mind that the parametric cost-estimating technique requires that each record is complete. In other words, records that are missing value for one or more data fields cannot be included in the statistical analysis used to develop the CERs.

The following section includes additional detail on recommended practices for establishing the data collection framework. These recommendations are based on lessons learned during the conduct of this research project, best practices identified in the literature review and stakeholder outreach effort, and SME input.

Recommendations for Data Collection Practices

The most important step in ensuring a successful data collection effort is the establishment of data standards. These standards should include the following:

- Specifications for general data to be collected for all projects.
- Specifications for project-specific data (i.e., data that varies by project type).

These specifications should both identify the data fields to be collected for each project, as well as provide definitions that clearly identify the intent and meaning of each field. These definitions should be sufficiently detailed so as to ensure that data are collected consistently. As an example, consider the CIV "area" for vertical projects. The definition should specify that the combined floor area across all stories should be included. The definition should also determine whether the floor space should be measured to the exterior and interior walls and address the handling of unusable space. Finally, for each data field, the units of measurements should be specified (where applicable).

General Data

The requirements for collecting general data are likely to be very similar to the data collected during the course of this project. However, some added specificity and improvements are possible. Likely data fields include the following:

- **Record identifier:** Each record in the database should be assigned a unique identifier that can be used for indexing and cross-referencing purposes.
- **Airport identifier:** A unique airport identifier is required in order to establish the location of the project. This is necessary to adjust for regional variation and can also be used to test that the database is not biased toward a specific geographic area. It also allows for follow-up queries, for example, if the data collected for the airport contains inconsistencies or missing fields. The data requirements should specify whether the FAA or International Civil Aviation Organization identifier should be used. If the identifier is linked to an airport database, no additional geographic information needs to be collected. If this is not the case, or the airport is not in the database being used, it is recommended that one or more of the following geographic identifiers be collected: zip code, county, and/or state.
- **Project type:** The project type allows the data to be mapped to a specific CER. While this requires that the project types be static (i.e., they must be established in advance), the research conducted during this project suggests that a relatively small number of project types account for the majority of construction projects. In this study, the number of supported project types was limited to eight. However, this was primarily the result of limited data availability. In an expanded data collection effort, it is recommended that a broader range of project types be supported. The projects originally identified as candidates for inclusion can serve as the starting point for identifying the project types to be supported in a future effort:
  - Airfield signage
  - Construct ARFF facility
  - Construct or rehabilitate taxiway
  - Construct parking garage
  - Construct parking lot
  - Construct SRE building
  - Construct, expand, or rehabilitate apron
  - Construct, expand, or rehabilitate terminal building
  - Construct, extend, or rehabilitate runway
  - Improve runway safety area
  - Install airport visual aid
  - Install NAVAIDs
  - Install perimeter fencing
  - Install weather reporting equipment
  - Rehabilitate runway lighting
  - Remove obstructions
  - Runway pavement marking
  - Security access systems

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- **Project description:** The project description is useful for identifying project type and, especially, for determining whether the project includes bundled construction types. It appears most practical to leave the project description as a free text field. However, guidelines should be established for the level of specificity desired in the description. For example, for pavement projects, it should be clear whether the project consists of constructing a new pavement area, expanding an existing pavement area, or rehabilitating old pavement. The type of pavement used (i.e., asphalt, PCC, or a hybrid) should be specified. The description should specify whether the project includes design only, construction only, or both. A table of relevant keywords may serve as a useful guide to craft clear and comprehensive project descriptions.
- **Year:** The year of construction is required for normalizing construction costs to take inflation into account. This is a relatively straightforward input, but the guidance should specify whether calendar or fiscal year should be used, and how to treat projects that span multiple years. Also, some thought should be given as to which is most relevant to the cost modeling—the year(s) of construction activity or the budget year(s) associated with the grant funds expended on the project.
- **Total project cost:** Project cost is the sole dependent variable in the parametric cost methodology presented here and is the most critical variable in the model. For this reason, particular care should be taken in both defining the meaning of total project cost and in ensuring that the data is collected according to the resulting definition.

  In the database created for this project, cost was unavailable for some data records and had to be estimated based on the federal share for AIP-funded projects. While the federal share is theoretically established by formula allocation, in practice, the share can vary from project to project due to items ineligible for federal funding. For this reason, estimating the total project cost based on the federal share is not ideal and is likely to introduce inaccuracies in the cost database.

  The guidance for collecting historical project cost data should clearly specify that total costs should be considered. This total includes the federal share, the state share, and the sponsor's share. Moreover, guidance should specify which stage in the project the historical cost should be based on. Options range from the cost provided during the bidding phase to that provided on the project close-out report. In general, the latest available cost data is preferred.

  Another important aspect of providing specifications for the collection of historical costs is the treatment of soft costs. Soft costs typically range from 10% to 30% of total project costs. These include design fees, permitting fees, utilities, costs associated with inspections and land acquisition, costs associated with the bidding and procurement process, and project administration and management costs. The guidance should clearly specify which costs should be included, so that the historical cost data follows a consistent pattern that allows for pooling historical observations across many projects and airports.

Project-Specific Data

The project-specific data is the set of historical values for the CIVs that are part of the hypothesized CER for the project type under consideration. Since one of the major goals of any expanded data collection effort is to improve the performance and robustness of the cost model, the number of CIVs should be expanded significantly from the final list selected for the development of ACCE. The goal should be to identify and include all major variables that are measurable and that have the potential to affect the cost of a project significantly. At the same time, since the number of data points required increases with the number of CIVs included, the guidelines should not call for the inclusion of CIVs that only have a minor impact on cost. If the number of CIVs is excessive, the labor effort required to collect historical project data could also increase to the point that the number of records collected is substantially reduced. It is important to keep in mind that in order for a past project to be included in the model, all fields must be complete, which means a value must be collected for each CIV included in the CER.

Table 13. Potential cost drivers for horizontal airport construction project.

ro e t Cate or	C	C	C	C	C
ir iel si na e	No. of intersections	Airplane design group	Control tower		
Constru t or re a ilitate taxi a	Area	MTO	Landing gear configuration	avement type	Design free ing index value
Constru t par in lot	No. of spaces	Drainage type			
Constru t expan or re a ilitate apron	Area	MTO	Landing gear configuration	avement type	Design free ing index value
Constru t exten or re a ilitate run a	Area	MTO	Landing gear configuration	avement type	Design free ing index value
nstall airport isual ai	Type of system	No. of systems/ runway ends			
nstall s	Type of NAVAID				
nstall peri eter en in	Length	No. of automatic gates	No. of manual gates	No. of pedestrian gates	
nstall or re a ilitate run a li tin	Length	Runway approach type			
nstall eat er reportin e uip ent	Type of equipment				
e a ilitate run a li tin	Length	Runway approach type			
e o e on airport o stru tions e etation	Acres				
un a pa e ent ar in	Length	Runway approach type			
e urit a ess s ste s	No. of pedestrian gates	No. of vehicle gates			

In identifying which CIVs to include, the CERs hypothesized at the beginning of this project will serve as a useful starting point. This is because the original CERs included many more CIVs than contained in the final database, since the number of CIVs was reduced substantially to deal with the lack of available data. An expanded data collection effort should allow for a number of the rejected CIVs to be included in the model as originally intended. Table 13 displays a list of proposed CIVs for potential horizontal projects and Table 14 displays a similar list for vertical projects. These lists employ up to six CIVs per project type (compared to three for the cost model implemented in ACCE).

Table 14. Potential cost drivers for vertical airport construction projects.

ro e t Cate or	C	C	C	C	C	C
Constru t a ilit	Area	No. of stories	No. of bays	Construction type	uilding skin type	ite conditions
Constru t expan or re a ilitate ter inal uil in	Area	No. of stories	No. of spaces	tructural system	Architectural treatment	Lobby area
Constru t par in ara e	Area	No. of stories	Construction type	uilding skin type	ite conditions	
Constru t E uil in	Area	Annual enplanements	No. of stories	uilding skin type	ite conditions	

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Conclusions

The goal of this project was to develop a model and database for estimating the cost of airport construction projects during the capital planning phase. The recommend approach—parametric cost estimating—uses historical cost data to establish mathematical relationships between construction cost and the hypothesized cost drivers for the project type in question.

The study resulted in the creation of a database that includes data on construction cost and cost drivers for eight different types of airport construction projects. The database was used to develop a statistical cost model using the parametric cost-estimating approach. Both the database and the model were implemented in Microsoft Excel. A user interface allows the user to enter airport and project-specific information and generate a cost estimate report that can then be saved, printed, or exported. The model also provides a simple what-if analysis capability that allows the user to modify the assumptions. The resulting cost estimates are adjusted for inflation and geographical variations in construction cost. The cost estimate is presented as a range of estimates, with best, low, and high values. This allows the user to take into account uncertainties and unique factors that affect cost.

The cost model was evaluated using statistical measures of quality of fit and subjective evaluations by the research team's SMEs. The model was also validated using a case study approach. The model passes the statistical tests of significance and quality of fit and, in general, generates cost estimates that match the experience of the SMEs. The research team concludes that the parametric cost-estimating methodology is a suitable approach for cost estimating for airport construction projects. This is especially true in the capital planning phase, where cost estimates need to balance accuracy with the effort required to develop the estimates. At the same time, the validation effort showed that the performance of the model is highly variable. Depending on the project type and specific circumstances, actual costs may vary significantly from those predicted by the model. This is true even when considering the range of low and high estimates provided by the model to take uncertainty into account. For this reason, the model should be treated as a proof-of-concept tool. Estimates prepared with the current model should only be used for initial planning purposes and should not be the sole means for evaluating the cost of a proposed project.

The lack of robustness and variations in performance in the model are primarily caused by the limited availability of historical cost data. Collecting data in a format that supports inclusion in a cost database was the greatest challenge identified by the research team. Data is often stored in a manner that prevents the data from being imported electronically. Also, in many cases the total project cost is available but not the values of the cost drivers that are required to perform the cost estimate. Finally, bundling of multiple projects frequently prevents historical project data from being used in the model.

Because the model suffers from a lack of robustness, the guidebook contains specific and in-depth recommendations on how to interpret the results and identify specific risks. Checklists are included for evaluating the results in order to assess the uncertainty of the cost estimate report. If the checklists identify risks that could drive the cost up or down, the airport should consider using the high or low range of the estimate. If the risk assessment reveals an unusually high level of uncertainty, an alternative cost estimate should be considered.

The guidebook includes a series of recommended best practices for any future data collection intended to update and expand the model. Increasing the number of observations and incorporating additional cost drivers are likely to substantially improve model performance. For this reason, the guidance on expanded data collection is the focus of the discussion on recommended future research.

Any expanded data collection would require a framework for collecting the data in a centralized manner. Standards need to be established to ensure data consistency and that the format supports transfer into a spreadsheet or database. Consideration should also be given to collecting site plans. These drawings provide important information on project dimensions, such as the size of pavement surface areas. Analyzing such information would require analysis by an architect or engineer to interpret the drawings, however.

A key finding of the data collection effort is that there is no single entity that can provide the data required to expand and improve the model. Consequently, the research team suggests that a cooperative approach to data collection be considered that involves state aviation agencies, transportation departments, industry organizations, and the FAA Airports organization, especially at the regional level. The research team believes that a broad-based, collaborative approach to the collection of airport project and cost data has the greatest potential for achieving the best outcome. The resulting improvements could provide substantial benefits to the airport community by enabling standardized and more accurate cost estimates to be available in the capital planning phase.

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APPENDIX A

Cost-Estimating Relationships

Table A.1 shows the coefficients that define the cost-estimating relationships (CERs) in the final cost model. The CERs used here take the general linear form:

$$C = \beta_0 + \beta_1 CIV_1 + \beta_2 CIV_2$$

where C is the total construction cost (normalized to FY 2014 Kansas dollars), β_0 is the intercept, β_1 is the coefficient multiplying the value of the first candidate independent variable (CIV_1), and β_2 is the coefficient multiplying the value of the second candidate independent variable (CIV_2). Note that in the final version of the cost model, for all but one CER, the intercept is zero. Also, only the pavement-related CERs have two independent variables (i.e., the runway, apron, and taxiway project types). "Adjusted" maximum takeoff weight (MTOW) indicates that the MTOW has been converted to a single-wheel-equivalent MTOW, as described in Chapter 4.

Table A.2 displays measures of statistical fit for each CER in the final cost model. The measures shown are adjusted R^2 and the P-values associated with the t-statistics for the coefficients for the independent variables. As described in Chapter 3, adjusted R^2 value is a measure of the overall correlation between construction cost and the cost drivers (i.e., CIVs) selected for inclusion in the CERs. Values close to one indicate a good statistical fit. Unlike adjusted R^2, P-values are computed separately for each coefficient (i.e., β_1 and β_2). They represent measures of the statistical significance of the corresponding independent variable as a predictor of cost. Low P-values (i.e., close to zero) indicate high levels of statistical significance.

The P-value for a statistical test associated with the F-statistic is also shown. This test indicates whether a significant linear relationship exists between cost and the CIVs (as opposed to a constant value). For this project, a statistical significance of 95% was adopted as the standard, which corresponds to a target P-value of 5% or less.

Note that the CERs for installing PAPIs and weather reporting equipment consist of a simple arithmetic mean of the historical cost of each installation in the database. For this reason, statistical measures of quality of fit are not available. Since the construction of PAPIs can involve installations at multiple runway ends, the CER consists of the mean cost per system multiplied by the number of systems to be installed.

The remaining sections of this appendix contain graphs that plot the predicted cost for each data point, as estimated using the CER derived for the project type in question, against the observed actual cost. Note that both predicted and actual cost values have been normalized to thousands of FY 2014 Kansas state dollars. For a CER that predicts costs perfectly, the plot of predicted versus actual costs would fall on a line through the origin with slope one. This line is

Table A.1. Final cost-estimating relationships.

Project Type	Intercept (FY 2014 KS $)	Coefficient 1		Coefficient 2	
Horizontal Projects					
Construct or rehabilitate taxiway		11.9	Pavement area (sq. ft.)	6.1	MTOW (lbs.)
Construct, expand, or rehabilitate apron		1.2	Pavement area (sq. ft.)	12.2	MTOW (lbs.)
Construct, extend, or rehabilitate runway		2.9	Pavement area (sq. ft.)	35.4	Adj. MTOW (lbs.)
Install perimeter fencing		32.2	Fencing (linear ft.)		
Install PAPI		83.1	No. of systems		
Install weather reporting equipment	171,700				
Vertical Projects					
Construct ARFF facility		374.5	Floor area (sq. ft.)		
Construct SRE building	111,500	116.5	Floor area (sq. ft.)		

Table A.2. Statistical tests.

Project Type	Adj. R2	P-value β_1	P-value β_2	P-value F-statistic
Horizontal Projects				
Construct or rehabilitate taxiway	82.5%	0.0%	0.4%	0.0%
Construct, expand, or rehabilitate apron	87.4%	1.6%	0.0%	0.0%
Construct, extend, or rehabilitate runway	83.7%	0.1%	0.1%	0.0%
Install perimeter fencing	83.5%	0.0%		0.0%
Install PAPI	N/A	N/A	N/A	N/A
Install weather reporting equipment	N/A	N/A	N/A	N/A
Vertical Projects				
Construct ARFF facility	88.2%	0.0%		0.0%
Construct SRE building	88.3%	0.0%		0.0%

shown as a reference: The amount of scatter about the reference line serves as a visual indicator of the predictive ability of each CER. One graph is shown for each project type in the final cost model (except for "install PAPI" and "install weather reporting equipment," which use simplified CERs, as described previously).

Horizontal Projects

Figures A.1 through A.4 plot the predicted cost for each data point against the observed actual cost for four of the horizontal project types in the final cost model.

Vertical Projects

Figures A.5 and A.6 plot the predicted cost for each data point against the observed actual cost for the vertical project types in the final cost model.

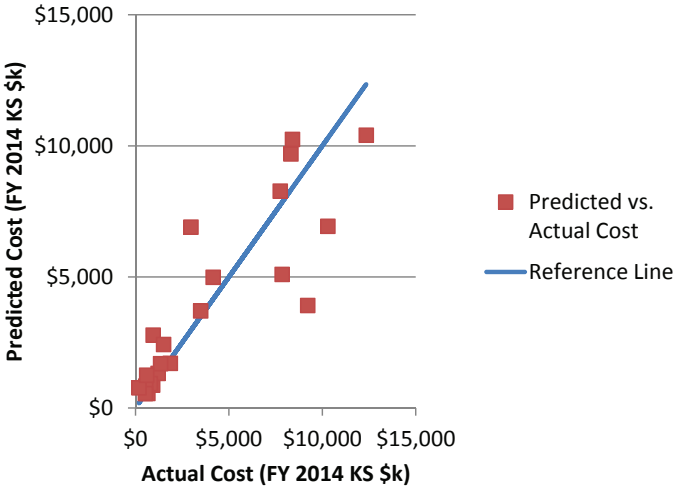


Figure A.1. Predicted vs. actual cost—construct or rehabilitate taxiway.

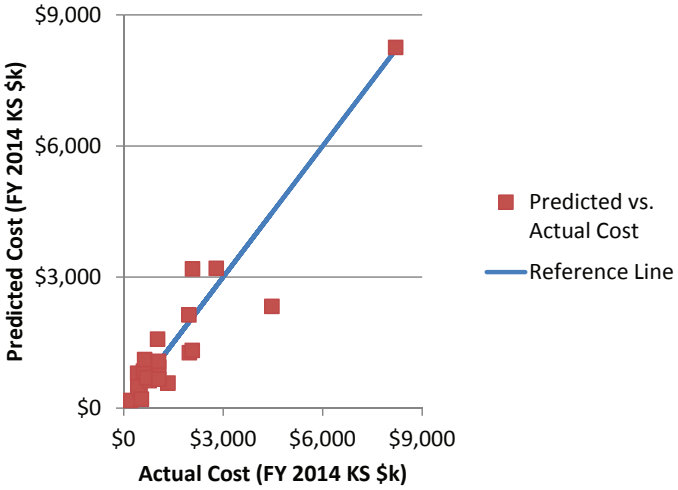


Figure A.2. Predicted vs. actual cost—construct, expand, or rehabilitate apron.

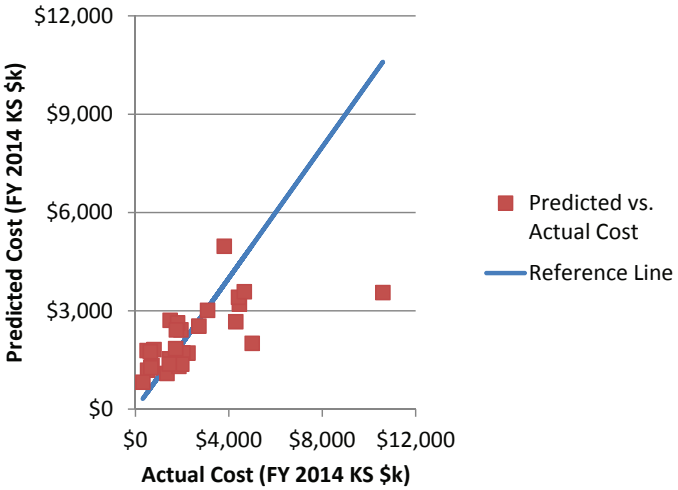


Figure A.3. Predicted vs. actual cost—construct, extend or rehabilitate runway.

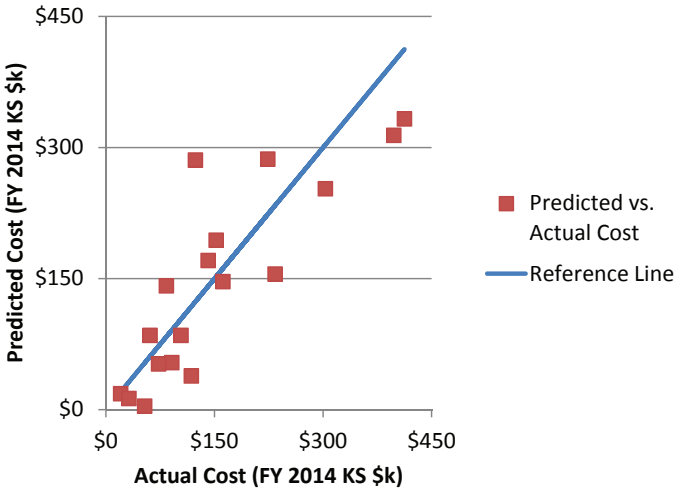


Figure A.4. Predicted vs. actual cost—install perimeter fencing.

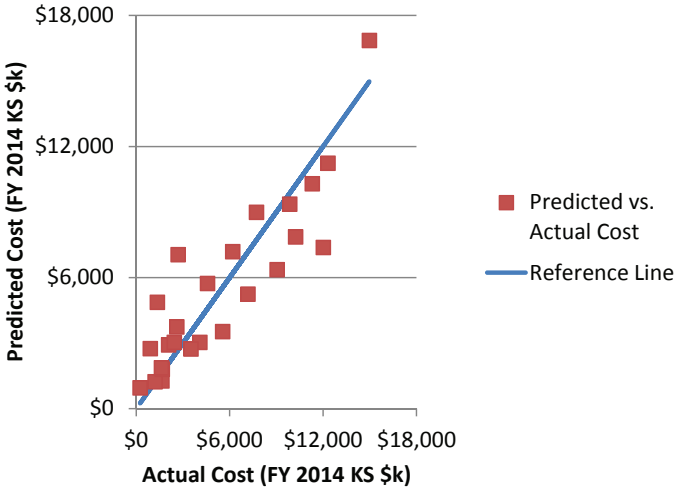


Figure A.5. Predicted vs. actual cost—construct ARFF facility.

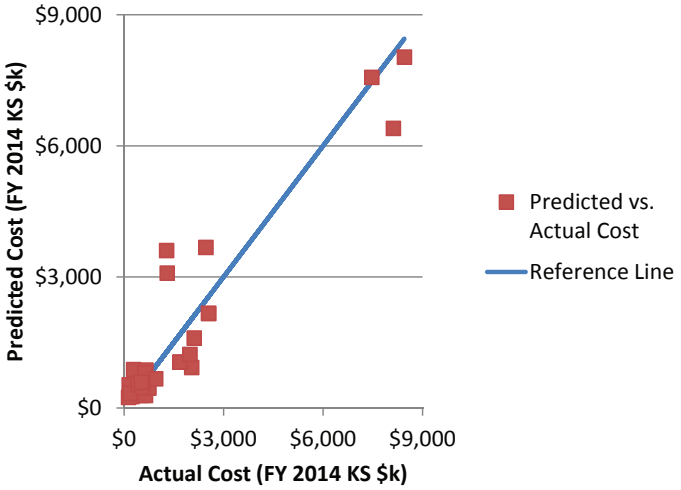


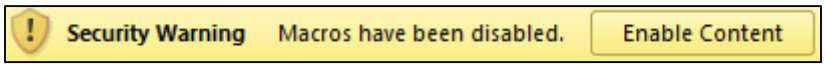
Figure A.6. Predicted vs. actual cost—construct SRE building.

APPENDIX B

ACCE Quick Reference Guide

Running ACCE

✓ ACCE requires 32-bit Microsoft® Excel (version 2007 or later) and a display resolution of 1024x768 pixels or greater.
✓ To start ACCE, click on the button **ACCE** on the accompanying CD or right click on the file **ACCE.xlsm** and select "Open" (or double click on the file name to begin the program).
✓ ACCE requires an Excel function known as "macros" in order to function properly. If a pop-up message with an "Enable Macros" or "Enable Content" button appears, that content should be enabled:



If no warning appears, macros have already been enabled and ACCE is ready to be used.

Before Starting

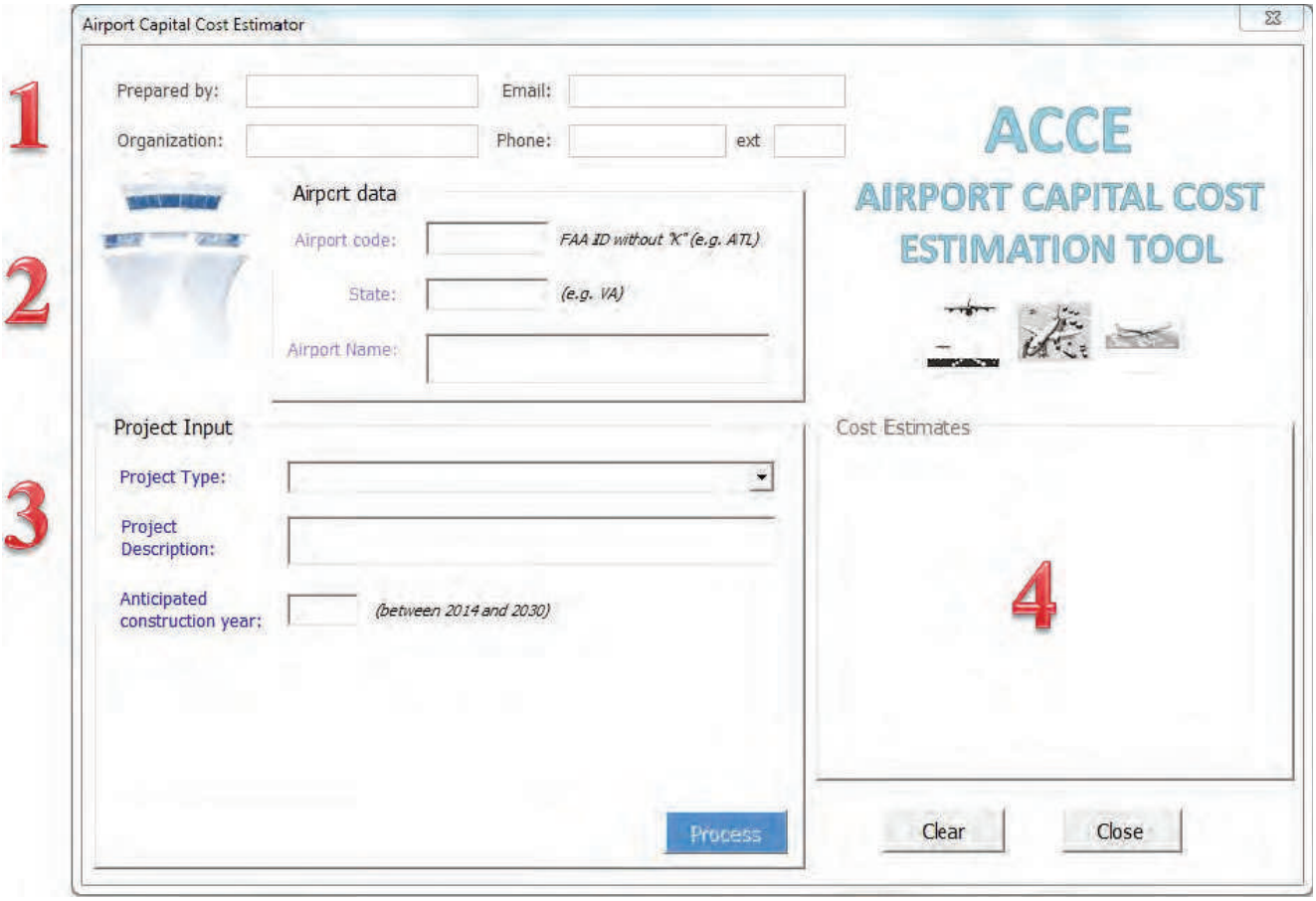
Before starting, have the following information ready:

- Description of proposed construction project.
- Planned year of construction.
- Values for key cost drivers:
  - Pavement projects: Pavement area (square ft.), design aircraft MTOW (lbs.), and, for runway construction projects, design aircraft landing gear configuration (SW/DW/DTW/DDTW)
  - Security fence projects: Length (ft.)
  - SRE building and ARFF facility projects: Combined floor area (square ft.)

Input Window

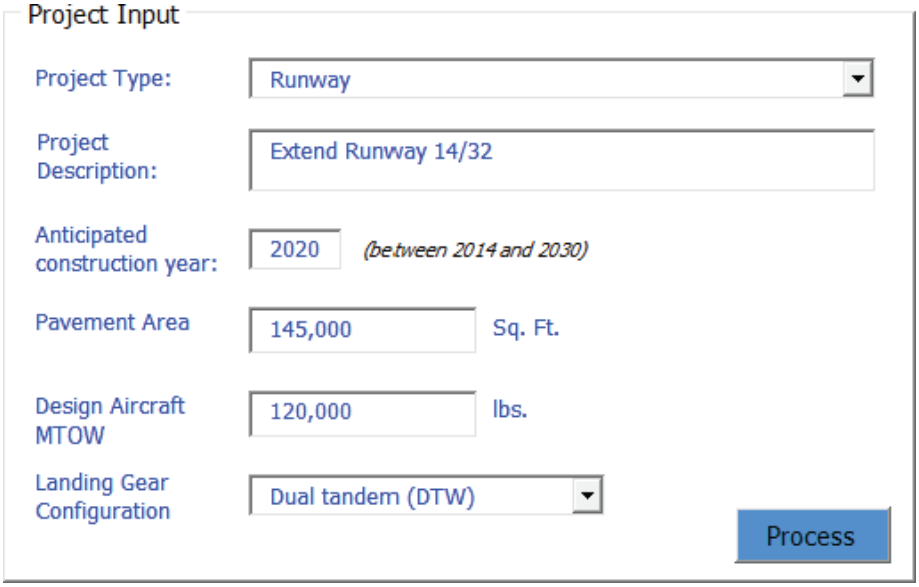
✓ The ACCE input window is displayed automatically when opening the tool. It consists of four sections:

1. Contact information: To be used for entering the name and contact information of the preparer of the cost estimate. This information is optional.
2. Airport data: Includes the three-letter FAA identifier, state abbreviation, and name. For NPIAS airports, only the identifier has to be entered: The remaining information is retrieved automatically. This information is required.



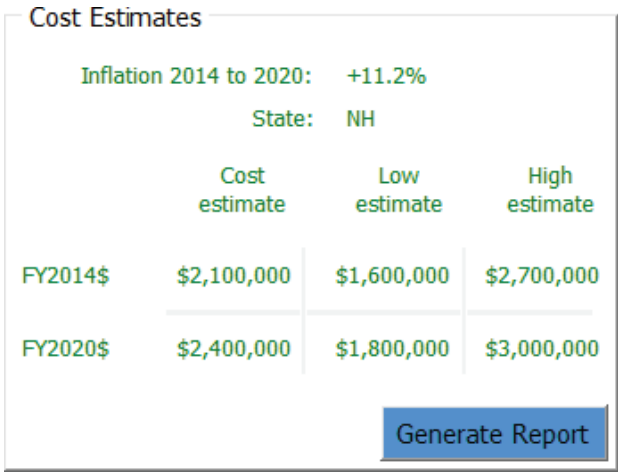
3. Project input: This includes a drop-down menu for selecting the project type, a text field for free-form entry of a project description, and a field for the construction year. Once the project type has been selected, additional input fields are shown for entering the input values for the key cost drivers. This information is required.

   Example:



4. Cost estimate: Once the project input data has been entered, the "Process" button can be used. This causes a cost estimate to be instantaneously calculated and shown to the right of the project input section. This estimate can be updated by changing the project input values and pressing "Process" again. Selecting "Generate Report" will produce the final output—the cost estimate report.

   Example:



Other features:

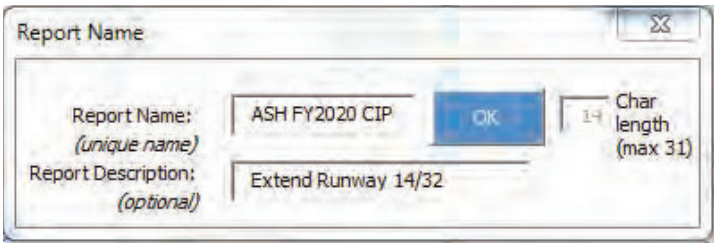
✓ The "Clear" button can be used to clear the input values, in order to generate a brand new cost estimate.
✓ The "Close" button closes the ACCE tool and returns the user to Microsoft Excel.

Project Types

✓ The project type is selected using a drop-down menu in the project input section.
✓ The following project types are supported:
- Aircraft Rescue and Fire Fighting (ARFF) Facility
- Apron
- Automated Weather Observing System
- Perimeter Fencing
- Precision Approach Path Indicator (PAPI)
- Runway
- Snow Removal Equipment (SRE) Building
- Taxiway

Cost Estimate Report

✓ Provide a name and an optional description to identify the cost estimate. **Note: The report name can be a maximum of 31 characters and must conform to Excel naming conventions.**
✓ Press OK to generate the cost estimate report.
✓ The cost estimate report displays the contact and airport information, the date and time the report was generated, the project input data, and the cost estimate.



✓ The cost estimate includes a low estimate and high estimate that create a range of possible costs. The low and high estimates are based on the level of statistical uncertainty in the cost model for the project type in question.
✓ Cost estimates are provided both in fiscal year (FY) 2014 dollars and in inflation-adjusted dollars for the proposed year of construction. The inflation adjustment is based on predicted increases in general price levels (i.e., not increases in construction-specific costs).

Airport Capital Cost Estimation Tool: Report

Report Name	ASH FY2020 CIP
Report Description	Extend Runway 14/32
Name of Preparer	Elena Smith
Organization	Nashua Airport Authority
Phone number	(603) 123-4567, Ext. 1200
Email	emith@flyash.com
Date Created	1/28/14 8:48 AM
FAA Airport ID	ASH
State	NH
Airport Name	Boire Field
Project Type	Runway
Project Description	Extend Runway 14/32
Planned Year of Construction	2020
Pavement Area	145,000 Sq. Ft.
Design Aircraft MTOW	120,000 lbs.
Landing gear configuration	Dual tandem (DTW)

Output

	Cost Estimate	Low Estimate	High Estimate
FY2014$	$2,100,000	$1,600,000	$2,700,000
FY2020$	$2,400,000	$1,800,000	$3,000,000

Inflation 2014 to 2020: +11.2%

Disclaimer: *This cost model is a proof-of-concept tool developed as a research project under the Airport Cooperative Research Program. Actual costs may differ significantly from the estimates provided here. These cost estimates are intended for initial planning purposes only and should not be used as the sole means to evaluate a proposed project.*

✓ A disclaimer is shown explaining that ACCE is a proof-of-concept tool and that actual costs may differ significantly from the cost estimates produced by the tool.
✓ A toolbar is available below the report:

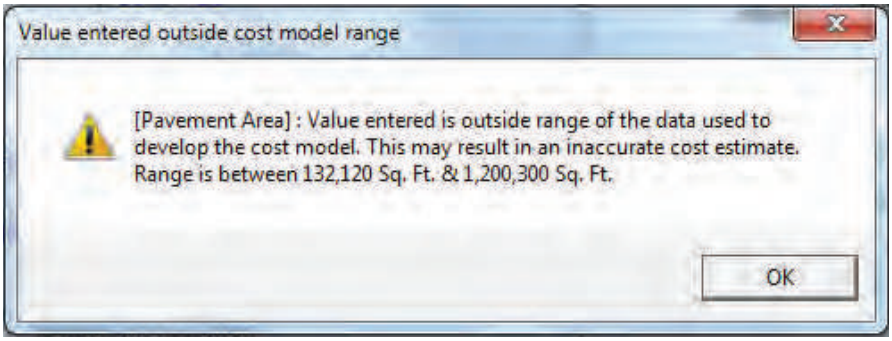
This toolbar supports the following functions:

- Print: Sends the report to a printer attached to the computer or on the network.
- Save as PDF: Saves the report as a PDF file.
- Export: Prompts the user to select a folder and then saves a copy of the report as a Microsoft Excel file with the specified name. Note that only the output is saved (i.e., the cost estimate report). The macros that make up the ACCE tool are not exported.
- Return: Returns to the input window—this allows the user to enter new inputs and generate a different cost estimate (i.e., to create a what-if analysis).

Notes

✓ If the planned year of construction is FY 2014, then inflation-adjusted results are not shown, since these would be identical to the cost estimate expressed in FY 2014 dollars.

✓ If an input value for a key cost driver falls outside the range of values used to develop the cost model for the project type in question, a warning message is displayed indicating that this may result in higher than usual levels of uncertainty:



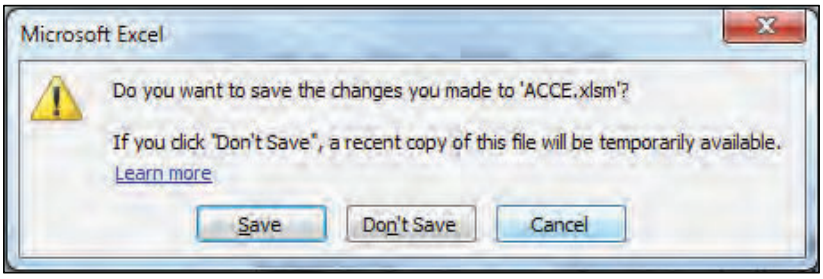
This warning does not, however, preclude use of the entered value—it is only a cautionary note explaining that the value may result in a greater than usual level of uncertainty.

If the user proceeds with the entered value, a similar warning is also displayed in the cost estimate report:

Project Type	Runway
Project Description	Extend Runway 14/32
Planned Year of Construction	2020
Pavement Area	**120,000 Sq. Ft. *****
Design Aircraft MTOW	120,000 lbs.
Landing gear configuration	Dual tandem (DTW)

***** Warning: This input value falls outside the range of data used to develop the cost model. The resulting cost estimate projects into an area that has not been validated and may be inaccurate.**

✓ When exiting Microsoft Excel, the following message may appear:



Generally, "Don't Save" should be selected, to avoid overwriting the ACCE tool with entered data. To save results from a cost estimate, use the "Export" button in the cost estimate report.

Abbreviations and acronyms used without definitions in TRB publications:

A4A	Airlines for America
AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HMCRP	Hazardous Materials Cooperative Research Program
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
MAP-21	Moving Ahead for Progress in the 21st Century Act (2012)
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
RITA	Research and Innovative Technology Administration
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation

Annexure 22

adani

Subject: Constitution of Committee for Review of Electricity Charges

Upon execution of the Concession Agreement between Airports Authority of India (AAI) & Lucknow International Airport Limited (LIAL) & after handing over the commercial operations to LIAL. Madhyanchal Vidyut Vitaran Nigam Ltd supply connection was handed over as a part of agreement .

A committee has been constituted on 22nd Feb 2023 with the following member of LIAL & AAI (Select employee) to review the electricity charges build to concessionaire based on the unit's consumption thereof.

S.NO.	NAME	DESIGNATION	DEPARTMENT
1	Shardool khare	Assistant Manager	AAI
2	Vijay Tiwari	Senior Manager	AAI
3	Sunil Parate	Head E&M	LIAL
4	Manoj Shukla	Head Finance	LIAL

Committee has verified the following:

1. The Separate meters are installed for each concessionaire /User.

2. The meter readings are done on monthly basis & necessary records are maintained.

3. LIAL raises the invoice for the electricity usage charges to concessionaire/user on monthly basis.

4. LIAL Charges to Concessionaire/user on cost-to-cost basis (without any mark-up) based on the actual meter reading & units consumed by each concessionaire/user.

5. Based on the review of electricity invoices raised on the concessionaire/user for the period from Apr 2021 to Dec 2022, **the average power supply utilized by concessionaire/user during the period is 9.58 s%.**

21/03/2023
DM (E-E)
AAI

21/03/2023
AGM(E-E)
AAI/LIAL

Sunil Parate
Head of Engineering/Project
Lucknow International Airport Limited

(Manoj Shukla)
(SFC)

Lucknow International Airport Ltd
(Formerly known as Adani Lucknow International Airport Ltd)
First Floor, Terminal 1
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Uttar Pradesh, India
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