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Ref No: AIAL/CO/AERA-MYTP/2022/4

21st November, 2022

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. 10/2022-23 dated 20th October 2022 in The Matter of Determination of Aeronautical Tariff for Ahmedabad (AMD) for the Third Control Period (01.04.2021 - 31.03.2026)

Dear Sir,

This is in respect to the Consultation Paper No. 10/2022-23 dated 20th October 2022 in The Matter of Determination of Aeronautical Tariff for Ahmedabad (AMD) for the Third Control Period (01.04.2021 - 31.03.2026), we hereby submit our written comments. Since the submission is detailed, we have not used the tabular format as provided in the Annexure 7 of the Consultation Paper, though we have provided the comments chapter-wise.

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

Thanking you

Yours truly,
For Ahmedabad International Airport Limited,

Manoj Chanduka
Director

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Comments on the Consultation Paper No. 10/2022-23 dated 20th October 2022 in the Matter of Determination of Aeronautical Tariff for Sardar Vallabhbhai Patel International Airport (SVPIA). Ahmedabad (AMD) for the Third Control Period (01.04.2021 - 31.03.2026)

Disclaimer

This document has been prepared by Ahmedabad International Airport Limited (AIAL) in response to AERA's Consultation Paper No. 10/2022-23 dated 20th October 2022 in the Matter of Determination of Aeronautical Tariff for Sardar Vallabhbhai International Airport (SVPIA). Ahmedabad (AMD) for the Third Control Period (TCP) (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 AIAL. This document includes statements, which reflect various assumptions and assessments by AIAL 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 AIAL 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, AIAL cannot be held responsible for any errors or omissions. AIAL 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 AIAL 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 AIAL'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
AIAL or AAIAL or AMD	Ahmedabad International Airport Limited
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 AAIAL 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
GoG	Government of Gujarat
GoI	Government of India
GPCB	Gujarat Pollution Control Board

Abbreviation	Expansion
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
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	New Integrated Terminal Building
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
SVPIA	Sardar Vallabhbhai Patel International Airport
T1	Terminal 1 of Ahmedabad Airport
T2	Terminal 2 of Ahmedabad 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 AIAL 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

Table of Contents

Chapter 1 “Comments on Consultation Paper Chapter 1 - Brief on Sardar Vallabhbhai Patel International Airport (SVPIA)”

1.1 AERA comments as per 1.2.2 page 22 of CP relating to Passenger Terminal

1.2.2 (page 22 of CP), The existing terminals are currently undergoing refurbishment and expansion. The project is expected to be completed in the current Financial Year. The passenger handling capacity of the existing terminals (T1 and T2) is expected to increase from 7.5 MPPA to 16.8 MPPA post completion of the upgradation/modification works. The Airport Operator (AO) has also proposed the commissioning of the Phase 1 of the New Integrated Terminal Building (NITB) towards the end of FY 2026 (with a capacity of 20 MPPA). As a result, the total passenger handling capacity would be enhanced to 36.8 MPPA.

Comments by AIAL:-

1.1.1 The comments on the similar matter are provided at 4.1 below. The same may be referred hereto.

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 4.5.20 and 5.4.3 of CP relating to True up of RAB

4.5.20 The Authority proposes to consider the Deemed Initial RAB, which would be the Opening RAB for AIAL as on COD, to be INR 301.77 Cr. (i.e., INR 299.19 Cr + INR 2.59 Cr.) as determined by the Study on the Allocation of Assets (summary of the study is given in Annexure 1 and the study is attached as Appendix 1 of this Consultation Paper).

5.4.3 – Aero Capital Additions (Page 67 of CP)

The study examined the individual asset items capitalized by AIAL and classified them suitably based on the information regarding the assets shared by the Airport Operator. The common assets were further bifurcated between aeronautical and non-aeronautical based on the Terminal Area Ratio of 92.5 : 7.5 (aeronautical : non-aeronautical). The reallocation of assets resulted in a reduction of INR 1.27 in aeronautical capital additions. (Refer Para 6.2.1 and Para 6.2.4 of the Study). As provided in the study, the common assets are allocated in the Terminal Building Ratio of 92.5 : 7.5

Extract from Study on Allocation of assets

4.11.2. The bifurcation of Common assets to aeronautical and non-aeronautical is based on the Terminal Area Ratio (ratio of terminal area allocated towards aeronautical and non-aeronautical activities). As per the submissions of AAI, the average Terminal Area Ratio in the Second Control Period is 94.83 : 5.17 (aeronautical : non-aeronautical). However, the Study has considered the ratio to be 92.5 : 7.5 (aeronautical : non-aeronautical) as approved by the Authority in Order No. 14/2018-19,

8.1.5. The bifurcation of Common assets to aeronautical and non-aeronautical is based on the Terminal Area Ratio (ratio of terminal area allocated towards aeronautical and non-aeronautical activities). As per the submissions of AAI, the average Terminal Area Ratio in the Second Control Period is 94.83 : 5.17 (aeronautical : non-aeronautical). However, the Study has considered the ratio to be 92.5 : 7.5 (aeronautical : non-aeronautical) as approved by the Authority in Order No. 14/2018-19.

Comments by AIAL :-

2.1.1 The comments on the similar matter are provided at 4.2 below. The same may be referred hereto.

2.2 AERA proposal as per 5.4.4 page 68 of CP relating to Intangible Assets (Pre-COD expenditure)

AIAL has capitalised an amount of INR 25.55 Cr. as an intangible asset. The asset is a notional item, the value of which constitutes certain pre-COD expenses incurred by AIAL, AEL and AAHL in the process of winning the concession rights to the airport and until the COD was achieved. The Study noted that the Concession Agreement does not specifically provide for intangible asset, or expenditure which constitutes salary and consulting costs incurred prior to COD, to be included in the RAB. Accordingly, the intangible asset has been excluded by the Study from the aeronautical capital additions considered for the Second Control Period. (Refer Para 6.4 of the Study)

Extract from Study on Allocation of Assets Between Aeronautical and Non-Aeronautical Assets

6.4.3. The following clause in the Concession Agreement may be read with respect to the Intangible assets submitted by the Airport Operator as part of the capital additions:

Clause 5.1.1 – Subject to and on the terms and conditions of this Agreement, the Concessionaire shall, at its own cost and expense, procure finance for and undertake the operations, management and development of the Airport, in accordance with the provisions of the Applicable Permits, Applicable Laws, this Agreement and observe, fulfil, comply with and perform all its obligations set out in this Agreement or arising hereunder.

6.4.4. The aforesaid clause or any other clauses in the Concession does not specifically provide for intangible asset, or expenditure which constitutes salary and consulting costs incurred prior to COD, to be included in the RAB. Accordingly, the intangible asset has been excluded from the aeronautical capital additions considered for the Second Control Period.

Comments by AIAL:-

2.2.1. Adani Enterprises Limited (AEL) was announced the successful bidder for Ahmedabad 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).

2.2.2. 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"

Particular	Details
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. With respect to the comments of the Authority that there is no provision in the CA which specifically permits these expenditures to be capitalized, we would humbly submit that the CA specifically provides for restrictions on some expenditure not to be considered as pass-through for example monthly concession fees. There is no clause in the CA which restrains the expenses incurred before COD to be sought as pass-through, as there is no ambiguity that these expenditures are part of the audited financial statements and are genuine, legitimate and were essential for smooth airport functioning on transition.

2.2.4. Though the Airport was operational before COD, the expenses incurred by AIAL before COD are pre-operative in nature and should be allowed as RAB either by way of it is capitalization and allocation to various assets or capitalized as separate asset as Intangible.

2.2.5. **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.23.82 crores against Rs. 25.55 crores claimed by us. In case the Authority believes that the same cannot be allowed to be capitalized as intangibles for the purpose of arriving at RAB, we request the Authority to allow the same as expenses in the FY20-21 for calculation of ARR. Not considering this expenditure for calculation of ARR would tantamount to penalizing the AO for a successful COD with smooth transition in an operating Airport.**

2.3 AERA proposal as per 5.7.8. page 72 of CP relating to Rationalisation of O&M expenses

5.7.8 b) *The Authority notes that as per the MYTP submission of AIAL, there are 180 Select employees (from AAI) who are deployed at SVPIA since COD. Since these employees are expected to continue serving the airport until the end of the Deemed Deputation Period (i.e., till 3 years from COD), the need for 122 AIAL employees over and above the abovementioned 180 Select employees* ***appears to be unreasonably high****, especially in the first five months of operations. Hence, the Authority has proposed to make certain adjustments to the employee ratio of AIAL.*

Para 6.1.17 to Para 6.1.19 and Table 91 and 92 of the Study on Efficient Operation and Maintenance Expenses indicates that Authority has rationalized the AIAL manpower expenses on the following basis:

i. *Only 6 out of 16 employees of security department considered as Aero providing the following reasons:*

   The Study compared the department wise head count at the other PPP airports and could not find reference to security departments at other airports. Prior to COD, AAI had deployed only one employee in the Security department. Therefore, the need for 16 AIAL employees in this department within the first five months of operation appears to be redundant, especially since the Security related matters are primarily managed by Central Industrial Security Force (CISF). AIAL has also mentioned that this function will be carried out with a mix of on-roll employees and outsourced employees. AIAL was requested to share the details regarding the deployment and responsibilities of each individual. Vide email dated 13th July 2022, AIAL provided the break-up of responsibilities of individual employees in the Security Department. Based on the information provided, it is observed that there are 5 employees engaged in aero activities such as CISF liaising and ILBS. Therefore, the Study has considered these 5 employees as aero and the remaining employees have been excluded.

ii. *Only 3 out of 12 employees of Human Resources & Admin department considered as Aero providing the following reasons:*

   When compared with the employee strength at other matured PPP airports such as HIAL, the number of employees in the HR department in AIAL seems to be quite high (on a per PAX level). It is observed that 23 Select employees are already involved in this department. Hence, the need for additional 12 AIAL employees over and above these 23 Select employees, within the first five months of operation is unjustified. It is understood that AIAL would need to acquire senior management level employees to supervise the Select employees. Based on these facts, 3 employees have been considered by the Study and the remaining 9 employees have been excluded.

iii. *Only 2 out of 10 employees of Engineering & Maintenance department considered as Aero providing the following reasons:*

   When compared with the employee strength at other matured PPP airports such as HIAL, the number of employees in the Engineering & Maintenance department in AIAL seems to be quite high (on a per PAX level). It is also observed that 39 Select employees are already involved in this department. Hence, the need for additional 10 AIAL employees over and above these 39 Select employees is unjustified. Vide email dated 13th July 2022, AIAL provided the break-up of responsibilities of individual employees

in the Engineering & Maintenance Department. Based on the information provided, it is observed that there are 2 employees engaged in aero activities such as Airfield Ground Lighting and Baggage Handling System. Hence, the Study has considered 2 employees as aeronautical, and the remaining 8 employees have been excluded.

5.7.8 c) *Admin & General Expenses were allocated in Gross Block Ratio of 93.66 % (as derived from Table 35 of Study on Allocation of Assets – an extract of the same is appended below).*

Particulars	***Reference***	***Asset Value as on 31st Mar'21***
Aero Gross Block	*A*	*751.85*
Non-Aero Gross Block	*B*	*24.35*
Excluded Gross Block	*C*	*26.52*
Total Gross Block	*D=A+B+C*	*802.71*
Gross Block Ratio Proposed by AERA	*E=A/D*100*	*93.66%*

5.7.8 d) *R&M Expenses: The aeronautical R&M expenses of INR 10.41 Cr. as proposed by the Authority (post reallocation) was compared as a percentage of the opening RAB of AIAL in a similar manner as done in the case of AAI. The Authority noted that the extrapolated R&M expense (INR 26.25 Cr.) was found to be greater than 6% of the opening RAB of AIAL. Hence, the Authority proposes to rationalise the R&M expenses of AIAL at 6% of opening RAB.*

Para 6.1.41 and 6.1.42 of the Study on Efficient Operation and Maintenance Expenses mentions that:
6.1.41. It can be observed from the above table that the R&M expense as a % of opening RAB are higher than 6%. It is seen that in the case of Pune (Order No. 45/2021-22 dated 17th March 2022) and Calicut (Order No. 39/2021-22 dated 11th February 2022), AERA has considered the R&M expenses to be reasonable provided that they are within 6% of the Opening RAB for each Tariff Year (Refer Para 5.6.2).
6.1.42. In view of the above, the R&M expenses have been rationalized as shown in the above table which led to an overall reduction of INR 3.23 Cr in the R&M expenses.

5.7.8 e) *Corporate support services expenses (CSS): The Authority notes that CSS expenses as submitted by AIAL comprises of inhouse legal team expense amounting to INR 0.44 Cr. However, the Authority proposes to exclude this in house legal team expense as recommended by the Study on Efficient O&M Expenses for SVPIA. Further, As indicated in Para 6.1.30 of Study on Efficient Operation & Maintenance Expenses for SVPIA Study on Efficient Operation & Maintenance Expenses for SVPIA, the employee expenses towards the inhouse legal team of AIAL has already been allowed and therefore, providing additional expenses towards legal department at the corporate level would result in redundancy. Hence, the Study has excluded the same from the determination of Aeronautical charges*

5.7.8 f) *Other Outflow Expenses:*
As per Para 6.1.53 and 6.1.54 of Study on Efficient Operation & Maintenance Expenses for SVPIA, the Authority has considered:

1. *Security Services from M/s Modern Veer in the ratio of only aero employees in security department*
2. *Security Services from M/s G4S Solutions considered as Non-Aero as their responsibilities are limited to Cityside only.*
3. *Housekeeping Expenses- Appointment of Contractor for landside cleaning work at Ahmedabad Airport considered as Non-aero as their activity pertains to Landside*

Comments by AIAL:-

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 by the Authority for rationalization of manpower is that 122 employees by the AO appears to be **unreasonably high.** AIAL would like to submit that the reasons provided by the Authority lacks consistency with its own Independent Study of O&M. As per point 4.5.5 of Study of O&M, 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".* Ahmedabad Airport had achieved Pre-COVID traffic of 11.43 million in FY19-20 and based on aforesaid global benchmark it should have at least employees of 760 (11.43*10^6/15000). AERA in its Study for O&M point 7.3.3 has acknowledged that Ahmedabad Airport was **unstaffed Airport**. The relevant extract is

7.3.3. From the above figures and table, the following observations may be gathered:

o Though Ahmedabad airport has the highest average salary among the comparable airports, it is the most understaffed among them. SVPIA handles the highest number of passengers per employee (~250k PAX per employee) which is nearly 3x of that of Cochin, almost 2x of that of Bangalore, Hyderabad and Chennai Airports.

2.3.1.3 We would like to bring to the kind attention the manpower requirements at PPP Airports: -

2.3.1.3.1 Hyderabad Airport in the First Control Period had manpower of over 400 when the traffic for the Airport was 6 mppa (refer

https://aera.gov.in/uploads/mytp/16572941115078.pdf) (given below the Manpower table extract)

In Study for O&M Page no. 92, it is mentioned that *"The Study compared the department wise head count at the other PPP airports and could not find reference to security departments at other airports"*

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			-	-	-	-	-

2.3.1.4 Hyderabad Airport since inception has department of Security with over 150 people as provided in the above table when the traffic was 6 million. You may also refer below point 2.3.4.1 for listing of DIAL Manpower and separate department for Security.

The comment in the Study of O&M report reflects that no real comparison is done with PPP Airports.

2.3.1.5 **Regarding the Authority's proposal to reduce Security Department manpower from 16 to 5,** In addition to above comparison of Hyderabad Airport, 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

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

- Ahmedabad airport is one of the hypersensitive airports and thus to ensure proper safety and security of the premises, AIAL has to deploy manpower in security department to liase / deal with Designated GOI agencies such as BCAS/CISF
- Also, AIAL 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.
- AIAL has also deployed security staff for monitoring the kerbside security for the airport and all compliances relating to AVSEC

2.3.1.5.2 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
Executive - Avsec Audit & Compliance	Supporting Lead - Avsec Audit & Compliance in Security Compliances	1

Designation	Role Description	Head Count #
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
Lead - ILBS	Managing the screening of passenger baggage through mix of human and system-based screening	1
Duty Manager - ILBS	Managing the baggage screening round-the-clock in shifts	3
Lead - Security Planning	Planning of Airport security operations and resource management	1
Lead - Pass section & AEP	Managing the activities of preparation and issuance of airport entry permits for Airport and its stakeholders	1
Executive - Pass Section	Supporting Lead - Pass section	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	3

2.3.1.6 **Regarding the Authority's proposal to reduce HR manpower from 12 to 3** 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 170 employees within time bound manner.

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

2.3.1.6.2 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.

2.3.1.6.3 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
Executive - Talent Acquisition	Supporting Lead - Talent Acquisition	1
Lead - Compensation & Benefits	Overseeing employee compensation and benefits, compensation databases, job descriptions, benchmark compensation as well as annual performance reviews.	1
Lead - Talent Management	Leading the process of developing and retaining employees throughout	1
Lead - Training & Development	Leading the process of Identification, Design, co-ordination, organizing, and facilitating learning and development solutions	1
Lead - HR Ops	Leading the process for Employee Lifecycle management, implementing new company policies and maintaining internal HR systems	1
Lead - Admin	Managing the Office premises with requisite administrative facilities	1
Executive - Admin	Supporting Lead-Admin	1
Lead - IR	Co-ordination for AAI employee joining formalities, Handling complaints, industrial relations, managing grievance procedures and facilitating counseling	1
Lead - Employee Engagement & AAI Co-ordination	Engaging with AAI employees, Understanding the current skills, working out compensation plan and rolling out joining offers as per concession agreement	1
Lead - HR Compliances	Managing compliances with respect to PF, ESIC and other contract labour related compliances	1

2.3.1.7 **Regarding the Authority's proposal to reduce Engineering & Maintenance manpower from 10 to 2** we would like to place the following facts:

2.3.1.7.1 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, AIAL made offer to AAI select employee. However, nobody accepted the offer.
It was necessary for AIAL to plan hiring and training for various roles.

2.3.1.7.2 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.

2.3.1.7.3 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 #
Manager - E&M-Civil	Supporting the Lead - E&M-Civil in exercise of duties	1
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
Lead - E&M-Planning & Scheduling	Planning for Maintenance and Upkeep including preparation of maintenance schedules	1

2.3.1.8 **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 adjustment.**

2.3.2 **In respect of Revised Block Ratio of 93.66% considered by AERA,** we would like to provide the following:

2.3.2.1 The ratio calculated by the Authority excluding the value of "Excluded" assets (Rs. 26.52 Cr) from numerator while the same amount continues as addition in the denominator:

Particulars	Reference	Asset Value as on 31st Mar'21
Aero Gross Block	*A*	*751.85*
Non-Aero Gross Block	*B*	*24.35*
Excluded Gross Block	*C*	*26.52*
Total Gross Block	*D=A+B+C*	*802.71*
Gross Block Ratio Proposed by AERA	*E=A/D*100*	*93.66%*

2.3.2.2 In this case, while we do not agree with AERA's treatment of excluding assets (which are being commented separately), we hereby would like to submit that the correct calculation would be as below:
Gross Block Ratio = (Aero Gross Block) / (Aero Gross Block + Non-Aero Gross Block) x 100.
i.e. = 751.85 / (751.85+24.35) x 100 = 96.86 % (please note, this will further change based on the treatment of Intangible assets and other misc. assets).

2.3.2.3 **In view of the above, we request AERA to revise the Gross Block Ratio and corresponding workings wherever it is applied.**

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

2.3.3.1 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 9th November 2022.

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 Net 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)

2.3.3.2 It is evident from the Joint Fixed Reconciliation signed by AAI and AIAL that last major capital expenditure was incurred by AAI during year 2010. 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

6.1.41. It can be observed from the above table that the R&M expense as a % of opening RAB are higher than 6%. It is seen that in the case of Pune (Order No. 45/2021-22 dated 17th March 2022) and Calicut (Order No. 39/2021-22 dated 11th February 2022), AERA has considered the R&M expenses to be reasonable provided that they are within 6% of the Opening RAB for each Tariff Year (Refer Para 5.6.2).

We would like to highlight the operative portion from Tariff orders for both these Airport. *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 AIAL, most of the assets are old or very old, hence AIAL R&M expenses would anyways be higher than 6% of opening RAB.

2.3.3.3 AERA in its Study for O&M has acknowledged the initiatives and improvements which have taken place and stated that the cost structure of AIAL will be altogether different than Government Airport. On one side AERA is acknowledging AIAL being a Private Airport Operator will have a different cost structure and on other side it is applying the yardstick it has applied for Government owned Airports like Calicut and Pune. AERA has never used 6% cap in any of PPP Airports. The approach adopted for AIAL lacks consistency.

Refer extracts from 6.1.36 and 6.1.56 of the study.

6.1.36. As seen in the table above, AIAL has initiated several maintenance activities post taking over the operations of the Airport. During the visit site, it was observed that several of these activities were underway.

6.1.56. It can be seen that AIAL has incurred several new expenses that were not prevalent when the airport was operated by AAI. The projections approved by AERA in the Tariff Order for the Second Control Period were in the context of the airport being operated by AAI. It is expected that the cost structure of a private player would be different from that of a government entity. Therefore, it is not fair to ascertain the reasonableness of these expenses of the airport operator based on the costs incurred over the first five months of operations, during which several one-time expenses would have been incurred towards repairs, modifications, and refurbishments. Rather, the performance of the Airport Operator needs to be monitored over a longer period of time to evaluate the efficiency of operations.

2.3.3.4 Further, it is observed that while AERA has considered 6% of Net Block in FY22 and FY23, and for FY24 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 per percentage of Net Block. 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.

2.3.3.5 **We request AERA to true-up the R&M expenses based on actual cost incurred, without any capping. We are pleased to provide any information required by Authority in this regard as always.**

2.3.4 **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

2.3.4.1 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**

2.3.4.2 **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.**

2.3.5 **With respect to the consideration of Other Outflow expenses by AERA**, we would like to submit the following:

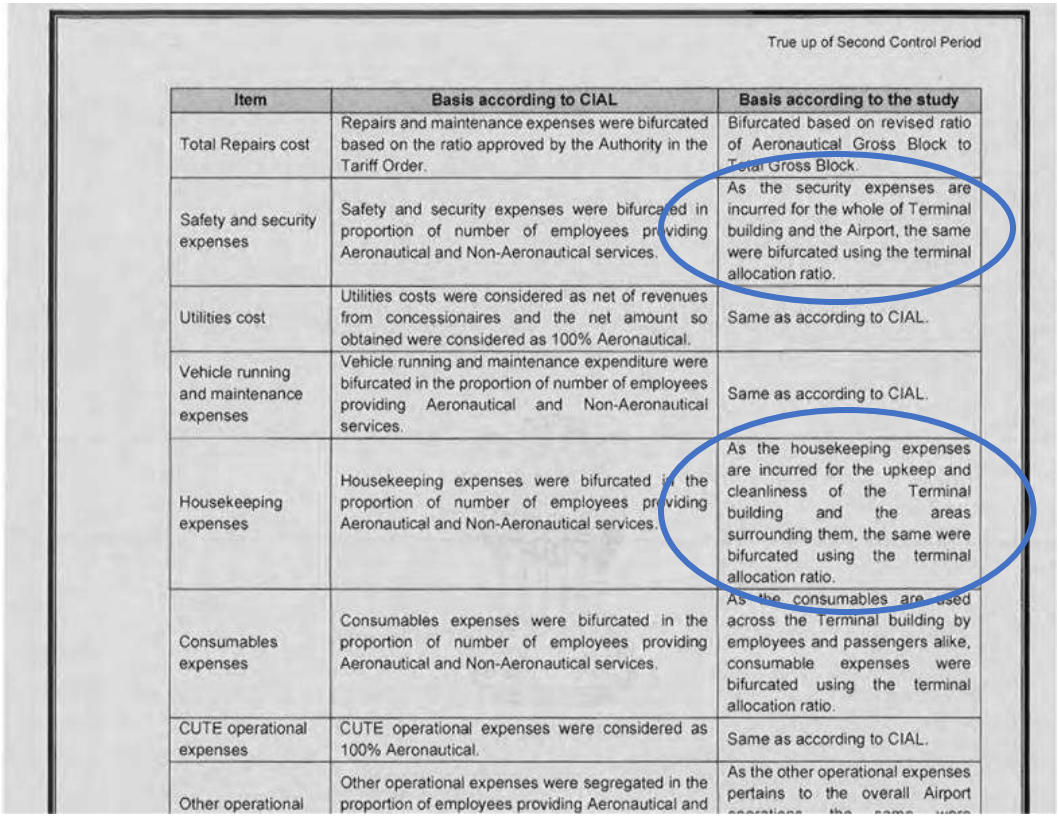
2.3.5.1 **Expenses like housekeeping and securities relating to Kerbside / forecourt**

- In case of other Airports like CIAL, DIAL, HIAL cost for kerbside or forecourt is common and bifurcated into Gross Asset Allocation ratio or 100% Aero.
- In case of Cochin, security related expenses are **for whole Airport** and not only for terminal building.
- Kerbside or forecourt is an operational area which is used by the passengers and travelers. These are essential activity of Airport operations which are for surrounding areas.

Under the Concession Agreement of Ahmedabad 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;*

2.3.5.2 Extract from Cochin Airport Third Control Period order no. 08/2021-22 Page 61, point 4.8.10, expenses for Security and housekeeping are **for whole Airport**



True up of Second Control Period

Item	Basis according to CIAL	Basis according to the study
Total Repairs cost	Repairs and maintenance expenses were bifurcated based on the ratio approved by the Authority in the Tariff Order.	Bifurcated based on revised ratio of Aeronautical Gross Block to Total Gross Block.
Safety and security expenses	Safety and security expenses were bifurcated in proportion of number of employees providing Aeronautical and Non-Aeronautical services.	As the security expenses are incurred for the whole of Terminal building and the Airport, the same were bifurcated using the terminal allocation ratio.
Utilities cost	Utilities costs were considered as net of revenues from concessionaires and the net amount so obtained were considered as 100% Aeronautical.	Same as according to CIAL.
Vehicle running and maintenance expenses	Vehicle running and maintenance expenditure were bifurcated in the proportion of number of employees providing Aeronautical and Non-Aeronautical services.	Same as according to CIAL.
Housekeeping expenses	Housekeeping expenses were bifurcated in the proportion of number of employees providing Aeronautical and Non-Aeronautical services.	As the housekeeping expenses are incurred for the upkeep and cleanliness of the Terminal building and the areas surrounding them, the same were bifurcated using the terminal allocation ratio.
Consumables expenses	Consumables expenses were bifurcated in the proportion of number of employees providing Aeronautical and Non-Aeronautical services.	As the consumables are used across the Terminal building by employees and passengers alike, consumable expenses were bifurcated using the terminal allocation ratio.
CUTE operational expenses	CUTE operational expenses were considered as 100% Aeronautical.	Same as according to CIAL.
Other operational	Other operational expenses were segregated in the proportion of employees providing Aeronautical and	As the other operational expenses pertains to the overall Airport

2.3.5.3 Extract from DIAL Consultation Paper 15/2020-21 dated 09th Jun 2022 for Third Control Period Study for Efficient O&M Cost in respect to Security agencies deployed for landside areas

12.4.6 SECURITY EXPENSES

The number of manpower deployed around the airport for ensuring safety at various locations are given as below:

Table 67 Count of Manpower Services deployed by DIAL- Location and Contractor Wise

SL. No	Duty Post	Total RAXA Manpower	Total Peregrine Manpower
1	T3 Landside	102	95
2	T1 Landside	78	15
3	CARGO Terminal	55	0
4	CDU	6	0
5	Vital Installations	70	0
6	New Udaan Bhawan	38	0
7	T2 Landside	69	0
	Total	418	110
	Leave Reserve/Weekly off (24% for RAXA and 16% for Peregrine)	99	18
8	Officers	13	0
9	EPGs (5) & Gunmen (4)	9	0

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2.3.5.4 Security Services from M/s Modern Veer in the ratio of only aero employees in security department

2.3.5.4.1 While AIAL doesn't agree with the rationalization of headcount for Security Department, the authority's view to restrict the expenses towards the outsourcing of certain part of security services (which is manpower intensive and thus outsourced from economic feasibility) lacks merit.

2.3.5.4.2 As already provided by us and also as indicated by AERA in the CP, "These manpower are deployed for Kerbside traffic management at T1 and security check post at Domestic Cargo Entry gate. Their overall role includes Kerbside management, traffic marshalling, traffic management, landside security, patrolling, Billing & accounting for NASFT, Co-ordination with CISF/Policy, Emergency Response etc".

2.3.5.4.3 In view of the nature of services, we request AERA to consider the same as 100% Aero without any adjustments.

2.3.5.5 *Security Services from M/s G4S Solutions considered as Non-Aero as their responsibilities are limited to Cityside only.*

2.3.5.5.1 As already provided by us and also as indicated by AERA in the CP, "These are recurring expenses. These manpower are deployed for Kerbside traffic management at T2. Their overall role includes Kerbside management, traffic marshalling, traffic management, patrolling etc"

2.3.5.5.2 AERA has considered the above services which are related to Kerbside traffic management as Non-Aero with a reason "Since their responsibilities are limited to the cityside, the Study has considered this expense as non-aeronautical."

2.3.5.5.3 The above contention of AERA is not aligned with nature of services as the Kerbside Traffic Management services is not related to City Side Developments. Under the Concession Agreement City Side Development are earmarked land parcels which has no relation with Airport operations

2.3.5.5.4 In view of the nature of services, we request AERA to consider the same as 100% Aero without any adjustments.

2.3.5.6 *Housekeeping Expenses- Appointment of Contractor for landside cleaning work at Ahmedabad Airport considered as Non-aero as their activity pertains to Landside*

2.3.5.6.1 AERA has considered the above services which are related to Landside Cleaning works as Non-Aero with a reason "This activity pertains to the landside; hence it is considered as non-aeronautical."

2.3.5.6.2 Kindly refer the points mentioned above regarding the treatment of Kerbside/ Forecourt in various other Airport orders. It is to be noted that the treatment proposed by AERA is not consistent with approach followed for other airports

2.3.5.6.3 Thus, we request AERA to consider the Housekeeping works as Common which may be allocated in Gross Block Ratio.

2.4 AERA proposal as per 5.8.4 page 76 of CP relating to True Up of Non-Aeronautical Revenue

Para 5.8.4. The Authority, through its Consultant, noted that space rentals from airlines have been included as part of the non-aeronautical revenue. However, space rentals from agencies providing aeronautical services should be treated as aeronautical revenue. Hence, the Authority proposes to consider "Space rentals from Airlines in the terminal like SpiceJet, Indigo, TATA SIA, Emirates, Qatar, Go Airlines, Emirates, Air Arabia, Singapore Airlines, Air Asia" as aeronautical revenue.

The effect of the same is also provided by AERA in Para 5.9.4 under Aero Revenues.

Comments by AIAL:-

2.4.1 AERA Act, 2008 and the AERA guidelines do not consider the airline space rental as aeronautical revenues. Further, AERA does not regulate the airline space rental at SVPIA. Thus, the proposal of AERA does not confirm to its Act and guidelines.

2.4.2 Further, ICAO Doc 9562 Airport Economics Manual clearly states the definition of Revenues from Non-aeronautical sources as: "**Revenues from non-aeronautical sources:** Any revenues received by an airport in consideration for the various commercial arrangements it makes in relation to the granting of concessions, **the rental or leasing of premises and land**, and free-zone operations, even though such arrangements may in fact apply to activities that may themselves be considered to be of an aeronautical character (for example, concessions granted to oil companies to supply aviation fuel and lubricants and ***the rental of terminal building space or premises to aircraft operators***). Also intended to be included are the gross revenues, less any sales tax or other taxes, earned by shops or services operated by the airport itself."

Also, it is to be noted that the clause 4.23 of ICAO Doc 9562 Airport Economics Manual states the following under "Revenues from non-aeronautical activities":
4.23 Rentals. Rentals payable by commercial enterprises and other entities for the use of airport-owned building space, land or equipment. Such rentals should include those payable by aircraft operators for airport-owned premises and facilities (e.g. check-in counters, sales counters and administrative offices) other than those already covered under "air traffic operations" above.

2.4.3 **We request Authority to consider the recommendation provided by the ICAO Doc 9562 Airport Economic Manual.**

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

3.1 AERA proposal as per 6.2.1 page 81 of CP relating to Exempted Traffic

The Authority notes that AIAL has considered only billable ATM, after excluding ATM traffic covered under the RCS scheme and aircrafts with capacity less than 80-seater. AIAL has assumed the share of such ATMs to be approximately 15% to 20% over the Third Control Period based on historical trends. However, the Authority is of the view that RCS scheme is promoted by the Government of India 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, the flights operating under this scheme are not eligible to be claimed as a passthrough/ exemption. The Authority notes that out of the total exempted traffic submitted by the Airport Operator (15% to 20% of the total domestic ATMs), 1.5% to 3% constitutes flights operating under the RCS Scheme and the balance pertains to non-RCS flights. Hence, the Authority has considered the billable ATM traffic after excluding the ATMs that pertain to less than 80-seater capacity non-RCS flights that are exempted from landing charges.

Further, 6.2.2 of CP states that:

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. AIAL cannot claim any passthrough regarding UDF on such categories and this is followed by AERA across at all Major Airports. Therefore, there is no reason to consider the billable PAX traffic separately, as the Authority follows a consistent approach across all Major Airports, that naturally accounts for such considerations while projecting aeronautical revenues.

Comments by AIAL:-

3.1.1 We would like to reproduce the relevant extract from the MYTP submission as follows

"4.6. AIAL appreciate the RCS scheme initiated by government to boost the regional connectively whereby no landing charges are charged to Airlines and also no UDF is charged to the departing passenger. Secondly ATMs having less than 80-seater capacity are also exempted from landing charges. Lastly, there are certain categories of passengers which are exempted from user charges being infant, transit etc.

4.7. Therefore, while calculating the revised aeronautical charges, the ATM and Passenger traffic is suitably adjusted to account for only billable ATMs and billable Passengers."

3.1.2 It is to be noted that AO has done adjustment in ATMs (RCS and less than 80 seater) and Passengers to calculate only the billable traffic. The adjustment is necessitated to project the correct Aeronautical revenues.

3.1.3 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.

3.1.4 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.

3.1.5 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

Order. No. 46/2015-16 Page 51 of 76

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

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

3.1.7 **We, therefore, request Authority to consider deduction of exempted ATM and Passenger flights while determining billable traffic for projection of aeronautical revenues. Accordingly, AIAL 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.

Chapter 4 "Comments on Consultation Paper Chapter 7 - Regulatory Asset Base (RAB) And Depreciation For The Third Control Period"

4.1 AERA proposal as per 7.3.14 on page 96 of CP relating to capacity planning at the Airport

The Authority finds that the construction of the NITB Phase 1 was also envisaged by AAI as per Schedule U of the Concession Agreement (Refer Para 17.3.11 in Annexure 3 of Chapter 17). However, it would be pertinent to note that the total passenger handling capacity at the end of FY 2026 would be 36.6 MPPA with the commissioning of the NITB Phase 1, whereas the projected traffic is 19.85 million. The Authority is of the view that there is a gap in capacity planning, whereas the Concession Agreement requires that the planning effort of the Airport Operator must result in a scheme that remains flexible while also definitely establishing a coordinated plan for the incremental growth of specific elements of the Airport as per Clause 2 of Schedule B of the Concession Agreement (Refer Para 17.3.15 in Annexure 3 of Chapter 17). Hence, the Airport Operator is expected to proceed with expansion and development of the Airport in a modular fashion, in order to avoid undue stress on Airport Users.

Comments by AIAL:-

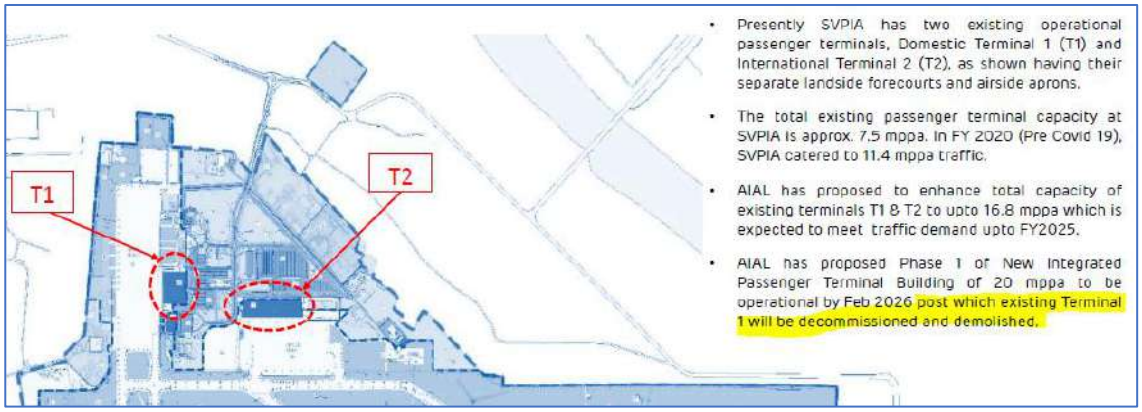
4.1.1 AERA has suggested to proceed with expansion and development in a modular fashion. In this regard we would like to submit the following:-

4.1.1.1 During the period FY10 to FY20 traffic had increased significantly whereas Airport capacity was not enhanced to take care of the requirement. This is reflected from the fact that the Airport handled annual passenger throughput of 11.4 million in Pre-COVID period as against the rated capacity of 7.5 million.

Going forward the annual passenger throughput is expected to 20 million in next 5 years and 30 million over 10 years.

4.1.1.2 It is pertinent to note that AIAL needs to ensure IATA Level of Service Optimum and parameters mentioned in Schedule H of CA. This shall not be possible without addition of new terminal capacity. In view of this development of a new, integrated passenger terminal at SVPIA is essential to cater to projected traffic demand.

4.1.2 We would like to refer the Master Plan for AIAL which was presented in the AUCC held on 21st Jan 2022. AUCC presentation was shared with the Authority's consultant on 7th April 2022 (refer the relevant extracts of AUCC presentation appended below)



New Integrated Passenger Terminal Building

adani Growth with Goodness

A integrated terminal building is proposed to cater the ultimate capacity of Ahmedabad International Airport which will be developed in 2 phases. Phase 1 will be built with the capacity of 20MPPA with **a built-up area of approx. 214,000 sq.m.** and is required to be made operational by FY 2026 as per traffic forecast. It is planned to be a multi-level terminal with main departure level at 13 m, arrival mezzanine at 6m and arrival level at 0.0 m, well connected on the landside with elevated departure roadway and at grade road network at arrival level. A multi-modal transport hub (MMTH) is envisioned abutting the NTB which includes Metro connectivity, city side check-in and self-bag drop (SBD) facility, Curbside facilities for passengers / visitors arriving early at the airport from surrounding villages, towns and cities, staff and stakeholder facilities – all connected seamlessly to the main levels of the NTB setting a new benchmark for the state and the country offering world class passenger and user experience.

The Phase 1 of the New Integrated Terminal Building will be completed by February 2026. Once phase 1 of NTB is ready for operations, all the domestic traffic from T1 will be shifted to the NTB and T1 will be decommissioned and demolished to make way for future phase 2 of the NTB in the next control period.

It was clearly explained that AIAL has already adopted a modular approach in planning of Terminal Building in line with requirements under the Concession Agreement. Accordingly, as part of overall 42 Mn capacity planned for New Integrated Terminal Building considered in master planning, only 20 Mn capacity is planned in this control period.

4.1.3 Master Plan is also submitted to relevant authorities as a compliance to the Concession Agreement. Please refer the below relevant extracts from Master plan which was shared with relevant authorities and also AERA`s consultant on 22nd Jul 2022

6.2 Terminal Planning Approach

A new terminal building (NTB) within the airport boundary is planned for the long-term development. The surplus of passenger traffic which cannot be handled in the existing Terminals 1 and 2 will be accommodated in the new terminal building. The location of the new terminal is planned such that impact on ongoing operations will be minimized. Nevertheless, it will have a minor impact on the landside roads during construction of the new terminal building in proximity to T1. After completion and commissioning of NTB, the existing terminals T1 and T2 will be phased out.

The development strategies for the terminal area are defined as follows:

- Modification of T1 and T2 to increase capacity up to a total of approx. 16.8 mppa;
- New state-of-the-art integrated terminal complex with a total capacity of 40.0 mppa;(in three phases)
- Phasing out of Terminal 1 first, followed by phasing out of Terminal 2.

The distribution of traffic over the new terminal requires an in-depth study which can be performed once the planning of the new terminal building will commence. Such study should consider, airlines and/or domestic-international segment allocation inside the new terminal building, where the Master Plan is flexible to accommodate various segment allocations.

6.3 Terminal

The ambition for AMD is to have a state-of-the-art new terminal that accommodates growth of the airport and can accommodate the passenger capacity up to 42.33 million passenger per year.

The design of a terminal functional layout should take into consideration the following objectives:

- Optimum functionality with sufficient processors
- Flexibility in development to meet changing operational demands over time
- Meeting IATA's Level of Service 'Optimum'
- Segregation of arriving and departing passengers.
- Adani's development principles.

The sizing of the passenger terminal building is determined for the terminal building gross floor area, the following terminal area planning parameters have been used:

- 20-25 sqm per domestic peak hour passenger (peak hour 1-way arrival + departure for domestic passengers)
- 30-35 sqm per international peak hour passenger (peak hour 1-way arrival + departure for international passengers)

The above-mentioned values for areas per peak hour passenger are conceptual master planning parameters. It does not give a detailed representation of the real terminal capacity, but only of the potential terminal capacity. This is based on floor area only, not on the number of processors and gates. The actual terminal capacity is dependent on e.g. check-in capacity, security screening capacity, baggage handling and reclaim capacity and gate capacity.

In the year 2023, construction of a new terminal building is planned to commence (phase 1 of NTB). This new terminal will increase the total terminal capacity, while at the same time Terminal 1 will be phased out to create space for phase 2 development of the new terminal building. In the Master Plan, the footprint areas and the related gross floor area are used.

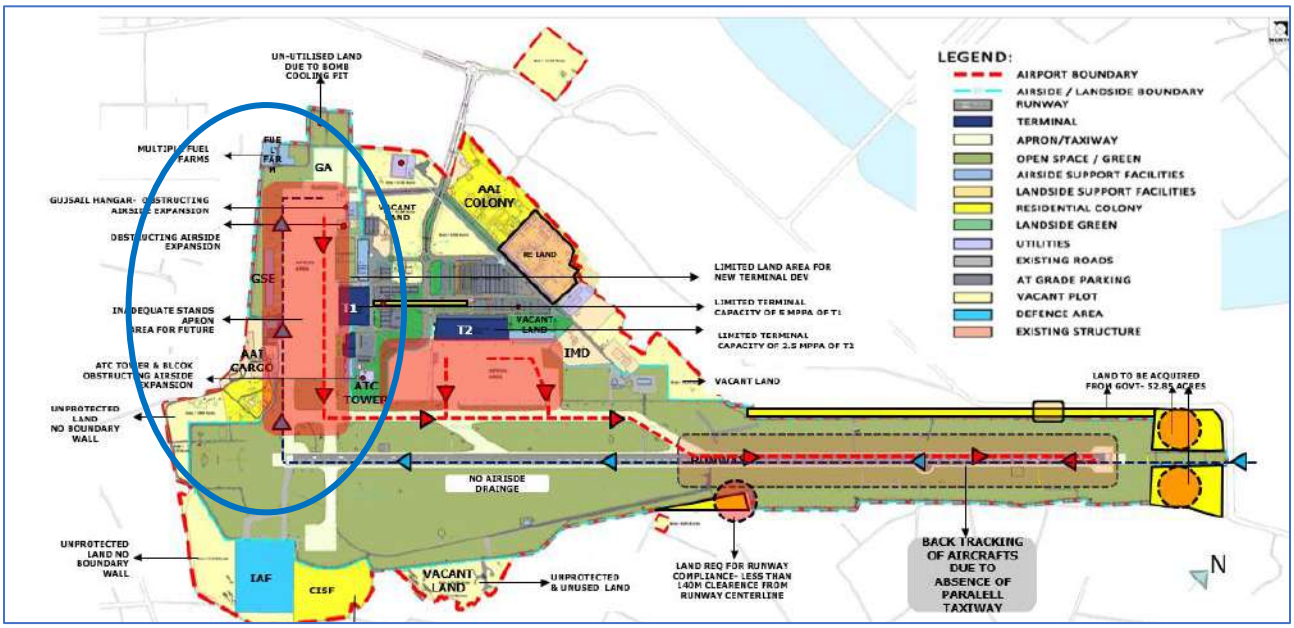
The compact arrangement of the new terminal building should ensure fast and efficient operational processes. The new terminal is planned to be an integrated terminal serving domestic and international traffic. Three main passengers' flows can be distinguished:

- Passenger departure flow for international and domestic
- Passenger arrival flow for international and domestic
- Transfer flow from international to domestic and from domestic to international

4.1.4 It has been explained extensively during AUCC and during MYTP review that once NITB Phase 1 of 20 million is operationalized, as per Master Plan, the T1 will be decommissioned and demolished making way for the future developments in Airside and Terminal side. Accordingly, the operational capacity available will only be 28.8 million (T2 8.8 million + Phase 1 of NITB 20 million).

For ease of convenience, we would like to re-iterate that there would be 13 contact stands once the new NITB is commissioned it would be imperative that the airside should have dual taxiway for efficient operations of the airside. To create the dual taxiway system with all the necessary clearances the existing T1 Terminal need to be demolished and the necessary corrections in the Apron geometry need to be done and various development approach

considerations were factored in. Kindly refer the below drawing depicting the alignment of existing T1 which is coming under the Airside development.



4.1.5 This kind of modular capacity enhancement is not new to the PPP Airports. For example, when Delhi Airport (DIAL) T3 was commissioned, all the International Traffic from T2 was moved to T3; and T2 remained un-operational.

Extract from DIAL Consultation Paper No.32/2011-12

309. LeighFisher have stated that the initial selection criterion for comparator airports was that they should ideally be of a size comparable to DIAL in terms of its current passenger capacity of around 52 mppa (this figure makes allowance for the fact that capacity of around 10 mppa at Delhi is currently mothballed).

321. The figures shown above in relation to Delhi takes account of the fact that currently part of Terminal 1 and all of Terminal 2 are decommissioned. Thus, capacity for a little over 12 million passengers is not currently operational.

Few more example of capacity creation based on latest AERA orders are as : -

1. Hyderabad Airport Third Control Period Order No. 12/2021-22 - Capacity is enhancing to 34 mppa when the Pre-COVID traffic was 22 mppa
2. Bangalore Airport Third Control Period Order No. I1/2021-22 – Capacity is enhancing to 55 mppa when the Pre-COVID traffic was 32 mppa

4.1.6 **In view of the above facts, we request AERA to take cognizance that the operational capacity of the terminal would be 28.8 MPPA instead of 36.8 MPPA as mentioned in CP which we feel can be misinterpreted. Therefore, we request AERA to take note of these facts while issuing the tariff order.**

4.2 AERA proposal at clause 7.5.3 on page 151 of CP relating to Terminal Area Ratio at the Airport

However, the non-aeronautical area allocation considered by the Airport Operator for computation of Terminal Area Ratio is quite low when compared to other PPP airports. The Authority had at the time of determination of tariffs for SVPIA 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 is expected that there would be larger focus on non-aeronautical activities and increased area allocation towards the same. It is 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 norms 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 expects the non-aeronautical area allocation at SVPIA to increase in future. Therefore, the Authority proposes to consider the Terminal Area Ratio for SVPIA for the Third Control Period as 90 : 10 (aeronautical : non-aeronautical). The Authority proposes to examine the same based on actuals at the time of determination of tariffs for the Fourth Control Period.

Comments by AIAL:-

4.2.1 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"*

4.2.2 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 (page 241 of the said 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."

4.2.3 No norms with respect to unit area and costs were mentioned in the bidding documents and Concession Agreement of Ahmedabad Airport. Therefore, we request AERA not to apply IMG norms in case of Ahmedabad Airport.

4.2.4 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.

4.2.5 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.

4.2.6 Without prejudice to the above, it is to be noted that 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. For example, the height of the terminal building at AIAL ranges between 12 to 15 meters whereas the retail areas have height of around 2 to 3 meters only. Hence, it is not logical to allocate the terminal building cost based on floor area. AIAL is of the view that allocation should, at best, be based on cost of the floor plate instead of allocating entire terminal cost based on square meter area basis.

4.3 AERA proposal at clause 7.3.83 and 7.3.84 on page 121 of CP relating to Distribution network for all Utilities

7.3.83. As per the cost estimates shared by AIAL, the AO has assumed the cost towards distribution network to be 25% of the cost of all utility projects. However, the Authority could not ascertain any such practice prevalent for the construction of Airport projects. The Authority is of the view that the actual costs would depend on the specification of the components used and the quantities required depending on the location of various facilities and the routing of the utility network.

7.3.84. Therefore, in the absence of a reliable estimate from the Airport Operator, the Authority has considered "Electrical external service connections" (3.75%) and "Civil external service connections" (1.25%), as per Plinth Area Rates (PAR) 2021 to derive an estimate for the distribution network for utilities. Accordingly, 5% of all the utility project costs has been considered towards the cost for distribution network for all the utility projects. The cost considered by the Authority towards distribution network for utilities is given in the table below.

Comments by AIAL:-

4.3.1 Consideration of Plinth Area Rates (PAR) 2021 of 5% (ie. 3.75% and 1.25%) for Utility Distribution Network on the cost of Utility Projects only is not a correct proposition. The PAR of 5% should be applied on overall cost of building of airport complex and not just on utility projects. Please refer the highlighted portion from the below extract of PAR 2021:

2.0	SERVICES(Percentage below refers to the percentage of building cost as per 1.0 above)					
2.1	Internal water supply & sanitary installations.	4%	10%	5%	12% with attached toilets, 8% with common toilets.	9%
2.2	External service connections and local body approval charges shall be as hereunder or as per estimates given by the local body whichever is higher.					
2.2.1	Electrical external service connections.	3.75%	3.75%	3.75%	3.75%	3.75%
2.2.2	Civil external service connections.	1.25%	1.25%	1.25%	1.25%	1.25%
2.2.3	Local body approvals including tree cutting etc.	1.25%	1.25%	1.25%	1.25%	1.25%
2.3	Internal electric installations.	12.5%	12.5%	12.5%	12.5%	12.5%
2.4	EXTRA FOR					

4.3.2 Based on the above, the Utility Distribution Network would cost approx. Rs 300 Crs as per PAR 2021 rates (i.e. considering 5% of Rs 6,000 Crs pertaining to cost of various building works proposed by AIAL).

4.3.3 Further, as per latest drawings and detailed Bill of Quantities, AIAL has prepared a cost estimate which indicates that the cost would be to the tune of approx. Rs 119 Crs.

4.3.4 From the above, it can be seen that AIAL's proposed cost of Rs 87.23 Crs for Utility Distribution Network is on a lower side when compared to the PAR 2021 rate and the cost estimate.

4.3.5 In view of the above, we request AERA to consider the cost for Utility Distribution Network as proposed by AO and also request to consider true up of actual costs during tariff determination for next control period.

4.4 AERA proposal at various clauses to consider various projects as 50% Aeronautical

7.3.35 - Passenger amenities at landside

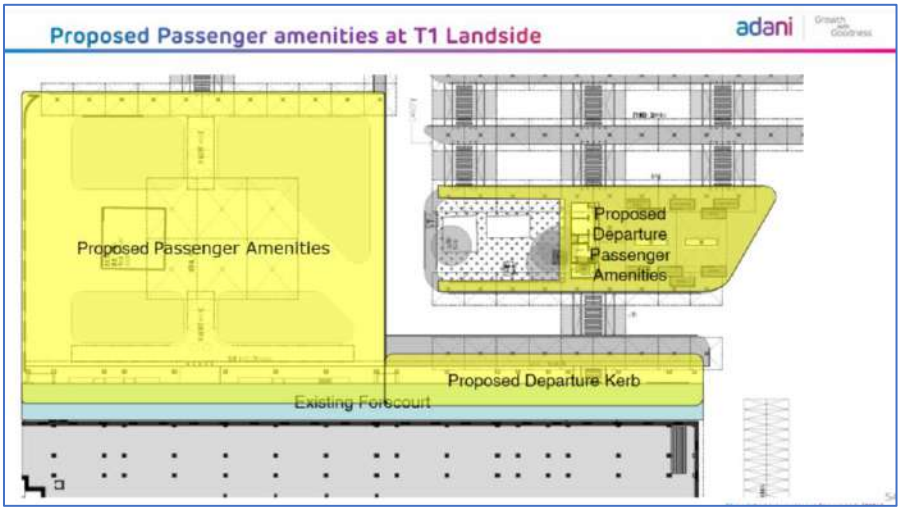
7.3.75 - T1 and T2 landside road works

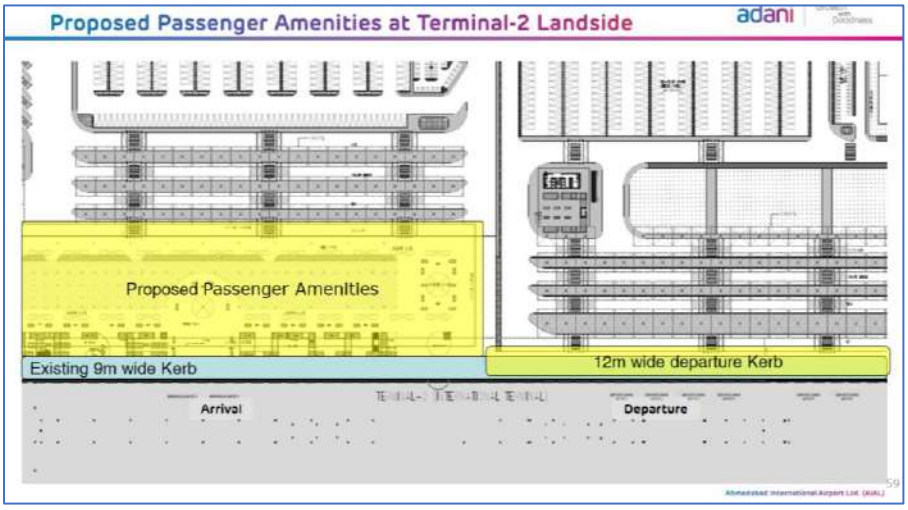
7.5.4. With regard to passenger amenities at landside (part of Upgradation / Modification in existing Terminal Building T1 and T2, refer Para 7.3.29), the Authority notes that INR 164.47 Cr. was budgeted towards passenger amenities at landside. AIAL was asked to clarify the purpose of this expense to which AIAL responded vide email dated 19th August 2022 that this involves "Improving the kerbside for T1 and T2. It includes providing a covered space for meeters and greeters and re-aligning the kerbside roadways to debottleneck the traffic congestion that is caused during peak hours. It further includes to provide covered pick-up points at the arrivals. It includes grade correction at the kerbside." From the BOQ shared by the Airport Operator, it is noticed that this space also includes commercial spaces such as Cafeteria, Pharmacy and Salon. The Authority is of the view that this area equally caters to the airport users and the commercial activities targeted at meeters and greeters. Therefore, the Authority proposes to consider only 50% of the cost towards passenger amenities at landside as aeronautical.

7.5.6. As mentioned above, the Airport Operator has planned significant developments on the city side. Considering the future potential for non-airport related traffic, the Authority is of the view that the landside developments planned by the Airport Operator would also benefit the commercial activities planned at SVPIA. The exact benefits that would accrue to the Airport Operators and to the commercial ventures cannot be determined at this stage. Therefore, the Authority proposes to consider the cost towards Landscaping & Horticulture and road works under Multi Modal Transport Hub as common and bifurcate them in 50 : 50 (aeronautical : non-aeronautical) ratio.

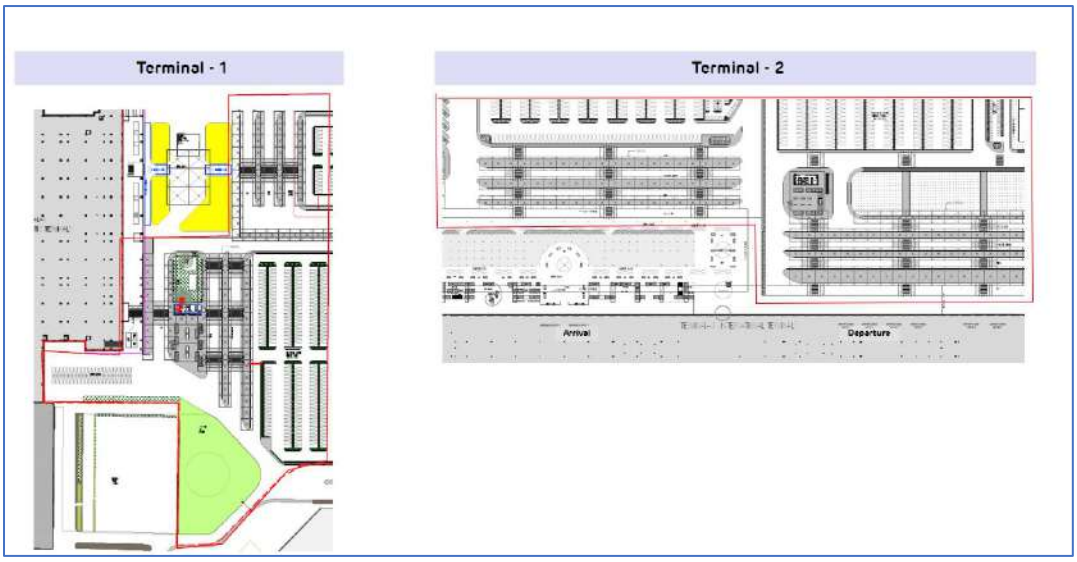
Comments by AIAL:-

4.4.1 During the virtual meeting held on 13th October followed by presentation sent over the email, it was explained that Passenger amenities are located at the kerbside / forecourt. For quick reference the relevant extract from the presentation is provided below : -





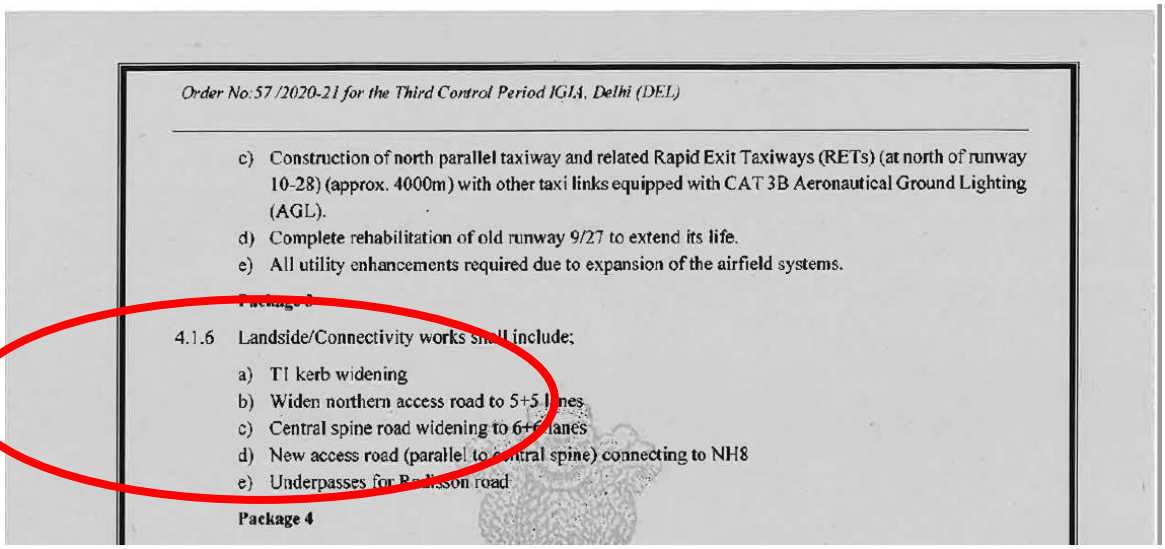
4.4.2 Landside road projects as per drawings is as follows: -



4.4.3 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"

4.4.4 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.



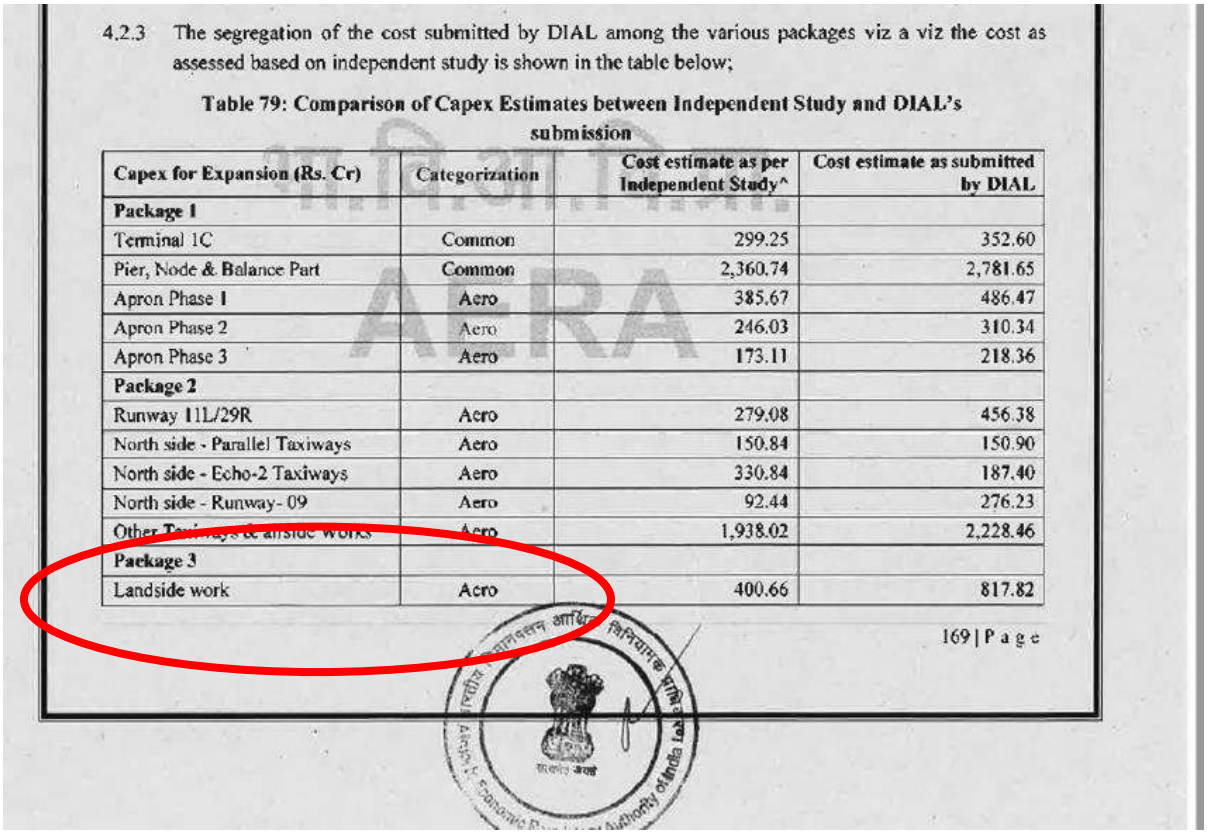
Order No:57 /2020-21 for the Third Control Period IGIA, Delhi (DEL)

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



4.2.3 The segregation of the cost submitted by DIAL among the various packages viz a viz the cost as assessed based on independent study is shown in the table below;

Table 79: Comparison of Capex Estimates between Independent Study and DIAL's submission

Capex for Expansion (Rs. Cr)	Categorization	Cost estimate as per Independent Study^	Cost estimate as submitted by DIAL
Package 1			
Terminal 1C	Common	299.25	352.60
Pier, Node & Balance Part	Common	2,360.74	2,781.65
Apron Phase 1	Aero	385.67	486.47
Apron Phase 2	Aero	246.03	310.34
Apron Phase 3	Aero	173.11	218.36
Package 2			
Runway 11L/29R	Aero	279.08	456.38
North side - Parallel Taxiways	Aero	150.84	150.90
North side - Echo-2 Taxiways	Aero	330.84	187.40
North side - Runway- 09	Aero	92.44	276.23
Other Taxiways & airside works	Aero	1,938.02	2,228.46
Package 3			
Landside work	Aero	400.66	817.82

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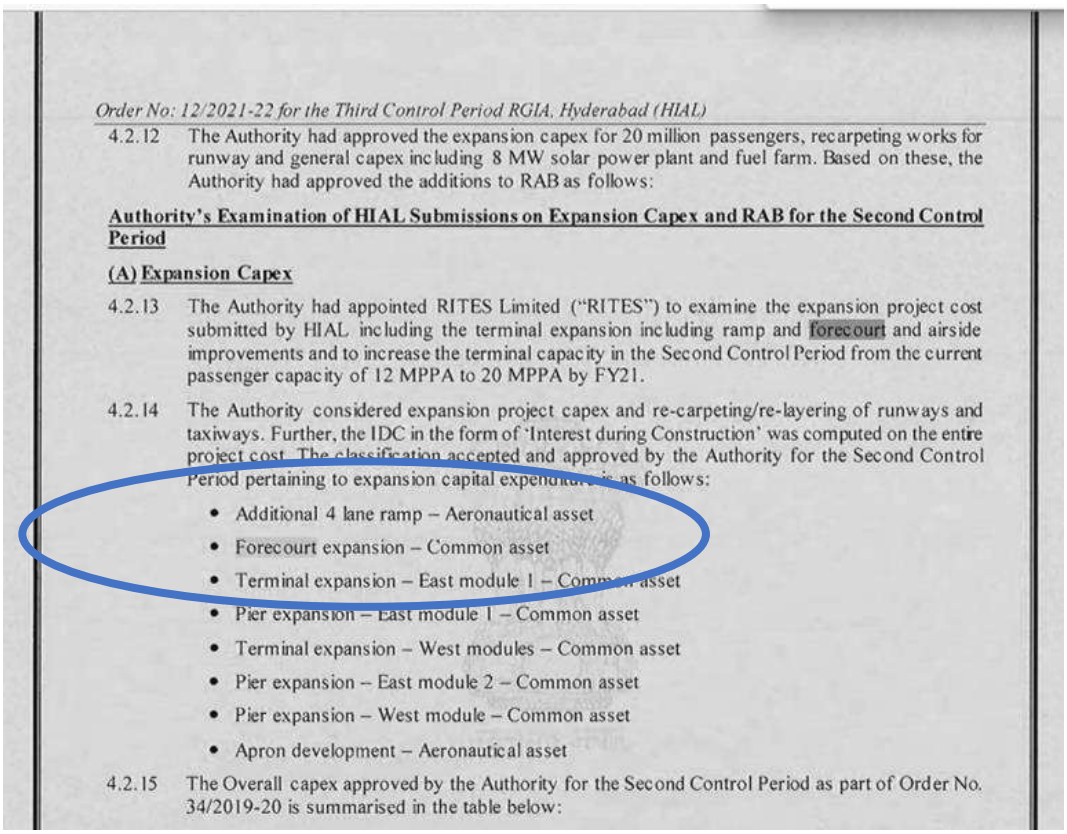
4.4.5 Reference is now invited to Hyderabad Airport Rites report dated April 2021 and AERA Order No. Order No: 12/2021-22, Forecourt and Kerbside are considered as part of Terminal and accordingly Terminal Ratio for bifurcation of Common Asset is considered.



Order No: 12/2021-22 for the Third Control Period RGIA, Hyderabad (HIAL)

4.2.12 The Authority had approved the expansion capex for 20 million passengers, recarpeting works for runway and general capex including 8 MW solar power plant and fuel farm. Based on these, the Authority had approved the additions to RAB as follows:

Authority's Examination of HIAL Submissions on Expansion Capex and RAB for the Second Control Period

(A) Expansion Capex

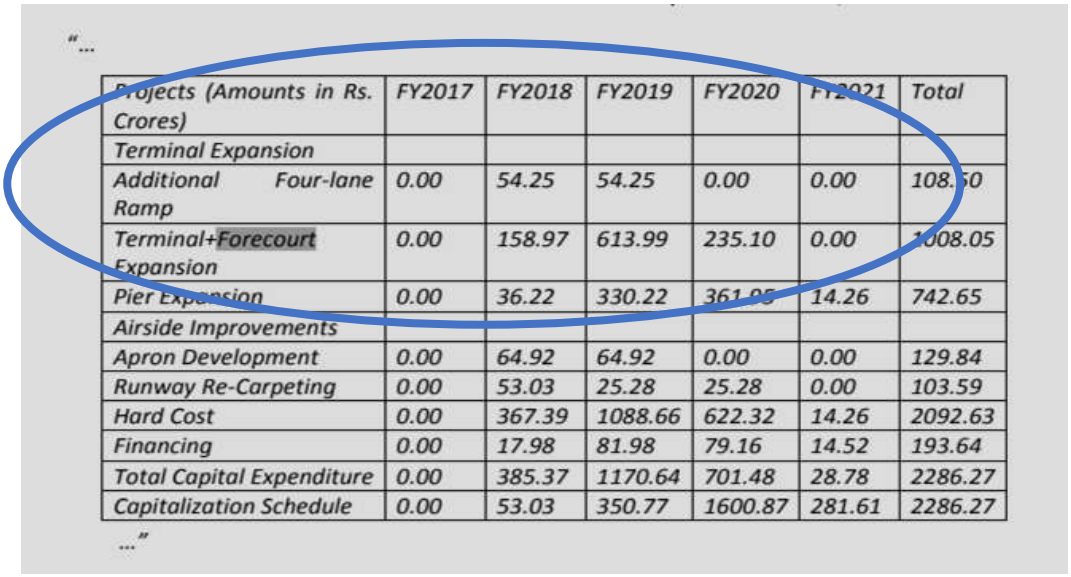
4.2.13 The Authority had appointed RITES Limited ("RITES") to examine the expansion project cost submitted by HIAL including the terminal expansion including ramp and forecourt and airside improvements and to increase the terminal capacity in the Second Control Period from the current passenger capacity of 12 MPPA to 20 MPPA by FY21.

4.2.14 The Authority considered expansion project capex and re-carpeting/re-layering of runways and taxiways. Further, the IDC in the form of 'Interest during Construction' was computed on the entire project cost. The classification accepted and approved by the Authority for the Second Control Period pertaining to expansion capital expenditure is as follows:

- Additional 4 lane ramp – Aeronautical asset
- Forecourt expansion – Common asset
- Terminal expansion – East module 1 – Common asset
- Pier expansion – East module 1 – Common asset
- Terminal expansion – West modules – Common asset
- Pier expansion – East module 2 – Common asset
- Pier expansion – West module – Common asset
- Apron development – Aeronautical asset

4.2.15 The Overall capex approved by the Authority for the Second Control Period as part of Order No. 34/2019-20 is summarised in the table below:

Hyderabad Airport Second Control Period Consultation Paper No. 30/2017-18 Page No 80 and 84. Forecourt is considered as part of Terminal Expansion and bifurcated into Terminal Building Ratio. The same has been considered in SCP and TCP order.



"...

Projects (Amounts in Rs. Crores)	FY2017	FY2018	FY2019	FY2020	FY2021	Total
Terminal Expansion						
Additional Four-lane Ramp	0.00	54.25	54.25	0.00	0.00	108.50
Terminal+Forecourt Expansion	0.00	158.97	613.99	235.10	0.00	1008.05
Pier Expansion	0.00	36.22	330.22	361.05	14.26	742.65
Airside Improvements						
Apron Development	0.00	64.92	64.92	0.00	0.00	129.84
Runway Re-Carpeting	0.00	53.03	25.28	25.28	0.00	103.59
Hard Cost	0.00	367.39	1088.66	622.32	14.26	2092.63
Financing	0.00	17.98	81.98	79.16	14.52	193.64
Total Capital Expenditure	0.00	385.37	1170.64	701.48	28.78	2286.27
Capitalization Schedule	0.00	53.03	350.77	1600.87	281.61	2286.27

..."

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.

4.4.6 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.

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

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

4.4.7.2 Similar treatment has been considered and approved by AERA as either 100% Aeronautical or Allocated as Common asset under Terminal Building Ratio.

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

4.4.8 **The treatment of these projects as 50% Aeronautical Assets provides discriminatory treatment to AIAL without any rational, undermining the definition under the CA and is against the already established principles. We hereby request AERA to provide the similar treatment for AIAL as considered for other Airports.**

4.5 AERA proposal as per 7.3.179 on page 147 of CP relating to Financing Allowance on CWIP projects

The Authority is of the view that SVPIA being one of the oldest Airports in India, would not be eligible for Financing Allowance, as it is only a notional allowance and is different from the actual investment incurred by airport operators which includes interest during construction, amongst other things. Therefore, the provision of financing allowance on the average capital work in progress would lead to a difference between the projected capitalisation and actual cost incurred, especially when the airport operator funds the projects through a mix of equity and debt. Further, the Authority notes that in case of greenfield Airports, the Airport Operator would have had to wait for a considerable length of time before getting the return on the large capital outlay incurred by it as these projects take longer durations to commission and operationalise. It was with this consideration that the Authority had earlier provided financing allowance in the initial stages to such Airports. The Authority notes that SVPIA is a brownfield Airport and has lower construction and traffic risk for new construction at the Airport and Financing Allowance has never been provided in case of other Airports such as DIAL, MIAL and KIAL, Chennai, Kolkata etc.

Comments by AIAL:-

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

4.5.2 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 in construction phase of an asset including the equity portion, before the asset is put to use. This is a legitimate expectation of investors.

4.5.3 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:

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

$$-Commissioned\ Assets\ (CA)$$

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 x (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.*

4.5.4 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.

4.5.5 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.

4.5.6 We would like to refer the point 5.4.4 second bullet point relating to True-up of second control period in the CP

5.4.4. Apart from the reclassification of assets and the normative assessment, the study on the allocation of assets (summary of the study is given in Annexure 1 and the study is attached as Appendix 1) made the following observations and adjustments:

- *The capitalisation proposed by AIAL for the SCP includes financing allowance of INR 0.97 Cr. on the average WIP in FY 2021 (post-COD). However, as per AERA (Terms and Conditions for Determination of Tariff for Airport Operators) Guidelines, 2011 dated 28th February 2011, financing allowance is not applicable to assets/projects which have been acquired/initiated and commissioned within the same Tariff Year. Therefore, no financing allowance has been considered by the Study on the assets capitalised by AIAL in FY 2021. (Refer Para 6.5 of the Study)*

In point 5.4.4 of the CP, AERA has rightfully acknowledged the applicability of Financing Allowance to AIAL and has made adjustments as per instant formulae prescribed in the AERA Guidelines. When the airport such as Ahmedabad 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.

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

4.6 AERA proposal as per 7.3.78 on page 118 and 7.3.81 on page 119 of CP relating to Cost for Annex Building of Hangars

7.3.78 The Authority notes that this is an enabling project for NITB. Hence, the Authority has considered the cost towards this project part of the capital expenditure for the Third Control Period. However, there is no basis for the cost estimated for the "Annex building" at a rate of INR 93,750 per SQM. Therefore, the Authority has recalculated the same considering a cost of INR 47,300 per SQM on the basis of the cost considered for the GSE Maintenance facility. Further, the Authority observes that the cost proposed by the AO towards the main pavement is beyond the inflation adjusted normative cost. Therefore, the Authority recomputed the cost towards main pavement based on the inflation adjusted normative cost after making appropriate provisions for the GST and other items such as AGL ducts & reconfigurations, drain connections and airside operational constraints.

7.3.81 Based on the examination by the Authority, the cost proposed by AIAL for the hangers appears to be reasonable, however, there is no basis for the cost estimated towards "Annex buildings" at a rate of INR 93,750 per SQM. Since there is no basis for arriving at such a figure, the Authority has revised the cost towards "Annex buildings" based on the rate considered for GSE Maintenance Facility i.e., INR 47,300 per SQM as done in the case of Hangar 1. Subsequently, the cost towards the main pavement was rationalised using the inflation adjusted normative costs as done in the case of Hangar 1 (Refer Para 7.3.78).

Comments by AIAL:-

4.6.1 In the case of Annex Buildings of hangars, we had provided the basis for cost estimate based on the committed costs for ARFF and APHO buildings. The details for the same were also provided on 21st Sep 2022.

4.6.2 Further, we would like to submit that the rate for construction of Cargo Building is also similar to that of Annex Buildings of Hangars. Please refer the below calculation of cost estimate based on the cost for Cargo Buildings (which is approx. INR 94000, per sqm).

SR. NO. from LOA BOQ Summary	NAME OF STRUCTURE	Overall Cost for Cargo Complex (as per LOA issued)	Cost Pertaining to Cargo Office Building	
			% *	Value (INR)
2	Cargo Office (G+2)	80,025,642	100%	80,025,642
16	Electrical	130,475,588	10%	13,047,559
17	HVAC	128,378,855	5%	6,418,943
18	Fire Protection	39,386,393	10%	3,938,639
19	Lifts	6,787,498	100%	6,787,498
7	Utility structures for MEP	33,075,274	10%	3,307,527
8	MEP RELATED CIVIL WORKS	15,088,103	10%	1,508,810
9	BOUNDARY WALL & MS GATE	20,164,656	10%	2,016,466
Others (ref. Sr. 1, 3, 4, 5, 6, 10, 11, 12, 13, 14, 15)		902,118,171	0%	-
	Total Basic Amount	**1,355,500,180**		**117,051,084**
	GST @ 18%	243,990,032		21,069,195
	Labour Cess @ 1%	13,555,002		1,170,511
	Grand Total	**1,613,045,214**		**139,290,790**
	Area of Cargo Office Building	In Sqm		1,481
	Cost Per Sqm	**In INR**		**94,052**
* As the BOQ for the cargo complex is composite, we have assumed the proportionate costs which would be allocable to Cargo Office Building to arrive at the Per Sqm cost of construction of Cargo Office Building.				

Extract of BOQ Summary from LOA issued for Construction of Cargo Complex

Annex 1 to LOA Ref:PROC/AMD/22-23/LOA/018 dtd 14th July 2022		
SUMMARY		
SR. NO.	NAME OF STRUCTURE	AMOUNT (INR)
1	CT 1 & 2	687,389,365
2	Cargo Office (G+2)	80,025,642
3	DRIVER REST ROOM - 1 &2	3,431,226
4	SECURITY CABIN - 1,2 &3	3,188,616
5	GATE COMPLEX (ENTRANCE FOYER)	15,185,203
6	ROAD WORKS & PARKING	124,111,305
7	Utility structures for MEP	33,075,274
8	MEP RELATED CIVIL WORKS	15,088,103
9	BOUNDARY WALL & MS GATE	20,164,656
10	LAND DEVELOPMENT	12,345,999
11	STORM WATER	28,866,546
12	WATER SUPPLY	5,187,138
13	PHE PUMPS	4,913,709
14	SWERAGE	6,000,164
15	Project cordination services	11,498,900
16	Electrical	130,475,588
17	HVAC	128,378,855
18	Fire Protection	39,386,393
19	Lifts	6,787,498
TOTAL BASIC AMOUNT		1,355,500,180
GST @ 18%		243,990,032
Labor cess @ 1%		13,555,001.80
Grand Total Incl GST @ 18% & Labor cess @ 1%		1,613,045,214

4.6.3 In view of the above, AIAL requests AERA to true up actual cost of Annex Buildings during tariff determination for next control period.

4.7 AERA proposal as per 7.3.151 on page 140 of CP relating to Cargo Equipment

The Authority notes that AIAL has not provided any supporting documents or basis for the cost estimates. The Authority understands that the availability of equipment would be critical for the operationalization of the ICT. However, it is not possible to assess the reasonableness of the costs proposed at this stage considering the large number of equipment that is required, the costs of which vary with respect to their specification. Therefore, in the absence of a reliable basis, the Authority proposes to consider 50% of the estimated cost at this stage. The Authority understands that this project is currently under bidding. In case the project is awarded prior to the culmination of the consultation process, the same would be taken into consideration by the Authority. Otherwise, the same may be considered at the time of true of the Third Control Period subject to efficiency of costs and reasonableness.

Comments by AIAL:-

4.7.1 In respect to the Material Handling System (MHS) equipment, please find attached the letter of award (Annexure 1. A. LOA of Supply – MHS and Annexure 1. B. LOA of ITC - MHS). The summary table for Cargo Equipment is as follows: -

	Projected Amount (Rs Crs)	**Status as on date**
Movable Equipment for ICT	9.33	Procurement is being undertaken
MHS Equipment	67.51	LOAs attached for USD 4.7 mn + taxes (i.e. Rs. 48 Crs. inclusive of duties, taxes etc.). Bidding for balance amount is under progress.
IT System, Equipment Dom + Intl + Exp	3.36	Procurement is being undertaken
Ancillary Services	26.40	Procurement is being undertaken
Total	**106.59**	

4.7.2 Based on the progress achieved, we request AERA to consider "Rs. 67.51 Crs (MHE Equipment) + 50% of other items" in the tariff determinations and balance 50% of other items can be considered in true-up.

4.8 AERA proposal as per 7.3.174 on page 146 of CP relating to Soft Costs

In this respect, 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 16-17% 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 (inclusive of the Consultant's cost for Concept planning and Master planning) to the extent 8% of the costs of the CAPEX allowed by the Authority in respect of new projects proposed by the AO for the Third Control Period. The Authority has thus derived the amount proposed to be allowed towards the aforementioned costs as INR 515.71 Crores (i.e., 8% of the costs of the CAPEX allowed for this Control Period)

Comments by AIAL:-

4.8.1 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)

4.8.2 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 4.8.1 and 4.8.2 above is minimum 18-20%.

4.8.3 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 2 - ACRP Report - Airport Capex

4.8.4 **Based on information from reputed agencies from India and Overseas, it is evident that soft costs requested by AIAL is within the reasonable range. We therefore request the Authority to allow the cost of 16% 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 Page 137 of 231

~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 (M1 I.B)	52,141.71	47,839.95	-4,301.77

~3.5%

PART 7

Form P1 (b): Payroll Related Expenditure and Provisions (ref: Section A5.4.5)

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

4.9 AERA proposal as per 7.3.183 on page 148 of CP relating to re-adjustment in ARR in case any particular capital project is not completed/capitalised as per the approved capitalisation schedule.

The Authority proposes to reduce 1% of the project cost (not capitalised) from the ARR / target revenue as re-adjustment in case any particular capital project is not completed/capitalised 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 capitalisation 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 Fourth 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 AIAL to commission/ capitalize the proposed assets as per the approved CAPEX plan/ schedule.

Comments by AIAL:-

4.9.1 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 AIAL 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 AIAL to complete the project as per schedule, however there could be delays due to various uncertainties, especially in present situation. 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.

4.9.2 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.

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

4.10 AERA proposal as per 7.3.179 to 7.3.181 on page 147 of CP relating to Financing Allowance and Interest During Construction

7.3.179. The Authority is of the view that SVPIA being one of the oldest Airports in India, would not be eligible for Financing Allowance, as it is only a notional allowance and is different from the actual investment incurred by airport operators which includes interest during construction, amongst other things. Therefore, the provision of financing allowance on the average capital work in progress would lead to a difference between the projected capitalisation and actual cost incurred, especially when the airport operator funds the projects through a mix of equity and debt. Further, the Authority notes that in case of greenfield Airports, the Airport Operator would have had to wait for a considerable length of time before getting the return on the large capital outlay incurred by it as these projects take longer durations to commission and operationalise. It was with this consideration that the Authority had earlier provided financing allowance in the initial stages to such Airports. The Authority notes that SVPIA is a brownfield Airport and has lower construction and traffic risk for new construction at the Airport and Financing Allowance has never been provided in case of other Airports such as DIAL, MIAL and KIAL, Chennai, Kolkata etc.

Further, this will disincentivize the airport operator from ensuring a timely completion of projects and delivery of services to airport 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.

7.3.180. The Authority considered that giving an assured return on the equity investment even on work-in-progress assets would result in reducing the risks associated with equity investment in capital projects. However, the Airport Operator is given a fair rate of return on equity when the capital assets are capitalised.

7.3.181. In respect of IDC, the Authority is inclined to allow the same and accordingly, the Authority has recomputed IDC to be provided on the debt portion of the total value of proposed aeronautical capital expenditure based on the notional gearing ratio (debt-equity ratio of 48:52) followed for other PPP airports and cost of debt @ 9% (refer Para 8.3.3, Table 169) for the Third Control Period. Accordingly, the IDC proposed by the Authority towards the capital expenditure for the Third Control Period is given below.

Comments by AIAL:-

4.10.1 To avoid repetition of comments on financing allowance and Cost of Debt, please refer comments provided in point 4.5 and point 5.2 respectively.

4.10.2 **IDC is calculated on Average of Opening & Closing CWIP and considering certain projected cash flows. Whereas in actual, the cash flow could be different, and IDC needs to be borne till the actual date of capitalization of asset. Hence, we request authority to provide necessary true-up for actual IDC at the time of tariff determination of next control period.**

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 on page 161 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 Delhi International Airport Limited (DIAL), Mumbai International Airport Limited (MIAL), GMR Hyderabad International Airport Limited (GHIAL), Bangalore International Airport Limited (BIAL) and Cochin International Airport Limited (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 AIAL 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 SVPIA 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:

Particulars	CIAL	MIAL	BIAL	DIAL	GHIAL	Average	Median
Risk free rate	7.56%	7.56%	7.56%	7.56%	7.56%	7.56%	7.56%
Equity beta	0.9427	0.9391	0.9296	0.9732	0.9442	0.9458	0.9427
Equity risk premium	8.06%	8.06%	8.06%	8.06%	8.06%	8.06%	8.06%
Cost of equity	15.16%	15.13%	15.05%	15.41%	15.17%	15.18%	15.16%

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 AIAL for the Third Control Period.

Comments by AIAL:-

5.1.1 As per AERA Guidelines. AERA is expected to estimate cost by using CAPM of equity 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 AIAL. 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

Cost of Equity • The Authority shall estimate 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 Ahmedabad Airport 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 SVPIA is the Capital Asset Pricing Model (CAPM). The three components to be estimated in the CAPM are (a) the beta of the SVPIA, (b) the risk-free rate and (c) the equity risk premium. Following assumptions

related to above three components which appropriately capture the risks of SVPIA 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 SVPIA: 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 Ahmedabad 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 SVPIA. Furthermore, an inverse of the proximity scores are used to calculate the 'asset' beta of SVPIA

5.1.8.1 **Re-lever the asset beta to obtain the equity beta:** The asset beta of the SVPIA 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 SVPIA has been used for computing reasonable rate of CoE for SVPIA.

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.

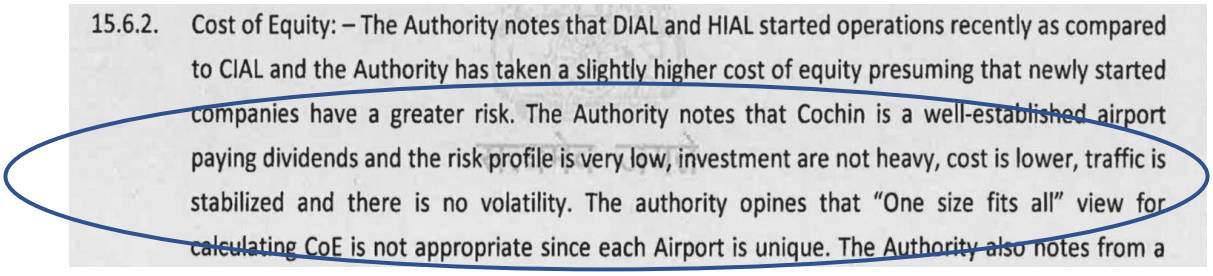
5.1.11 Asset beta of airports in developing countries is consistently higher than the asset beta of airports in developed economies. This can be demonstrated by the data provided in the IIM B study in which the asset beta for Sydney airport is 0.40 whereas the asset beta for Airport of Thailand is 0.86. 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 Pacifico, 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	0.848	0.893
14.	Flughafen Wien Ag	0.527	0.610
15.	Gruppo Toscana Aeroporti	0.457	0.455

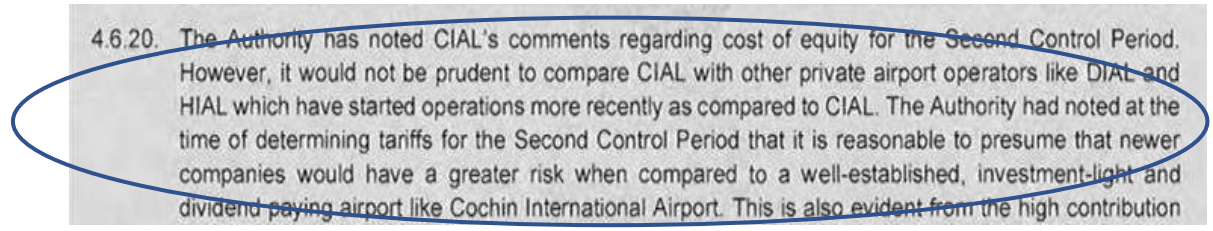
5.1.13 As is evident from table above, asset betas of airports in Mexico like Grupo Aeroportuario Del Centro Norte, Grupo Aeroportuario Del Pacifico, in Thailand like Airport of Thailand have asset betas of more than 1.

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 AIAL in the MYTP supported by an in-depth study conducted by an independent consultant PwC as per CAPM methodology.**

5.2 AERA proposal as 8.2.5 to 8.2.9 on page 162 of CP relating to Cost of Debt

8.2.5. The Authority noted that AIAL 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. Vide email dated 01st September 2022, AIAL was requested to clarify if AIAL or its current group lending shareholder, Adani Airport Holdings Limited has obtained credit rating from any external rating agency. AIAL, vide email dated 02nd September 2022, stated that, "Under the ECB guidelines there is no mandatory requirement for credit rating. However, the lenders have requested for credit rating. Therefore, AAHL has opted for private monitored rating which is shared with lenders. Since the credit rating is private and for specific purpose, it is not disclosed in public."

8.2.7. 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 privatisation 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 June 2022 has been in the range of 8.39% to 8.93% p.a.7. The Authority has also noted the Cost of Debt of other five PPP airports viz., DIAL, MIAL, GHIAL, BIAL and CIAL, which ranges from 7.80% to 10.30% (the average cost of debt works out to 8.95%).

8.2.9. Based on the above, the Authority proposes to consider the Cost of Debt as 9% for the computation of Fair Rate of Return.

Comments by AIAL:-

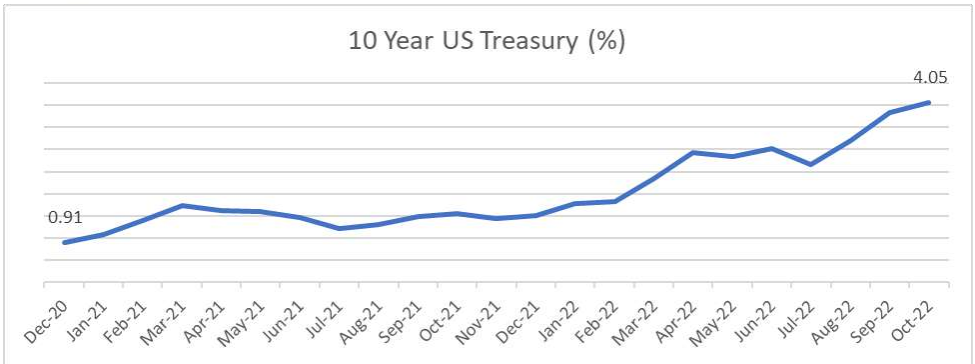
5.2.1 AIAL has considered CoD at 12% for the TCP based on its current borrowing rate from Adani Airport Holdings Limited (AAHL) which in turn has availed borrowing from global institutions like Standard Chartered Bank and Barclays Bank PLC.

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%)

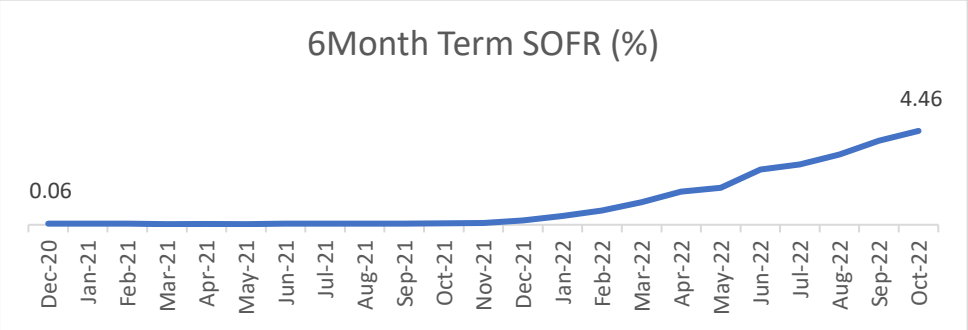
5.2.3 It is to be noted that tariff orders of above-mentioned PPP airports were issued during the period from December 2020 to August 2021. **The change in the global and domestic interest rates in the said period is provided in the following paragraphs.:**

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 (~3.14%) leading to increase credit spreads and cost of the borrowing globally:

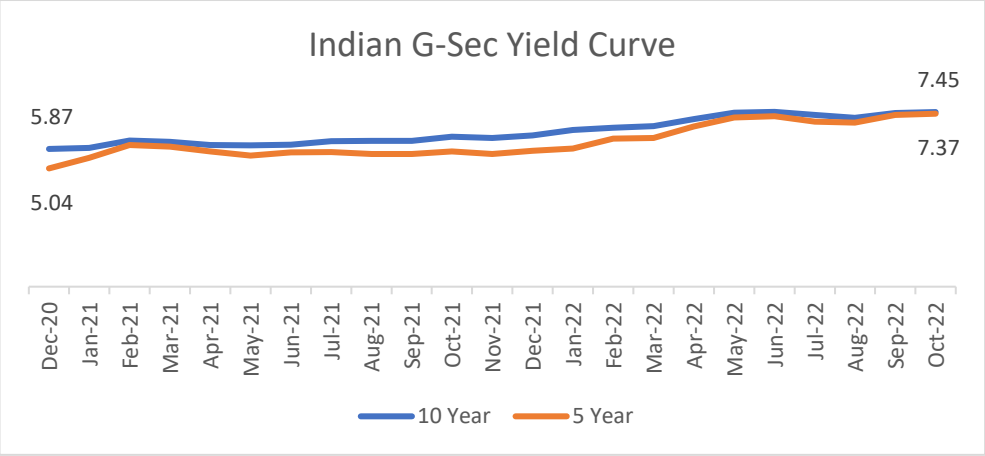


5.2.3.2 **Secured Overnight Financing Rate (SOFR)**, has also increased materially (~4.40%) in the said period:

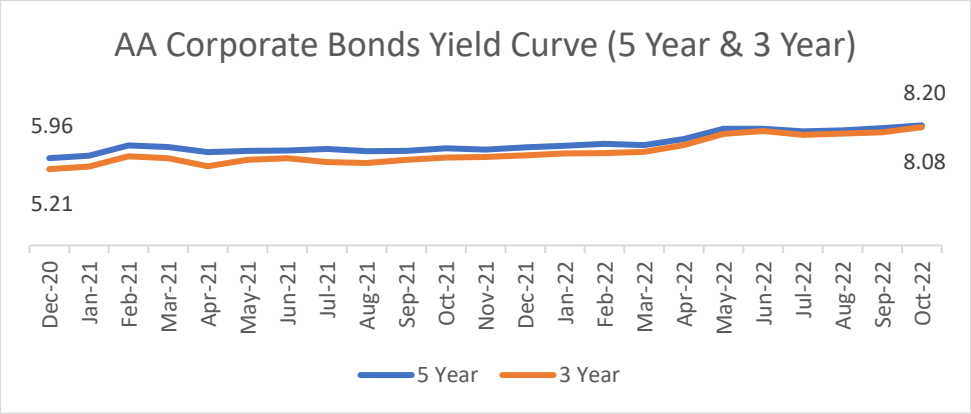


5.2.3.3 Increase in Domestic Interest Rates in India:

Since May-2022, the Reserve Bank of India has increased Repo Rate by 1.90% leading to cost of domestic borrowing becoming dearer in India. Following chart depicts increasing trend in **10 year (+1.58%)** and **5 year (2.33%)** Indian government securities yields:

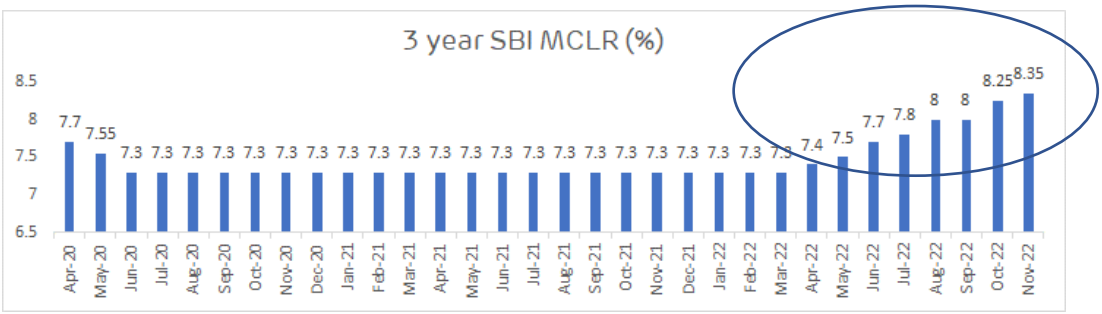


5.2.3.4 Following chart depicts increasing trend in **5 year (+2.24%)** and **3 year (2.87%)** AA rated corporate bond yields:



5.2.3.5 Increase in MCLR of Indian Banks :-

3 Year MCLR of both private sector banks and PSU Bank have increased more than 100 bps points from Nov-21 to Nov-22. 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 : -



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

It is to be noted that other Banks have also increased their MCLR, for example MCLR for Axis Bank is 8.50% in October 2022. Going forward Banks are likely to raise the rates further.

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

Considering the current profile of operation and outlook, rating of AIAL 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 AIAL 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 AIAL level will be BBB or below.

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

5.2.11 We believe that during the TCP, AIAL will be able to demonstrate competitive advantage of private sector in the operation of Airport which in turn will be reflected in the borrowing cost going forward. Keeping this in mind, at present we have locked up rates of borrowing for period of 3 years only to enable us to take advantage of reduced rate of interest going forward with synergy of operations.

5.2.12 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

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

5.3 AERA proposal as 8.2.10 and 8.3.2 on page 162 and 163 of CP relating to Fair Rate of Return (FROR)

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

Parameter (in %)	Formula	Value
Cost of Equity	E	15.18%
Cost of Debt	D	9.00%
Weighted average gearing of debt	G	48.00%
FRoR	D × G + E × (1 – G)	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 AIAL:-

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 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.

5.3.2 **We would request the Authority to consider our comments on CoE and CoD. We would also request the Authority to clarify whether the notional debt:equity ratio of 48:52 will be trued-up during the tariff determination of the next control period, based on actual gearing ratio.**

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

6.1. AERA proposal as 10.2.34 and 10.2.36 on page 177 and 178 of CP relating to Manpower Expenses

10.2.34. The Authority proposes to consider the actual expenses as submitted by AIAL for FY 2022 and revise the Y-o-Y increase in Payroll costs from 15.2% to 6% for the remaining (4) tariff years of the Third Control Period, as approved by the Authority for other similar airports. Based on its examination of the growth rate in average salary expenses at other PPP airports such as DIAL, MIAL, BIAL and GHIAL, the Authority is of the view that 6% is reasonable estimate for the growth of average salary.

Point 10.2.36

- *…… The Authority examined the average salary submitted by AIAL for FY 2023 and finds the same to be reasonable. It is noted that AIAL projected an increase of 15.2% on the average salary year-on-year (Y-o-Y), starting from FY 2024, in the Third Control Period. However, the Authority proposes to consider a growth rate of 6% for the remaining (3) tariff years of the Third Control Period, starting from FY 2024, in line with the approach followed for the AAI employees.*

Comments by AIAL:-

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

1. All India AAI Employees salary growth
2. Ahmedabad Airport AAI Employees Salary Growth
3. Analysis of Select Employee Cost Paid by AIAL to AAI from COD

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 Ahmedabad Airport AAI Employees Salary Growth

Avg salary per AAI employee at Ahmedabad Airport is Rs. 24 lakhs in FY19-20 and the CAGR increase in avg cost per employee is approx 12% in last 8 years from FY12 to FY20

		FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	CAGR
Employee Cost (Tabe 5 of Study of O&M)	Rs Crs	19.9	20.3	20.4	25	28.1	23.64	31.54	38.32	41.1	20%
No. of Aero Employees (Tabe 23 of Study of O&M and Page 65 from MYTP submission for SCP)	No. of Employees	206	158	171	174	188	154	147	160	174	
Avg Cost per employee	**Rs Crs per employe**	0.10	0.13	0.12	0.14	0.15	0.15	0.21	0.24	0.24	11.8%
Year on Year Growth in avg cost cost	%		33%	-7%	20%	4%	3%	40%	12%	-1%	

6.1.1.3 Analysis of Select Employee Cost paid by AIAL to AAI

The Avg cost per employee in FY21-22 has increased by 11% over FY20-21.

Period	Total Salary Cost	No. Of AAI Employees	Avg Annual Cost per employee Before Adjustment
	Rs. Crs	Nos.	Rs. Crs per employee per annum
	A	B	C = A/B*100
Nov-20	1.802	180	0.16
Dec-20	2.530	180	0.17
Jan-21	2.580	180	0.17
Feb-21	2.650	180	0.18
Mar-21	2.530	180	0.17
Total of FY 2020-21 (A)	**12.092**	**855**	**0.17**
Apr-21	2.660	180	0.18
May-21	2.420	179	0.16
Jun-21	3.060	178	0.21
Jul-21	2.780	177	0.19
Aug-21	2.690	176	0.18
Sep-21	2.650	175	0.18
Oct-21	2.947	174	0.20
Nov-21	2.860	174	0.20
Dec-21	2.670	174	0.18
Jan-22	2.988	174	0.21
Feb-22	2.561	173	0.18
Mar-22	2.910	173	0.20
Total of FY 2021-22 (B)	**33.196**	**2107**	**0.19**
Increase of Avg Cost in FY21-22 Vs FY20-21 (B/A*100)			**11%**

6.1.2 **It is evident from the above analysis that avg annual cost per AAI employees has been increasing at a rate of 11-13%.**

6.1.3 AIAL is a new AO who needs to build its manpower to run the Airport operations. AIAL 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%."

6.1.4 AIAL 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.

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

6.1.6 **We request the Authority to provide at least 11% YoY increase in avg cost of salaries for all employees i.e. AAI and AIAL Manpower.**

6.2. AERA proposal as 10.2.40 on page 180 of CP relating to Utilities Expenses

10.2.40. The Airport Operator has projected the electricity costs, after netting off the recoveries made from the Concessionaires (which is assumed to be 7.00% of the total electricity cost). The Authority notes that the power recovery percentage is significantly lower than that of comparable airports. The Authority is of the view that with the gradual increase in the non-aeronautical operations, the Airport Operator should increase the power recovery from the Concessionaires. In case the power recoveries do not increase, the Authority proposes to consider power recoveries at a notional rate of 25% while truing up of the Third Control Period.

Comments by AIAL

6.2.1 AIAL has provided the report duly authorized by representatives of AIAL and AAI whereby it is confirmed that actual recoveries of utilities is in range of 5% to 8% (for quick reference the same is attached as Annexure 3 - Report on Electricity Recovery).

6.2.2 The existing terminal capacity is not sufficient to take care of the growing passenger demand. After the ongoing refurbishment, the capacity will increase to 16.8 mppa which itself will not be enough to accommodate the traffic demand in FY25 and FY26 (refer traffic projection in Table 76 of the CP). For example, if we hypothetically apply 35 sq mtr area for 5,000 PHP, the total area requirement will be at least 175,000 sq mtr. Whereas even after refurbishment AIAL will have area of approx. 95,000 sq mtr. There is a significant mismatch between the demand requirement and area requirement which will get addressed at end of FY26 when NITB Phase 1 will be commissioned.

6.2.3 Second, AIAL will be charging users / concessionaires based on actual usage by them and not on notional basis. The proposal to reduce the recoveries by notional rate will lead to financial loss to Airport Operator forever.

6.2.4 **In light of above, we request AERA to consider the actual recoveries of utilities during the TCP at the time of true-up instead of imposing notional recovery of utilities from concessionaires as 25%**

6.3. AERA proposal as 10.2.50 on page 182 of CP relating to Rates and Taxes

10.2.50. Thus, the amount of tax paid / payable in FY 22-23 comes to Rs. 5.28 Cr. For FY 22-23, we had projected Rs. 4 Cr which has now increased to Rs. 10.69 Crs. The cost will be Rs. 8.45 Cr (on normalized basis after eliminating arrears) from FY 23-24 onwards."

Comments by AIAL

6.3.1 AIAL is thankful that AERA has considered the updates on property tax paid by AIAL. Further to our email dated 23rd Sep 22, we have recently received arrears for property tax invoice from AMC (Ahmedabad Municipal Corporation) for the period starting from COD till FY 21-22 as well.

6.3.2 In view of the above, the total amount of property tax paid to AMC and Cantonment Board comes to Rs. 18.46 Cr as tabulated below:

Particulars (in INR Cr.)	FY 21-22	FY 22-23
Cantonment Board		
Property Tax Invoice from Cantonment Board (CB) (A)	0.93	3.17
Differential cost as stated by CB for FY 21-22 that is to be paid in FY 22-23 (B)	-	2.24
Total property tax invoice from Cantonment Board (C = A + B)	0.93	5.41
Ahmedabad Municipal Corporation		
Property Tax Invoice from Ahmedabad Municipal Corporation (AMC) (D)	2.13	6.62
Differential cost as stated by AMC for FY 20-21 and FY 21-22 that is to be paid in FY 22-23 (E)	-	6.43
Total property tax invoice from AMC (F = D + E)	2.13	13.05
Total (C + F)	**3.06**	**18.46**
Annual Cost for Tax (on normalized basis after eliminating arrears) for considering in FY 24 onwards (G = A + D)	**-**	**9.79**

6.3.3 **In view of the above, we request AERA to suitably increase the allowable expense for FY22-23 to Rs. 18.46 Crs and consider Rs. 9.79 Cr annually from FY 24 onwards which would also be increased in line with additional terminal area from FY 24.**

6.4. AERA proposal as 10.2.60 on page 184 of CP relating to Security expenses considered as 50% Aero in the calculation table 191

Comments by AIAL:-

6.4.1 In order to avoid repetition of comments, please refer Point 2.3.5 above

6.5. AERA proposal as 10.2.68 to 10.2.72 on page 185 onwards of CP relating to Corporate Cost Allocation

10.2.68. The Authority on review of the above, observes that the corporate costs include cost towards the inhouse legal team. However, the Authority has already allowed the employee expenses towards the inhouse legal team of AIAL and therefore, is of the view that providing additional expenses towards legal department at the corporate level would result in redundancy. Hence, the Authority has excluded the same from aeronautical O&M expenses.

10.2.69. Based on the above, the Authority proposes not to consider an amount of INR 0.11 Cr. claimed by Airport Operator towards such inhouse legal team and allow the remaining amount of INR 13.83 Cr towards Corporate Costs for FY 2022.

10.2.72. Further, the Authority observes that the salary cost constitutes the major portion of the corporate allocation cost of INR 13.94 Cr. and hence, proposes to adjust the increase claimed by the Airport Operator by considering 6% Y-o-Y for all the 4 FYs, starting from FY 2023, which is in line with the increase proposed for Manpower expenses of AAI and AIAL employees.

Comments by AIAL:-

6.4.1 To avoid repetition of comments on in-house legal team, please refer the comments provided in 2.3.4

6.4.2 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 11% YoY as requested in point 6.1

6.5. AERA proposal as 10.2.81 on page 188 of CP relating to Repairs and Maintenance

• The Authority is of the view that AIAL 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 aeronautical repairs and maintenance expenses claimed by the Airport Operator to 6% of the Opening Net block of aeronautical assets.

• Therefore, the Authority proposes to rationalise the repairs and maintenance expenses claimed by the Airport Operator to 6% of the Opening Net block of Aeronautical Assets for FY 2022 and FY 2023 and consider the amount claimed by the Airport Operator towards repairs and maintenance (post bifurcation in the revised gross block ratio) for FY 2024, FY 2025 and FY 2026.

Comments by AIAL:-

6.5.1 To avoid repetition of discussion on Repair and Maintenance, please refer the comments provided above in **2.3.3**

6.5.2 In addition, we would like to submit that Repairs and Maintenance expenses for FY21-22 and FY22-23 are either incurred or committed. These are expenses which need to be incurred for maintaining safe operations at the Airport. Please find enclosed the list of expenses as **Annexure 4 - List of R&M Exp for 21-22**).

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

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

7.1 AERA proposal as 11.2.6 from page 202 of CP relating to Non-Aeronautical Revenues

11.2.6. The Authority notes that space rentals from airlines have been included as part of the non-aeronautical revenue. However, space rentals from agencies providing aeronautical services should be treated as aeronautical revenue. Hence, the Authority proposes to consider "Space rentals from Airlines in the terminal like SpiceJet, Indigo, TATA SIA, Emirates, Qatar, Go Airlines, Emirates, Air Arabia, Singapore Airlines, Air Asia" as aeronautical revenue. This is in line with the approach followed in the true-up of non-aeronautical revenue in SCP (Refer Para 5.8.4).

Comments by AIAL:-

7.1.1 **In order to avoid repetition of comment, please refer point 2.4 above.**

7.2 AERA proposal as 11.2.8 to 11.2.17 from page 202 onwards of CP relating to Non-Aeronautical Revenues

11.2.8. The Authority notes that the AO undertook the process for selection and appointment of Master Concessionaire through a global competitive bidding process. The criteria for selection of Master Concessionaire seems restrictive. The Authority may examine this issue in detail and comment, if required, in the final Tariff Order.

11.2.9 ……

11.2.10….The Authority is not convinced that the revenue from Master Services Agreement is remaining constant for the entire Control Period, while all the other costs are increasing across the Third Control Period. Further, the modification of T1 and T2 (19.83% increase in terminal area) and commissioning of NITB Phase 1 (224.30% increase in terminal area) would result in considerable increase in terminal area, thus adding more space for non-aeronautical services. Further, it is the responsibility of the AO to ensure that in the Third Control Period they achieve NAR higher than what was achieved in the SCP. In this context, there was no obligation on the AO to accept the bid of Master Concessionaire offering such low revenue share.

11.2.11…..

11.2.12….

11.2.13….

11.2.14…. Based on the above considerations, the Authority has estimated the total Non-aeronautical Revenue for the Third Control Period for AIAL as follows.

• The Authority has considered the actual revenue earned by the AO for FY 2022, as this FY has already passed.

• The non-aeronautical revenue earned by AAI in FY 2020, which is a pre-COVID year, is considered as the base for estimating the non-aeronautical revenue for AIAL in the Third Control Period. Therefore, the non-aeronautical revenue earned by AAI for FY 2020 i.e., INR 101.41 Cr. (Refer table 38) has been assumed for FY 2023 for AIAL, as the domestic traffic is expected to reach the pre-COVID level of FY 2020 by FY 2023 and international traffic's recovery to Pre-Covid level in FY 2023 and FY 2024 is ~84% and ~118% respectively (as explained in Chapter 6)

For FY 2024 till FY 2026, the Authority proposes to increase the various components of non-aeronautical revenue with respect to the growth rates as shown in the following table 214

11.2.15….

11.2.16….

11.2.17. The Authority is of the view that the AO should take efforts to substantially increase non-aeronautical revenue for the Third Control Period, in line with the other PPP airports. Otherwise, the Authority may propose for a notional increase in the non-aeronautical revenue for the Third Control Period, based on such revenue in other PPP airports as mentioned in the above para, while determining tariff for the Fourth Control Period, in the interest of the airport users.

Comments by AIAL:-

7.2.1 The AO invited bids through a global competitive bidding process for selection of a Master Service Provider for Non-Aeronautical services at SVPIA. 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.

7.2.2 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.

7.2.3 During the COVID-19 period, the Non-Aeronautical revenues of the Airport were severely impacted. In order to protect its business interests, AIAL 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 AIAL are projected.

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

7.2.5 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.

7.2.6 **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.**

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

8.1 AERA proposal as 12.2.2 from page 207 of CP relating to Taxation for the TCP Revenues

Therefore, the Authority is of the view that:-

•30% Non-Aeronautical Revenue should not be treated as a subsidy for the AO as the AO 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 Revenue as part of revenue from aeronautical services would result in an unfair enrichment to the AO, effectively reducing the cross-subsidy benefit to the airport user from the present 30% non-aeronautical income.

Comments by AIAL:

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. AIAL 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.

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.**

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

9.1 AERA proposal as 14.2.2 to 14.2.7 from page 211 of CP relating to Carry forward some portion of ARR

14.2.3. 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 to the fact that the new Aeronautical tariff proposed by the Authority may be implemented only by the end of the current Financial Year, thereby resulting in only lesser tariff years being available for recovery of the ARR.

14.2.4 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.

14.2.5. 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 12th January 2017.

14.2.6. Further, as per Schedule B of the Concession Agreement with AAI, the AO is expected to ensure that the "organization of the spaces and structural design of the terminal should be modular thereby allowing flexibility and ease of expansion". It can be noted from the Figure 1 and Table 76 that at the end of the Third Control Period, the combined passenger handling capacity of the Terminal buildings would be 36.8 MPPA against the requirement of 19.85 MPPA. Therefore, there would be considerable capital hangover due to the creation of such excess capacity at the end of the Third Control Period.

14.2.7. 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 AIAL:-

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

Investment mobilization through Privatization

9.1.1.1 In last 30 years investments of approx. Rs. 750 Crs (approx. Rs. 1,500 Crs inflation adjusted value) has been made in the Ahmedabad Airport, the last major expansion being in the year 2010. During the period FY10 to FY20 traffic had increased significantly whereas Airport capacity was not enhanced to take care of the requirement. Going forward, the annual passenger throughput is expected to grow to 20 million in next 5 years and 30 million over 10 years.

Considering the potential demand and operational requirements, AIAL is mobilizing investment of over Rs 10,000 crores during the control period.

Modular Approach and Capacity Requirement

9.1.1.2 As explained in point 4.1,

9.1.1.2.1 AIAL has adopted modular approach for Airport development.

9.1.1.2.2 The useable operational capacity of the Airport will be 28.8 million instead of 36.8 mppa.

9.1.1.2.3 There is no excess capacity hangover at end of the control period .

9.1.1.3 It is important to mention that infrastructure projects like Airports have large gestation period and future capacity requirement need to be planned well in advance. As per traffic projection (19.8 million in FY26), the Airport will be operating at approx. 70% of its capacity (19.8 mppa / 28.8 mppa). The Airport Operator will be required to start planning for capacity creation over 28.8 mppa immediately after TCP. This has been explained in the Master Plan and during AUCC.

Financial Position of the Airport

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

9.1.1.4.1 Ahmedabad Airport has been incurring losses since privatization. AIAL has incurred cash losses in FY21 and FY22 totaling to ~Rs. 250 Crs. The losses are getting accumulated in FY23.

9.1.1.4.2 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.

9.1.1.4.3 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.

9.1.1.4.4 AIAL will need to start planning the next capacity creation nearer to end of TCP.

Significant Increase in Tariffs

9.1.1.5 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 tariff card by AERA as follows: -

Airport	Reference	Yield Per Pax (Rs)	UDF for Domestic / International Departing Pax (Rs)
Hyderabad	TCP Order No. 12/2021-22	430	FY24 700 / 1,360 FY25 750 / 1,500 FY26 750 / 1,500
Bangalore	TCP Order No. 11/2021-22	388	FY24 450 / 1,400 FY25 550 / 1,500 FY26 550 / 1,500
Ahmedabad	CP 10/2022-23	413	FY24 703 / 1,400 FY25 738 / 1,470 FY26 775 / 1,544

Unserved consideration

9.1.2 Majority of the capex is being capitalized in the later years of the TCP. The impact of the same in ARR calculation for TCP is limited. The impact of this capex will be a part of the regulatory building blocks like return on RAB, depreciation and operating expenditure (area increase by approx. 180%) in the next control period (FY27 to FY31). 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 AIAL.

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.

9.1.3 In light of above, we 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 from 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 stakeholders' discussion and hence AIAL is directed to submit the detailed Annual Tariff Proposals in line with the ARR and Yield arrived at by the Authority on or before 31st October 2022 which will be put up for Stakeholders' Consultation.

Comments by AIAL:-

9.2.1 The tariff card was submitted to the Authority on 31st October 2022 and subsequently published by the Authority vide Public Notice No. 15/2022-23 dated 31st October 2022.

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.**

Chapter 10 “Other Points”

10.1 Please refer the point 7.11 as submitted in the MYTP. For easy reference the same is reproduced below: -

Presently SVPIA has a single runway (05-23) orientated in north-east to south-west direction, with length of 3,505 meters and width of 45m which is adequate for Code E aircraft operations. The predominant direction of operation for take-offs and landings is towards the southwest (23 direction). The runway length of 3,505m enables all narrow body aircraft to operate without commercial weight restrictions. (i) Development of mandatory Runway End Safety Area (RESA) of airport, at the end of runway, is essential compliance requirement. (ii) Similarly, development of full-length parallel taxiway is another important necessity for SVPIA to enhance its runway capacity and to improve operational efficiency. (iii) Another important DGCA compliance requirement is to have Runway Basic Strip of 140 m from the centreline.

In order to take up these projects, erstwhile Airport Operator i.e. AAI had initiated discussion with local state authorities for acquiring land measuring approx. 52.84 Acres. After privatization, AIAL has actively carried forward those discussions with AAI and state authorities (refer Annexure - K attached).

Total land of 20.24 Acres out of 52.84 Crs is immediate requirement to cater to critical projects in the Third Control Period.

AIAL acknowledges that acquisition of land is time consuming. It involves multiple stakeholders, various processes and procedures which have variability on the timing and cost of the acquisition of land. Considering these factors, AIAL has not considered the costs of land acquisition and some of the project dependent on availability of land in this MYTP. Therefore, AIAL request the AERA to kindly consider the necessary trueups for the same in the next control period and to provide for eligible return on land acquisition cost. AIAL 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.

10.2 Please refer the disclaimer provided in the Chapter 6 in the MYTP. For easy reference the same is reproduced below: -

As per Concession Agreement, AIAL is required to make payment of Estimated Deemed Initial RAB , Initial Non-Aeronautical Investment and CWIP. AIAL had received invoice from AAI for RAB and CWIP inclusive of GST against which AIAL had contested that GST will not be applicable on RAB and CWIP amount based on various opinions obtained from independent tax consultants. Subsequently, AAI had also taken legal opinion and based on the said opinion, AAI requested AIAL to provide necessary indemnity bond in case in future GST amount is payable by AAI to tax authorities on RAB and CWIP invoices. AIAL submitted the necessary indemnity bonds and accordingly, AAI had shared revised RAB and CWIP invoices after excluding GST. If in future, AAI is required to bear the GST, which based on indemnity bond inter-alia will be recovered by AAI from AIAL, the GST amount will be added to the Initial RAB and CWIP. For the time being, the Initial RAB and CWIP numbers provided in this MYTP are exclusive of GST. AIAL hereby, reserves the right to include the GST and to revise the Initial RAB and CWIP and thereby the MYTP or shall be considered in subsequent control periods as part of true-up, depending on the future outcome of the matter.

10.2.1 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-up based on actual incurrence in the next control period.

10.3 Please refer the disclaimer provided in the Chapter 7 in the MYTP. For easy reference the same is reproduced below: -

AIAL is required to pay the stamp duty and registration charges on the Concession Agreement. AIAL would be required to bear the stamp duty and registration charges based on decision with the state authorities, and it will be added to the capital expenditure. For the time being, the numbers provided below for capital expenditure are exclusive of stamp duty and registration charges for the purpose of this MYTP calculation. AIAL hereby, reserves the right to include the stamp duty and registration charges and revise the Capital Expenditure in MYTP or shall be considered in subsequent control periods as part of true-up, depending on the future outcome of the matter.

10.3.1 While AERA has considered the Stamp Duty payment (refer point 7.3.170 to 7.3.171 in the CP), there is no mention of registration charges in the said discussion. We request Authority to allow for necessary true ups for registration charges based on actual incurrence in the next control period.

Chapter 11 "Annexures"

i. Annexure 1 – LOAs for MHE Cargo Equipment
ii. Annexure 2 – Airport Capital Improvements: A Business Planning and Decision-Making Approach
iii. Annexure 3 – Certificate from Committee set up to verify the electricity charges
iv. Annexure 4 - List of R&M Expenditure for FY 21-22

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LETTER OF AWARD

15th NOVEMBER 2022
Ref. NO.: PROC/AMD/22-23/LOA/030

M/s. ALS Logistic Solutions GmbH - Dubai Branch
Grosvenor Business Tower, Off. 805
Barsha Heights, PO Box 36414, Dubai
United Arab Emirates

Kind Attn: Mr. Walid Khoury (Managing Partner)

Subject: Letter of Award for Design, manufacture, supply, transportation to site and delivery of Material Handling System (MHS) at Integrated Cargo Terminal, Ahmedabad International Airport Ltd, Ahmedabad.

References.:
1. EOI publish dtd 27th June'22
2. RFQ - PreQ dtd 27th June'22 ("RFQ")
3. RFP - dtd 28th July'22 ("RFP")
4. Your final proposal dtd 9th & 10th Nov'22

Dear Sir,

With reference to the RFQ and your proposal thereto, Ahmedabad International Airport Ltd. (**"Employer/AIAL"**) is pleased to issue this Letter of Award (**"LOA"**) to M/s. ALS Logistic Solutions GmbH – Dubai Branch (**"Supplier"**) for Design, Manufacture, supply, transportation to site, and delivery of Material Handling System (MHS) at Integrated Cargo Terminal at Ahmedabad International Airport Ltd, on DAP Ahmedabad basis along with two (02) years of DLP as per the technical specifications contained in tender documents, addendums and amendments issued, discussions between us and the agreed scope of work.
Based on the above and the understanding reached between AIAL and Supplier, we are hereby pleased to issue this LOA on the following terms

1. **Price:** We Employer agree to pay a sum of **USD 4,624,576 (US Dollar Four Million Six Hundred Twenty-Four Thousand Five Hundred Seventy-Six Only)** on DAP Ahmedabad, (Incoterms 2020) India basis. This amount includes Design, Manufacture, supply, transportation to site and delivery of Material handling system (MHS) with two (02) years of DLP with all necessary accessories, spares & services for DLP, custom clearance and excluding Custom duty & GST, 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.

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2. **Scope of works**: Detailed agreed scope of works as per attached annexure 2.

3. **Taxes and Duties:** The LOA price set out above excludes Custom duty, GST, demurrage charges attributable to AIAL (if any) and includes Custom clearance charges.

4. The Installation, testing & commissioning along with 05 years of Comprehensive maintenance services (CAMC) for MHS shall be carried by OEM Indian entity/Authorized Indian partner of Supplier against LOA ref: PROC/AMD/22-23/LOA/031 & 32 dtd 15th Nov'22.

5. **Contract Performance Bank Guarantee ("CPBG") cum Performance bank Guarantee ("PBG")**: Supplier shall submit CPBG cum PBG of 10% of total contract value within 30 days from the date of on issuance of the order/LOA whichever is earlier. The CPBG Cum PBG shall be valid until completion of 2 years of warranty/defect liability period.

   The CPBG cum PBG format shall be strictly as per the format shared along with tender documents

   All the payments pertaining to this contract shall be made only after receiving the correct and accepted CPBG cum PBG

6. **Terms of Payment:**

   All payments shall be made through irrevocable Letter of credit payable at sight as per below mentioned milestones:

   70 % on submission of relevant documents as mentioned below, all in triplicate:

   a) Bill of Lading
   b) Commercial Invoice
   c) Packing List
   d) Certificate of Origin
   e) 10% of CPBG Cum PBG of total LOA value, as per above clause no. 5

   20% after installation of MHS at site & acceptance (to be issued within 2 weeks after completion of full work against this milestone) from AIAL engineer-in-charge.

   10% after commissioning and handover to AIAL with due acceptance (to be issued within 4 weeks after completion of full work against this milestone) by from AIAL engineer-in-charge.

7. **Effective date:** 15th November 2022

8. **Schedule of Completion:** The entire SITC works of MHS shall be completed and handed over to AIAL on or before 05th October 2023 with below break up in two phases –

   Phase 1: All equipments/System (except ETV & Workstations) by 18th May 2023
   Phase 2: ETV system and Workstation by 05th October 2023.

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9. **Delay Damages:** It will be applicable at 0.5% per week delay and part thereof maximum up to 5% of the total basic contract price 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 & 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. **Warranty/ defect liability period:** Two (2) years from the date of issue of Take over certificate (to be issued within 4 weeks after completion of full work as per agreed scope) by AIAL in two phases as per completion schedule mentioned in clause 8.

12. We, AIAL, will be issuing a formal purchase order (PO) in this regard soon and until the finalization and execution of such PO, 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 Supplier/Contractor is required by AIAL to commence the Project in accordance with the References above-mentioned

13. **Governing Law:** This LOA shall be interpreted, construed and governed by the Laws of England and Wales.

14. The Supplier shall perform their obligations in terms of this LOA in accordance with applicable law and the instructions of AIAL

Till such time PO is made, this LOA is being issued to enable you to start the Project works.

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, Ahmedabad International Airport Limited

Hitarth Mankodi
Hitarth Mankodi (Nov 17, 2022 13:25 GMT+5.5)

Hitarth Mankodi
Chief Airport Officer

For, ALS Logistic Solutions GmbH-Dubai Branch

ايه ال اس لوجيستيك سليوشنز
ALS LOGISTIC SOLUTIONS
P.O. Box 36414, Dubai, UAE

Authorized Signatory

WALID KHOURY

Enclosures:
Annexure 1: Price Sheet
Annexure 2: Scope of Work
Annexure 3: List of below documents
- Special Terms & Conditions
- GTC
- Bank Guarantee Formats & other documents (if any)

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Annexure -1 LOA Ref. NO.: PROC/AMD/22-23/LOA/030 dtd 15th Nov 2022								
	Curreny : US DOLLARS							
Sl No.	Description	CT 1 - Export Phase 1A	CT 1 - Import Phase 1A	CT 2 - Import Phase 1A	Total Equipment Qty	UOM	Unit Rate (USD)	Total Price (USD)
1	ETV 15ft, including Aisle equipment		1		1	SET	1,067,312.17	1,067,312
2	ULD Rack Structure (4 Levels)		1		1	SET	227,593.57	227,594
4	10ft Friction Driven Roller Deck		37		37	SET	3,442.75	127,382
5	15ft Friction Driven Roller Deck		37		37	SET	5,167.57	191,200
6	Temporary 15ft Motorized Roller deck for ULD bypass lane		3		3	SET	8,163.56	24,491
7	10ft Lowerable Workstation with Delta ram protection and scale	1	1		2	SET	55,671.04	111,342
8	20ft Lowerable Workstation (2x10ft) with Delta ram protection and scale		1		1	SET	113,403.48	113,403
9	Fixed Workstation with Motorized Roller and weighing scale		1		1	SET	13,566.08	13,566
10	Fixed Workstation with Non-motorized Roller, galvanized	6			6	SET	6,981.67	41,890
11	Fixed Workstation with Non-motorized Roller	22			22	SET	6,577.67	144,709
12	Castor Deck (sqm), galvanized	153			153	SET	662.89	101,422
13	Castor Deck (sqm)	527			527	SET	686.12	361,586
14	Weighing scale integrated in Ball decks (4 load cells each)	6			6	SET	5,552.40	33,314
15	Motor Powered Roller Deck	7	11		18	SET	5,652.81	101,751
16	Ram protection (warehouse side)		2		2	SET	1,767.41	3,535
17	Transfer Lanes (5ft Airside Interface)	7	5		12	SET	4,219.31	50,632
18	Ram Protection with driven roller (Transfer Lane)	7	5		12	SET	3,188.53	38,262
19	Roller Shutter Transfer Lanes (3000mm W x 4900mm H)	7	5		12	SET	7,373.58	88,483
21	Slave Pallet Mover, incl. 1 battery & 1 charger	1	1		2	SET	75,754.34	151,509
23	IHP Storage Position (1.25m x 1.25m) (G+5), 11m height clearance			1,322	1,322	SET	71.48	94,490
24	IHP Storage Position (1.25m x 1.25m) (G+2), 6m height clearance	438	96		534	SET	71.47	38,167
24.1	IHP Storage Position Detained/Cold Rooms (G+2), 5m height clearance	87	33	9	129	SET	71.47	9,220
25	Inhouse Plastic Pallets, Size 1.2m x 1.2m				2,300	SET	54.52	125,387
26	Floor Scale 1.4m x 1.4m, 2T	9			9	SET	6,613.40	59,521
27	Floor Scale 7.2m x 3m, 13.6T	1			1	SET	23,982.76	23,983
28	IHP Conveyor (1.5m L x 1.2m W)	25			25	SET	3,855.07	96,377
29	IHP RA deck	5			5	SET	5,703.53	28,518
30	PLC & Electricals				1	SET	284,079.39	284,079
31	Visualization of the PLC system		1		1	SET	54,973.86	54,974
32	IT System				1	SET	274,871.29	274,871
33	Shipping & Delivery (DAP Ahmedabad Airport)				1	SET	367,031.00	367,031
34	Customs Clearance Handling fees				1	SET	31,200.00	31,200
35	DLP Cost				1	SET	143,375.00	143,375
a)	Preventative Maintenance Support during 2 Years DLP Period				2 Years		17,000.00	17,000
b)	Hotline Support for 2 Years				2 Years		51,480.00	51,480
c)	Spare Parts Package				Lot		74,895.00	74,895
TOTAL PRICE IN USD - DAP Ahmedabad (Incoterms 2020) Airport (Including Custom Clearance, excluding Custom duty & GST)								4,624,576.00

OPTIONAL ITEMS - FOR RATE ONLY

	Equipment Phase 1A	Qty	UOM	Unit Rate (USD)
1	Truck Dock 15ft (option)	1	SET	71827.00
2	Motor Powered Roller Deck	1	SET	5681.50
3	Dock Leveller at Import Area (in lieu of TD), excluding door	1	SET	3794.00
4	Workstation on Ball Mat (3.3m x 2.6m)	1	SET	8378.50
5	Ball Mat [m²], galvanized	1	SET	791.61
6	Ball Mat [m²]	1	SET	805.02
7	Battery Trolley for SPM	1	SET	2120.00
8	Extra battery for SPM	1	SET	5697.50
9	Dock Leveller, 2250mm x 3000mm (excluding door)	1	SET	3958.47
10	Sectional Door in Dock Leveller Area (2800mm W x 4900mmH)	1	SET	4041.20
11	Slave Pallet Mover, incl. 1 battery & 1 charger	1	SET	68900.00
12	Weighing Scale on the Airside Conveyor	1	SET	6987.67
13	Slave Pallet 10 ft	1	SET	3500.00

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ALS LOGISTIC SOLUTIONS
P.O. Box 36414, Dubai, UAE

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LETTER OF AWARD

15th NOVEMBER 2022
Ref. NO.: PROC/AMD/22-23/LOA/031

M/s. ALS Logistic Solutions India Pvt Ltd

Kind Attn: Mr. Walid Khoury (Managing Partner)

Subject: Letter of Award for Installation, Testing, Commissioning, and handover of Material Handling System (MHS) at Integrated Cargo Terminal, Ahmedabad International Airport Ltd, Ahmedabad.

References.:
1. EOI publish dtd 27th June'22
2. RFQ - PreQ dtd 27th June'22 ("RFQ")
3. RFP - dtd 28th July'22 ("RFP")
4. Your final proposal dtd 9th & 10th Nov'22

Dear Sir,

With reference to the RFQ and your proposal thereto, Ahmedabad International Airport Ltd. (**"AIAL/Employer"**) is pleased to issue this Letter of Award (**"LOA"**) to M/s. ALS Logistic Solutions India Pvt Ltd (**"Contractor"**) for Installation, Testing, Commissioning, and handover at Integrated Cargo Terminal at Ahmedabad International Airport Ltd.

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

1. **Price:** We Employer agree to pay a sum of **USD 100,000 (US Dollars Hundred Thousand Only).** All taxes alongwith GST are excluded in the prices. This amount includes Installation, testing, commissioning, and handover of Material Handling 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 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.

   Price-break up is as per the attached Annexure 1.

2. **Scope of works**: Detailed agreed scope of works shall be as per attached annexure 2.

3. **Taxes and Duties:** The LOA price set out above excludes GST @ 18%.

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4. The Design, Manufacture & Supply of MHS shall be done by M/s ALS Logistic Solutions GmbH – Dubai Branch (who are the principal OEM of ALS Logistic Solutions India Pvt Ltd for MHS) against LOA ref: PROC/AMD/22-23/LOA/030 dtd 15th Nov'22.

5. **Contract Performance Bank Guarantee ("CPBG") cum Performance bank Guarantee ("PBG")**: Contractor shall submit CPBG cum PBG of 10% of total contract value within 15 days from the date of on issuance of the order/LOA whichever is earlier. The CPBG Cum PBG shall be valid until completion of 2 years of warranty/defect liability period with a claim period of six (6) months from the expiry of the Defect Liability Period

   The CPBG cum PBG format shall be strictly as per the format shared along with tender documents

   All the payments pertaining to this contract shall be made only after receiving the correct and accepted CPBG cum PBG

6. **Terms of Payment:**

   All payments shall be made in INR currency as per the prevailing rates published by Reserve Bank of India on the date of invoicing, as per below mentioned milestones:

   70% on completion of installation works and acceptance (to be issued within 2 weeks after completion of full work against this milestone) from AIAL engineer-in-charge.

   20% against completion of testing and commissioning works and acceptance (to be issued within 2 weeks after completion of full work against this milestone) from AIAL engineer-in-charge

   10% on hand over with due acceptance (to be issued within 4 weeks after completion of full work against this milestone) from AIAL and against submission of 10% PBG valid till completion of warranty/defect liability period (DLP) of 2 years.

7. **Effective date**: 15th November 2022

8. **Schedule of Completion:** The entire works of MHS shall be completed and handed over to Employer on or before 05th October 2023 with below break up in two phases –

   Phase 1: All equipments/System (except ETV and Workstations) by 18th May 2023
   Phase 2: ETV system and Workstations by 05th October 2023.

9. **Delay Damages** It will be applicable at 0.5% per week delay and part thereof maximum up to 5% of the total basic contract price after agreed completion schedule.

10. This LOA is subject to the terms and conditions contained herein, in the tender documents, General Terms of Conditions ("**GTC**") and such other conditions that have been agreed to between the Employer and the Contractor by way of the addendum issued to the tender and tender deviations agreed between the Employer and the Contractor as referred above.

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11. **Warranty/ Defect Liability Period:** Two (2) years from the date of issue of Take over certificate (to be issued within 4 weeks after completion of full work as per agreed scope) by Airport Operator in two phases as per completion schedules mentioned in clause 8.

12. We, AIAL, will be issuing a formal purchase order (PO) in this regard soon and until the finalization and execution of such PO, 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 Contractor/Contractor is required by AIAL to commence the Project in accordance with the References above-mentioned

13. **Governing Law and Jurisdiction:** This LOA shall be interpreted, construed and governed by the Laws of India. The Employer and the Contractor hereto irrevocably submit to the sole and exclusive jurisdiction of the courts at Ahmedabad, Gujarat.

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

Till such time PO is made, this LOA is being issued to enable you to start the Project works.

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, Ahmedabad International Airport Limited

Hitarth Mankodi
Hitarth Mankodi (Nov 17, 2022 13:24 GMT+5.5)

Hitarth Mankodi
Chief Airport Officer

For, ALS Logistic Solutions India Pvt Ltd

Authorized Signatory

WALID KHOURY

Enclosures:
Annexure 1: Price Sheet
Annexure 2: Scope of Work
Annexure 3: List of below documents
- Special Terms & Conditions
- GTC
- Bank Guarantee Formats & other documents (if any)

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Annexure -1					
LOA Ref :- PROC/AMD/22-23/LOA/031 dtd 15th Nov 2022					
	Description	**UoM**	**Qty**	**Unit Rate**	**Total Price**
1	Installation, Testing, Commissioning & handover	LS	1	100,000	100,000
Total Amount in USD					**100,000**
Note - All taxes alongwith GST are extra					

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ALS
LOGISTIC
SOLUTIONS

P.O. Box 36414, Dubai, UAE

Airport Capital Improvements: A Business Planning and Decision-Making Approach (201

DETAILS

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CONTRIBUTORS

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AIRPORT COOPERATIVE RESEARCH PROGRAM

ACRP REPORT 120

Airport Capital Improvements: A Business Planning and Decision-Making Approach

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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.

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FOREWORD

By Lawrence D. Goldstein
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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

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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

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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

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

Table 4. Candidate project types.

Project Type	Share of AIP/ARRA Projects	Share of Survey Responses
Horizontal Construction Projects		
Airfield signage	N/A	2.80%
Construct or rehabilitate taxiway	12.07%	10.70%
Construct parking lot	N/A	N/A
Construct, expand, or rehabilitate apron	9.53%	8.50%
Construct, extend, or rehabilitate runway	16.32%	15.30%
Improve runway safety area	3.00%	1.70%
Install airport visual system	1.69%	N/A
Install NAVAIDs	1.57%	3.40%
Install perimeter fencing	4.04%	2.30%
Install weather reporting equipment	1.78%	N/A
Rehabilitate runway lighting	2.32%	10.20%
Remove obstructions	3.00%	2.30%
Runway pavement marking	N/A	2.30%
Security access systems	N/A	N/A
Vertical Construction Projects		
Construct ARFF facility	N/A	5.60%
Construct, expand, or rehabilitate terminal building	1.23%	10.70%
Construct parking garage	N/A	2.80%
Construct SRE building	1.15%	3.40%

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	25
Construct or rehabilitate apron	29
Construct, extend, or rehabilitate runway	48
Install perimeter fencing	24
Install precision approach path indicator	10
Install weather reporting equipment	31
Vertical Construction Projects	
Construct ARFF facility	42
Construct SRE building	42

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.

Historical Construction Data Tables	
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	PAPI
Install weather reporting equipment	Weather
Remove on-airport obstructions (vegetation)	On-airport Veg Removal
Construct aircraft rescue and fire fighting facility	ARFF
Construct snow removal equipment building	SRE Bldg
Ancillary Data Tables	
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.

Field	Example
Record identifier	Data Point CETR #9
Airport FAA identifier	MVY
State	MA
Project description	Shift Runway 6-24 303' Northeast
Year	2010
Total project cost	$5,494,476

Table 8. Structure of construction data tables—CIV values.

Project Type: **Construct, extend, or rehabilitate runway**	
Field	*Example*
Pavement area	550,000 SF
MTOW of design aircraft	93,000 lbs.
Landing gear configuration	Dual wheel (DW)

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.

To Convert From	To	Multiply By
Single wheel	Dual wheel	0.8
Single wheel	Dual tandem	0.5
Dual wheel	Dual tandem	0.6
Double dual tandem	Dual tandem	1.0
Dual tandem	Single wheel	2.0
Dual tandem	Dual wheel	1.7
Dual wheel	Single wheel	1.3
Double dual tandem	Dual wheel	1.7

Source: FAA (1995), p. 25.

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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.

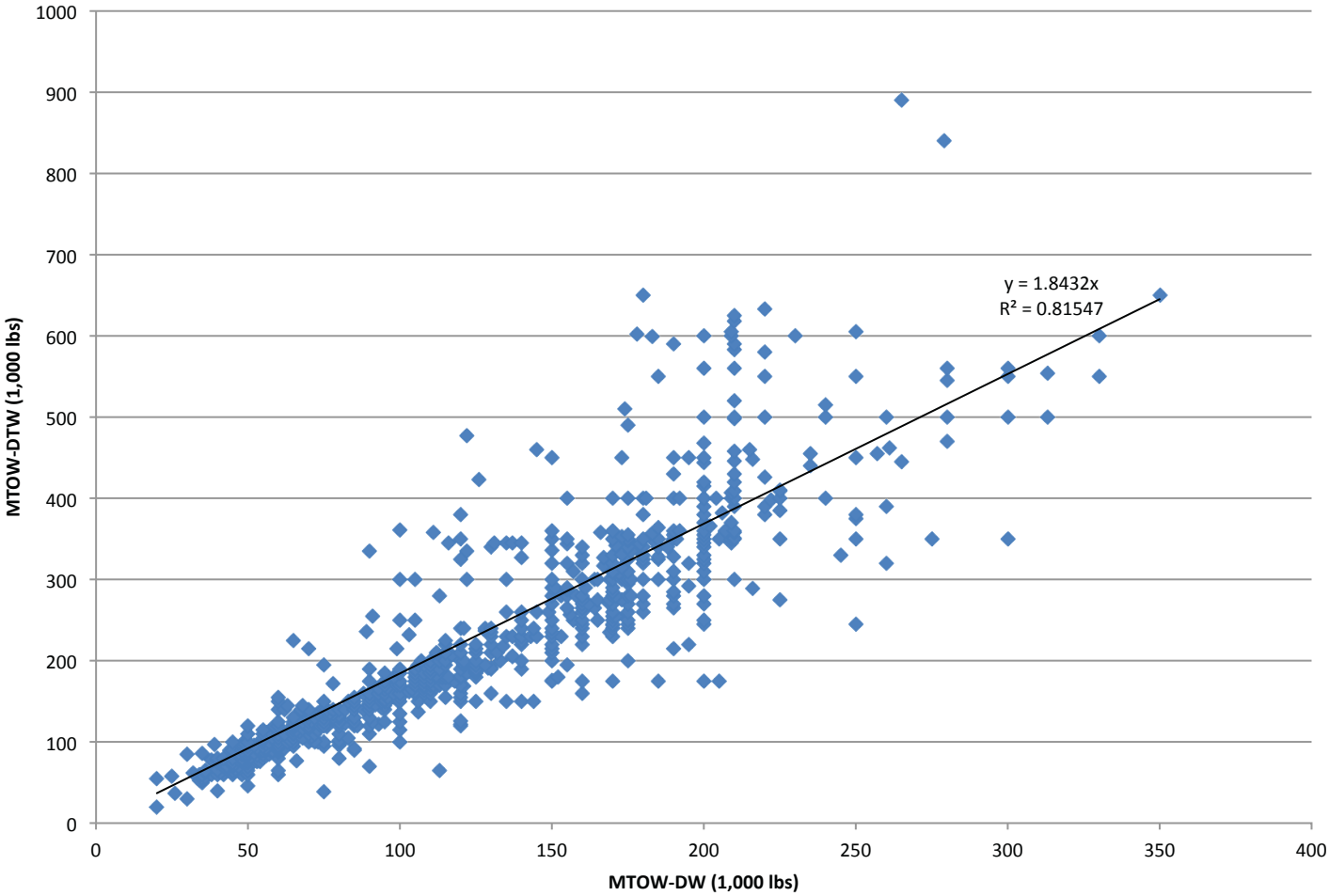

Figure 1. Relationship between MTOW in DW and DTW landing gear configurations.

Table 10. Results of data collection.

Project Type	Total Data Points Collected	Total Data Points Used	Yield
Horizontal Construction Projects			
Construct or rehabilitate taxiway	25	22	88.0%
Construct, expand, or rehabilitate apron	29	22	75.9%
Construct, extend, or rehabilitate runway	48	30	62.5%
Install perimeter fencing	24	18	75.0%
Install PAPI	10	5	50.0%
Install weather reporting equipment	31	28	90.3%
Remove on-airport obstructions (vegetation)	4		
Vertical Construction Projects			
Construct ARFF facility	42	25	59.5%
Construct SRE building	42	33	78.6%
All Projects			
Total	255	**183**	**72.9%**

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,

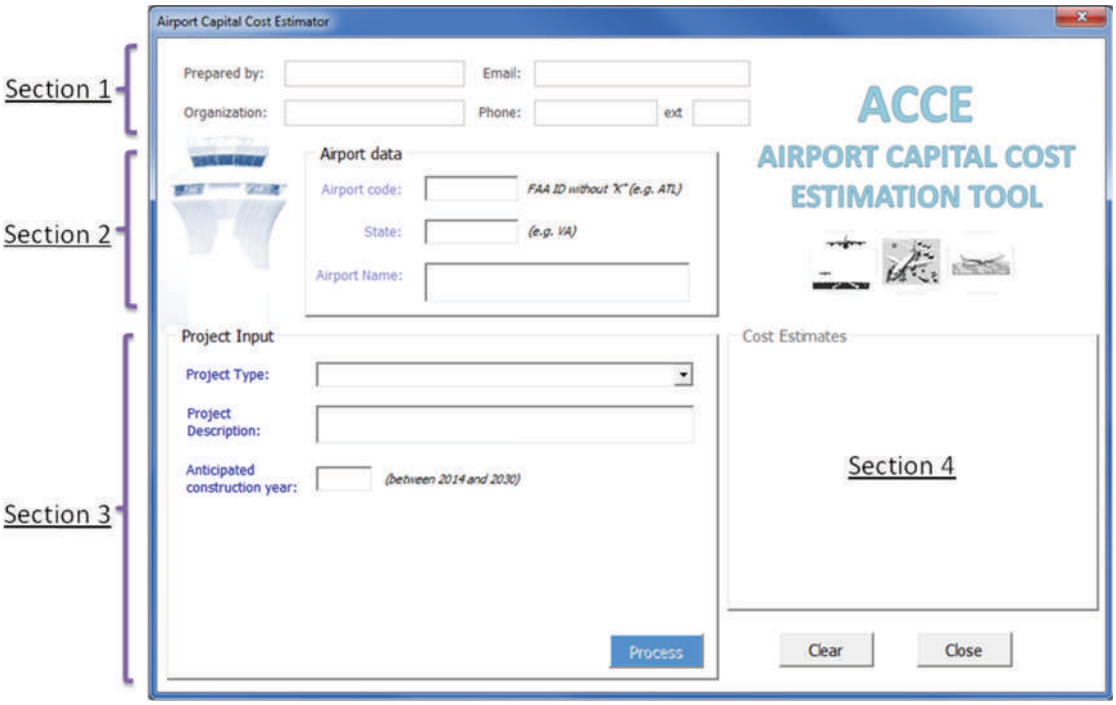

Figure 2. ACCE main user interface.

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.*

SAMPLE

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.

Project Type	Low/High Range
Construct or rehabilitate taxiway	±24.9%
Construct or rehabilitate apron	±23.2%
Construct, extend, or rehabilitate runway	±25.9%
Install perimeter fencing	±8.4%
Install PAPI	±18.1%
Install weather reporting equipment	±10.6%
Construct ARFF facility	±5.9%
Construct SRE building	±6.4%

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

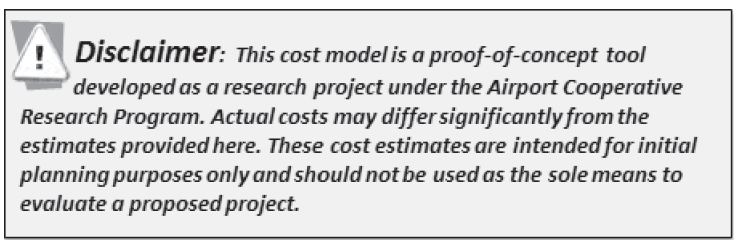

Figure 5. Cost model disclaimer.

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

- **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.

Project Category	CIV 1	CIV 2	CIV 3	CIV 4	CIV 5
Airfield signage	No. of intersections	Airplane design group	Control tower		
Construct or rehabilitate taxiway	Area	MTOW	Landing gear configuration	Pavement type	Design freezing index value
Construct parking lot	No. of spaces	Drainage type			
Construct, expand, or rehabilitate apron	Area	MTOW	Landing gear configuration	Pavement type	Design freezing index value
Construct, extend, or rehabilitate runway	Area	MTOW	Landing gear configuration	Pavement type	Design freezing index value
Install airport visual aid	Type of system	No. of systems/ runway ends			
Install NAVAIDs	Type of NAVAID				
Install perimeter fencing	Length	No. of automatic gates	No. of manual gates	No. of pedestrian gates	
Install or rehabilitate runway lighting	Length	Runway approach type			
Install weather reporting equipment	Type of equipment				
Rehabilitate runway lighting	Length	Runway approach type			
Remove on-airport obstructions (vegetation)	Acres				
Runway pavement marking	Length	Runway approach type			
Security access systems	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.

Project Category	CIV 1	CIV 2	CIV 3	CIV 4	CIV 5	CIV 6
Construct ARFF facility	Area	No. of stories	No. of bays	Construction type	Building skin type	Site conditions
Construct, expand, or rehabilitate terminal building	Area	No. of stories	No. of spaces	Structural system	Architectural treatment	Lobby area
Construct parking garage	Area	No. of stories	Construction type	Building skin type	Site conditions	
Construct SRE building	Area	Annual enplanements	No. of stories	Building skin type	Site conditions	

50 Airport Capital Improvements: A Business Planning and Decision-Making Approach

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:

$$C = \beta_0 + \beta_1 \mathrm{CIV}_1 + \beta_2 \mathrm{CIV}_2$$

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.

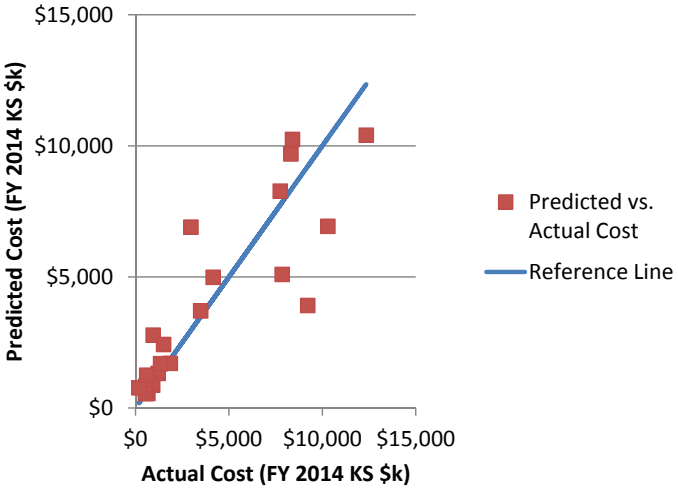


Figure A.1. Predicted vs. actual cost—construct or rehabilitate taxiway.

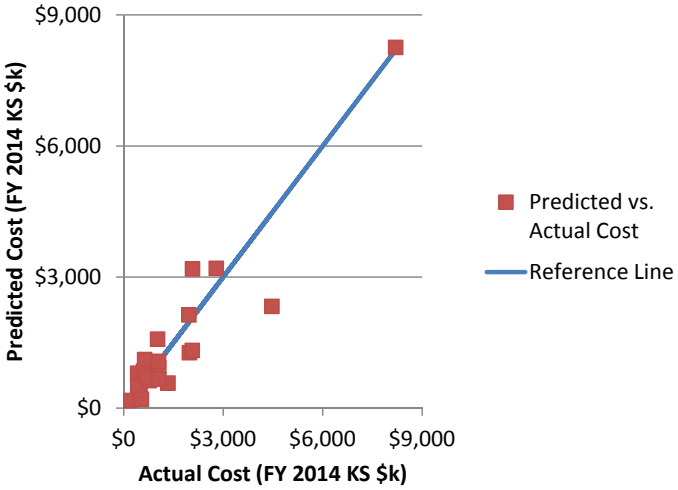


Figure A.2. Predicted vs. actual cost—construct, expand, or rehabilitate apron.

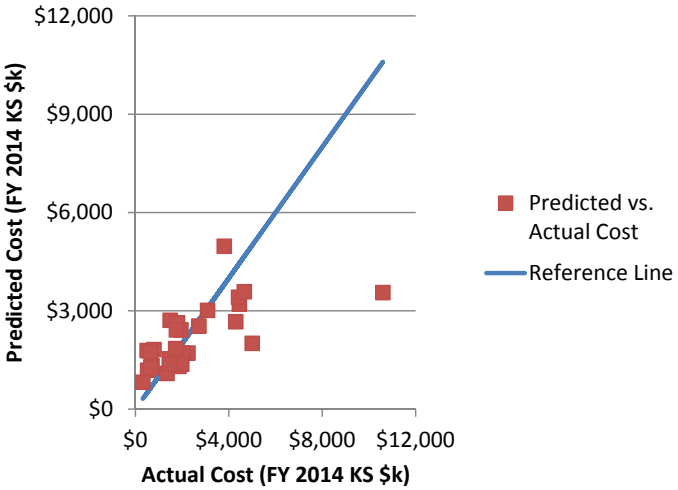


Figure A.3. Predicted vs. actual cost—construct, extend or rehabilitate runway.

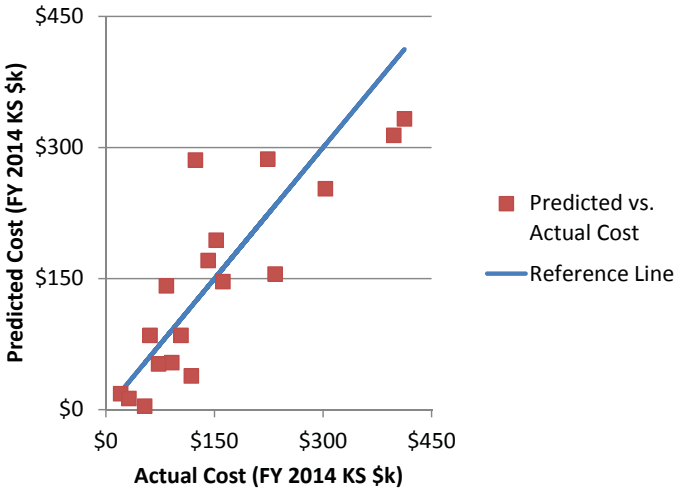


Figure A.4. Predicted vs. actual cost—install perimeter fencing.

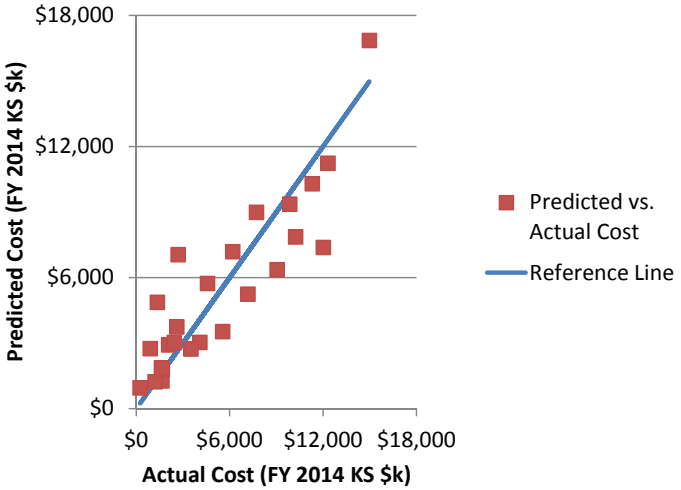


Figure A.5. Predicted vs. actual cost—construct ARFF facility.

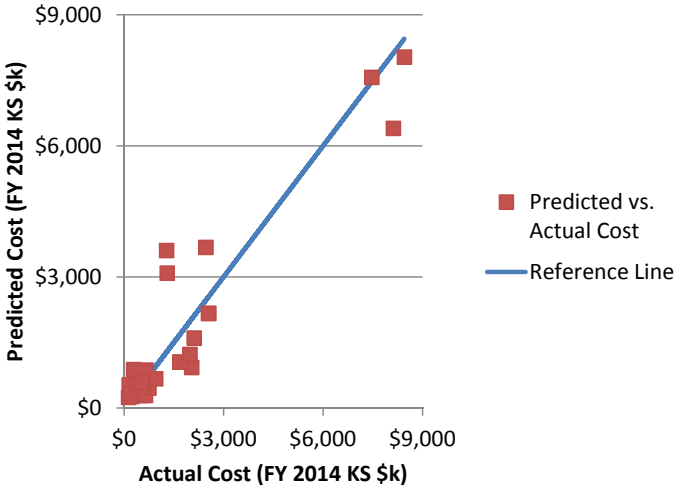


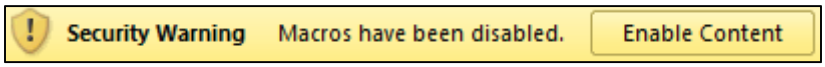
Figure A.6. Predicted vs. actual cost—construct SRE building.

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

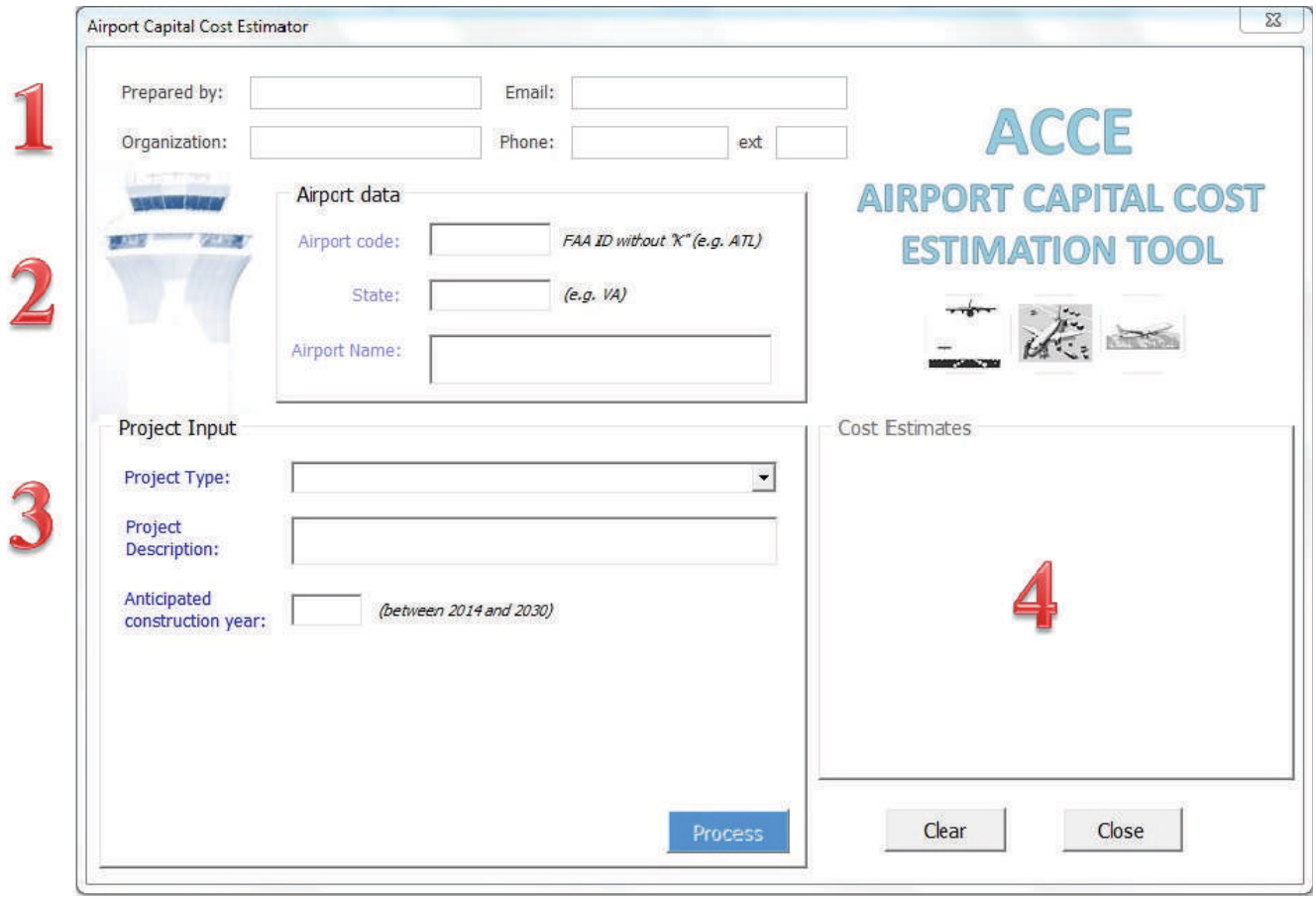
Before starting, have the following information ready:

- 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

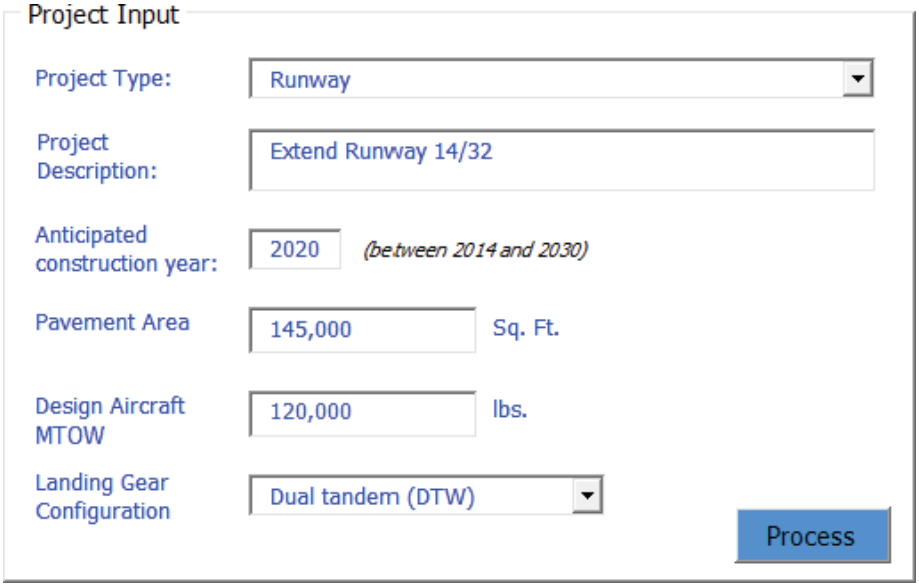
✓ The ACCE input window is displayed automatically when opening the tool. It consists of four sections:

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.



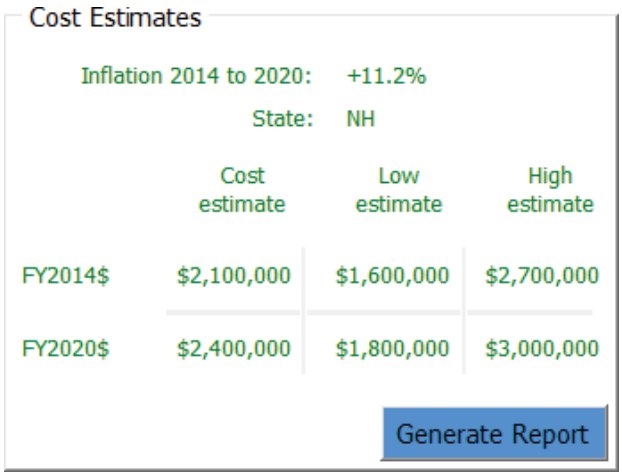
3. Project input: This includes a drop-down menu for selecting the project type, a text field for free-form entry of a project description, and a field for the construction year. Once the project type has been selected, additional input fields are shown for entering the input values for the key cost 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:

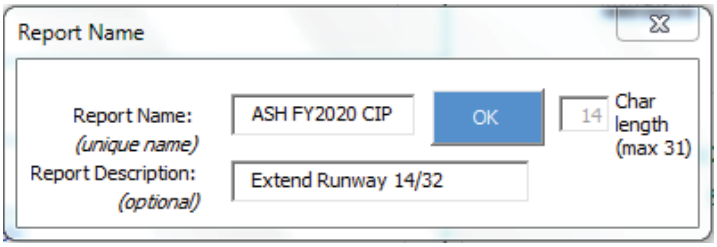
✓ The "Clear" button can be used to clear the input values, in order to generate a brand new cost estimate.
✓ The "Close" button closes the ACCE tool and returns the user to Microsoft Excel.

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:

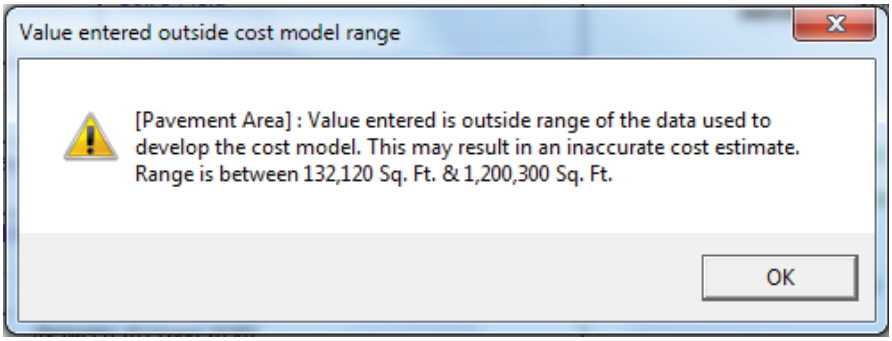
This toolbar supports the following functions:

- 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:



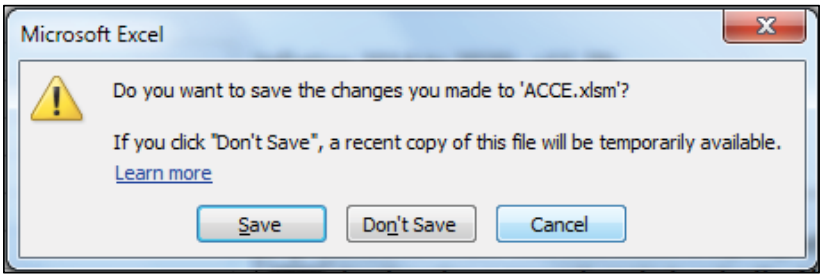
This warning does not, however, preclude use of the entered value—it is only a cautionary note explaining that the value may result in a greater than usual level of uncertainty.

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

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Subject: Constitution of Committee for Review of Electricity Charges

Upon execution of the Concession Agreement between Airports Authority of India (AAI) and Ahmedabad International Airport Ltd (AIAL) and after handing over the commercial operations to AIAL. Torrent power & UGVCL supply connections were handed over as a part of the agreement:

A committee has been constituted on 29th Sep '22 with the following members of AIAL and AAI (Select employees) to review the electricity charges billed to concessioner based on units' consumption thereof.

Sr. No.	Name	Designation	Department
1	S K Mazumder	Manager (Engg. – Electrical)	AAI
2	Avinash Kumar	Manager (Engg. - Electrical)	AAI
3	Amit Jain	AGM (E&M)	AIAL
4	Kalyanasundaram Arunachalam	Head E&M	AIAL

Committee has verified the following: -

1. The separate meters are installed for each concessionaire/ user.
2. The meter readings are done on monthly basis and necessary records are maintained
3. AIAL raises the invoice for the electricity usage charges to concessionaire/ user on monthly basis.
4. AIAL charges to concessionaire/ user on cost-to-cost basis (without any mark-up) based on actual meter reading and units consumed by each concessionaire/ user.
5. Based on review of electricity invoices raised on concessionaire/ users for the period from April 2021 to 31st August' 2022, the average power supply utilized by concessionaire/ user ranges from 5% to 8% of the total utilization of the Airport. **The average usage during the period is 6.3%**

S K Mazumder	Avinash Kumar	Amit Jain	Kalyanasundaram Arunachalam
Manager (Engg. - Electrical)	Manager (Engg. – Electrical)	AGM (E&M)	Head E&M

Ahmedabad International Airport Ltd
(Formerly known as Adani Ahmedabad International Airport Limited)
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Annexure 4 - List of R&M Exp for 21-22

Repairs & Maintenance Exp for FY 21-22

Nature of Service	Amount (Cr)
Service Order for SLA based Technical Services comprising of 16 Packages namely Electrical/Mechanical/Civil/HVAC/HNS/RO Sys/Water fountains /Chillers /UPS/DG's/ FAS/PAS/STP/ Sliding doors etc at Sardar vallabhbhai Patel International Airport, Ahmedabad.	7.56
SITC of Inline Baggage Screening Systems confirming to TSA standarsds /standarsds 3 (EU) for various Airports in india with one year on-siteWarranty and five years CAMC With Spares (Domestic terminal T1- 1unit), (International terminal T2- 2unit)	2.15
Service Order for Operation and Maintenance of E & M Installations of Operational Area, Terminal-3, Terminal-4, Residential Colony & Other Ancillary Buildings at S.V.P.I. Airport Ahmedabad	1.59
Service Order for Operation & Maintenance of E&M Installations of Terminal Building, Sub-Station, Pump House, ITL and External area of Terminal - 2 at SVPI Airport, Ahmedabad	1.54
Service Order for AMC T-1 Building & Power House, AAIAL , Ahmedabad Airport.	1.37
Operation & Maintenance of PBB, VDGS	1.42
Service Order for SLA based Services for Non- Technical Packages comprising of 6 Packages namely Housekeeping (Terminal, Landside, Airside & ancillary buildings), Landscape Management, Trolley Management, Birds & Wildlife Hazard Management, Monkey Control & Pest Control. at ADANI AMD INTNL ARPT LTD	1.11
Service Order for Appointment of Contractor for Repair, Retrofittings of civil works of Terminal-4 and ATC Tower at Ahmedabad Airport.	0.89
Annual Repairs and Maintenance of Civil Works for Terminal-2, MT building, Adjoining areas etc. at S.V.P.I. Airport, Ahmedabad	0.77
Service Order for Appointment of Contractor for Painting work at various location of Airport at SVPI Ahmedabad Airport.	0.75
Annual Repairs and Maintenance of Civil Works for Terminal-1,Terminal-3, Terminal-4 etc. and Adjoining Areas at SVPI Airport, Ahmedabad.	0.67
Service Order for Operation & CMC of HVAC System of T-2 and ITL at SVPI Airport, Ahmedabad	0.65
Service Order for Annual Repairs and Maintenance of Civil Works for Operational Area, Fire Station, NAVAIDS Buildings etc. and adjoining areas for the year at S.V.P.I. Airport, Ahmedabad.	0.63
Services Order for Job Work for Passenger Baggage Trolley (PBT) Retrieval services at SVPI Airport, Ahmedabad"	0.63
Service Order for Comprehensive Maintenance Contract of Elevator, Escalator & Travellator of T2 & ITL at Ahmedabad Airport.	0.59
Service Order for Appointment of Agency for wildlife hazard control at Ahmedabad Airport, Ahmedabad	0.54
Maintaince of XBIS(RB & HB)	0.53
Service Order for All inclusive Comprehensive maintenance & Operation contract of Baggage Handling System (imported make- vanderlande) at Domestic Departure Terminal (T-1) Ahmedabad Airport	0.53
Service Order for Operation & Annual Comprehensive Maintenance of Central AC plant of Terminal - 1 Building at SVPI Airport, Ahmedabad .	0.49
Service Order for Appointment of Contractor for Joint Filling of Apron and Taxiways in operational area at Ahmedabad Airport.	0.46
Service Order for comprehensive maintenance contract of Arrival and Departure baggage conveyor belt system at Terminal-2 S.V.P.I. Airport, Ahmedabad	0.40
Service Order for Terminal Decore for Diwali & X-mas Decor for Passenger exprience at Ahmedabad Airport.	0.35
Purchase ORder for Supply of Spares for Smiths make Security Equipment's (X-BIS) of Ahmadabad Airport.	0.28
Service Order for Terminal-1 Arrivals BHS system contract routing to M/s Swati Airport systems from M/s Vanderlande for 2 months till 28th Feb - 22 as per existing price, terms & conditions with M/s Vanderlande Industries.	0.25

Nature of Service	Amount (Cr)
Billing against Energy Performance Agreement with EESL under Building Energy Efficiency Programme	0.24
Service Order for Comprehensive Maintenance Contract of Elevator, Escalator & Travellator of T - 2 & ITL at Ahmedabad Airport.	0.24
Service Order for Appointment of Contractor for miscellaneous Civil supply & fixing works at Terminal-1, Ahmedabad Airport.	0.24
Service Order for Service Order for annual Maintenance Contract for Rosenbauer make CFTs at AAIAL.	0.23
Job contract for maintenance and upkeep of Airport security system	0.21
Annual Repairs and Maintenance of Civil Works for Terminal-1,Terminal-3, Terminal-4 etc. and Adjoining Areas (2020-21) at SVPI Airport, Ahmedabad.	0.21
Service Order for Comprehensive Annual Maintenance Contract (CAMC) of Threat Containment Vessel (TCV) and Suspect Luggage Containment Vessel (SLCV) at Sardar Vallabhbhai Patel International (SVPI) Airport, Ahmedabad.	0.18
AMCC of X-Ray Baggage inspection systems (05 machines Hand Baggage 6040 ex and 03 machines Registered Baggage 100100V)	0.18
Service Order for Appointment of Agency for Cleaning and Recharging of Percolation Well at Ahmedabad Airport.	0.18
Annual Maintenance Contract for Cummins make DG sets installed at Western Region Airports under Project UTKARSH. SH:- DG Sets of SVPI Airport Ahmedabad	0.17
Service Order for Appointment of Agency for Comprehensive Maintenance of Fire Alarm System and Fire Fighting System Installed at T-1 & T-2 SVPI Airport, Ahmedabad	0.16
Service Oder for Engagement of agency for relocation of monkeys at Ahmedabad airport.	0.14
Service Order for Appointment agency for Uttarayan festival Décor installation at T1 and T2 at Ahmedabad Airport.	0.13
Service Order for Appointment of agency for Holi decoration at Ahmedabad Airport.	0.12
Service Order for Maintenance of Split AC Units and Water Coolers at Ahmedabad Airport.	0.12
Service ORder for Friction Tester Hiring charges (ASFT) and VeeLO (Vehicle Locator) charges at Airport, Ahmedabad.	0.12
Service Order for Appointment of Contractor for providing and Fixing 4mm ACP, Gypsum False Ceiling and Glazing work at Terminal-2 at S.V.P.I. Airport, Ahmedabad.	0.11
Service Order for Appointment of Contractor for Repairs and Maintenance of Civil Works for Cargo Terminal and adjoining areas at Ahmedabad Airport.	0.11
Purchase Order for Appointment contractor for Carpentry work on Textile, Wooden, Stone and painting Artefacts at Ahmedabad Airport.	0.11
Annual Repairs and Maintenance of Civil Works for Cargo Buildings, CISF Barrack, Old AAI Colony etc. at S.V.P.I. Airport, Ahmedabad.	0.10
Other Misc. Items	3.98
Total	**33.41**