

Airport Master Planning: Issues involved

Robey Lal

**NALSAR
October, 10 2020
Hyderabad, Telangana**

Contents of this presentation

- **Basics of an Airport Master Plan**
- **Supporting analyses and User requirements**
- Assistance from many sources and other consultants and colleagues, too many to be named individually, is acknowledged.

Part 1: Basics of an Airport Master Plan

References:

- ICAO, *Airport Planning Manual, Part 1 Master Planning*. (Doc 9184-AN/902 Part 1 of 3 parts)

- ICAO Annexes & Corresponding DGCA's Civil Aviation Regulations (CARs)
- 9: *Facilitation*
- 10: *Aeronautical Telecommunications*
- 11: *Air Traffic Services*
- 14: *Aerodromes, Volumes 1 and 2*
- 16: *Environmental Protection*
- 17: *Security (in India BCAS)*
- *Aerodrome Design Manual* (Doc 9157 – in 6 parts)
- *Manual on Air Traffic Forecasting* (Doc 8991)

References are also found in FAA & ACRP (Airport Cooperative Research Program), IATA, ACI

Some Basic Questions about airports

- How is the size of an airport decided?
- How many physical facilities are there at airports?
- How are the numbers of runways decided and their lengths?
- How is the size of the passenger terminal decided?
- How is the safety and security of passengers planned for?
- Which organizations provide services at an airport?
- Who are involved in approving airport development?
- How are the costs of developing an airport met?
- Why are new airports so far from the cities they serve?
- Who decides where an airport is to be built?
- How much power, water, drainage, sewage treatment, ARFF is required?

What other questions do you have?

A Master Plan addresses those questions

A Master Plan PRESENTS:

- **Evaluation of airport demands and capacities;**
- **Lists all physical facilities of the airports;**
- **Suggests land uses and controls for areas around the airport;**
- **Establishes the surface access requirements;**
- **Harmonizes its layout with air access requirements;**
- **Determines the Environmental effects of airport construction and operation, and suggests mitigation efforts;**
- **Assesses Social Impact and suggests alleviation measures;**
- **Green airports and Sustainability**
- **Develops a first level of costs of the airport;**
- **Suggests a short & long-term development programme**

What is a Master Plan used for?

Inter alia:

- For policy guidance – short & long term.
- Identify Opportunities & Problems.
- Assist in getting finance for development.
- Inform, discuss and plan with other stakeholders.
- Basis for negotiations with airport service providers.
- WILL IT GROW? IF NOT, THEN WHAT?
 - Flexibility for the design to mutate in the future.

Master Plan Preparation

- **Co-ordinate Planning of many disciplines and organizations.**
 - Project aims are clarified.
 - Work programmes and schedules developed.
- **Economic Planning.**
 - Forecasts of traffic etc.
 - Assess Costs & Benefits of various options.
 - Assess economic impact in the area.
- **Physical Planning, and relate it to airspace and surrounding area planning, and Capacity vs. Demand, User Convenience, Ensure Standards & Recommended Practices (SARPs) are followed.**
- **Environment and Social Impact Planning.**
- **Financial Planning.**

Key factors in developing a project

- Location of site.
- Topography on and existing terrain & geo-tech conditions
- List the weather conditions, and relate to site hydrology
- Identify Runway Orientation
- Identify constraints, esp. Obstruction Limitation Study (OLS)
- Forecast volume of traffic – aircraft, passengers, cargo
- Identify facility requirements.
- Type of aircraft which is critical for the design is to be developed?
- Then Develop a range of Master Plan options.
- Assess Master Plans – with other users.
- Modify and finalize most acceptable Master Plan.
- **DYNAMIC PLANNING - RE-EVALUATE PERIODICALLY
or WHENEVER MAJOR WORKS ARE PROPOSED**

Supporting analyses required for proposal

An overview of the diverse inputs required in the preparation of an Airport Master Plan.

Assessment of Physical Needs

Physical Needs

- From Forecasts, assess capacity needed at different times for the different major facilities at the airport, incl. runways and aircraft parking aprons, Pax. & Cargo terminals, CNS equipment, access requirements etc. It's a long list!**
- Use IATA ADRM guidelines during detailed calculations of passenger terminal areas. Then assess support areas.**
- Assess, on the basis of experience & acceptable thumb rules , the areas of cargo terminal areas.**
- Assess services and utilities requirements**

Additional issues related to a greenfield airport.

Issues

- **Will airlines need an incentive to move to the new airport? Must be addressed by discussions amongst all stakeholders**
- **Can Ownership and management structure provide the incentives?**
- **Will passengers have a choice between airports? How will services at two airports be decided? Will airlines and passengers need incentives to use the new airport? If so what?**

Some planning issues that arise when selecting a site for a new airport.

- **How much land will we require for the project? (In fact it also applies to existing airport expansion.) Who will acquire and how? Removal of manmade obstructions.**
- **Who will pay how much for the project? PPP projects?**
- **What access provisions for people and goods are to be provided? Pax., and visitors and working staff.**
- **What will be the Social & Environmental impact of the airport?.. Impact on Heritage and Historical structures?**
- **What will be the impacts on the surrounding communities?**
- **How will the project address problem at the existing airport? Other nearby airports?**

Airport design and capacity analysis

- Airside design and capacity analysis
- Land side design and capacity analysis

Airside design and analysis

■ Runways

- How many runways?
- How are the runways oriented?
- How far apart are parallel runways?

■ Runways, taxiways, and aprons need to be designed

- How long will the runways be? Altitude, Temperature, Slope
- Layout and geometry of airfield components need to be designed
 - Taxiways and aprons can affect airside capacity of the airport

■ Airside approaches to be considered.

■ The airspace used by aircraft using the to be analyzed for

- Conflicts with other aviation activity
- Airside capacity needs to be analysed and assessed
- Capacity is influenced by a number of weather / meteorological conditions

Airside design and analysis

Outputs required from airside design and analyses:

- **Runway configuration plans**
- **Airfield design including runways, taxiways, aprons**
- **Airport Capacity and delay analysis: Peak hour and day**
 - **Average annual capacity**
 - **Variation in capacity across different times of the day, across days in a year, across years**
 - **When can airport cannot be used**
 - **Ability to accommodate different kinds of traffic**
 - **E.g. Airbus A-380 or proposed new Boeing subsonic aircraft**
 - **Level of General Aviation**
 - **Cost/operation accommodated**
 - **The need to build runways to address wind patterns**

Factors affecting airside design

Principal factors influencing runway configuration and length

- Wind patterns
- Temperature, humidity, altitude
- Noise-related restrictions on operations
- Aircraft mix

■ Other factors affecting airspace design

- topography, obstructions
- controlled airspace

■ Adverse weather conditions

Factors affecting airside design — Meteorological Issues

Wind and Temperature

- **Wind patterns measured and analyzed.**
 - **Wind velocity chart that shows.**
 - **Analysis of variation in wind patterns.**
 - **Across different times in a single day.**
 - **across days and seasons in a year.**
 - **across years.**
- **Optimal runway configuration given prevailing winds**
- **Coverage offered by main runway and parallel runway**
 - **Need for a secondary runway**
 - **Impact of winds on runway lengths**
- **Temperature data. Higher temperatures require longer runways**
- **Visibility, Cloud cover, rain & snow volumes etc.**

Other airside design considerations

- **Topography details.** In which direction is a longer runway length required to offset gradient.
- **The altitude (Above Mean Sea Level) of the proposed runway.**
- **Runway drainage**
 - **Surface friction characteristics**
- **Type of aircraft and range they will operate**
 - **Bigger the aircraft longer the runway**
 - **Runway, taxiway clearances and operating characteristics change by size of aircraft.**

Airside design

- **Runway configuration**
 - Separation of parallel runways.
- **Airfield design**
 - Runway length
 - Geometric design and layout of:
 - taxiways,
 - Aircraft parking aprons and remote stands
 - terminal aprons with power-in and push-out gates
 - Ground Handling equipment parking area
 - High mast lighting must not be obstructions
 - Location of control tower
 - Need unobstructed view of all runways and taxiways, but not an obstacle to operations.

Airside support requirements

– Service facilities

- **Service components of the airport to be included**
 - **Supporting airside facilities**
 - **Fire & emergency medical facilities**
 - **Fuel installations**
 - **Radars, primary & secondary; and communication equipment**
 - **ILS, PAPI, DVOR, DME locations**
 - **meteorological enclave and equipment, incl. RVR**
 - **hangars**
 - **maintenance facilities**
 - **for aircraft**
 - **for Ground equipment**

Airport Land side design and analysis

Layout of airport components

– Supporting land-side facilities

- Police facilities**
- Car and taxi and bus parking facilities**
- Offices**
- Flight kitchens**
- Airport site hotels**
- Other commercial activities**
- Staff housing**

- Access plan – Airside and Land side, main and secondary roadways and subway/ train access and boat access.**

Land side Surface access and circulation plan

Traffic Circulation Plan

- Provision for inter-terminal traffic**
- Provision for city traffic public and private**
- Mode of transport during 24 hours**
 - Passengers, cargo, visitors at special events.**
 - By mode – intercity bus and rail traffic**

Terminal design concepts and analysis

Terminal Complex layout

- **International and/or Domestic pax. traffic**
- **Annual and Peak Design period traffic and corresponding areas**
- **Mechanical Electrical and Plumbing, and Information systems**
- **Different kinds of services and different kinds of terminal concepts**
 - **Modular or centralized or with piers, terminal concepts.**
 - **No. of floor levels**
 - **Schedule, non-schedule and low cost airline operations.**
 - **Shared terminals or dedicated terminals.**
 - **Movement within the terminals**
 - **Grade separation on land side**

Supporting infrastructure — Other utilities

What capacities are available at the airport/ site of services?

- Water**
- Power**
- Sewerage treatment**

■ Are additional capacity provisions required?

- Consider demands for construction and operation.**

■ Inventory of current capacity and assess future demand.

Some Management Operational issues

- User fees
- What do airlines pay for and how much do they pay?
 - What level of input do the airlines have airport decisions?
 - How will airlines be required pay for any development?
- What do passengers pay?
- How are airport charges regulated?
- What discretion does the airport have to allocate capacity if there is
 - Temporary congestion (peaks periods, adverse weather)
 - Permanent congestion
 - Can the airport charge fees?
 - Can the airport auction slots?
- How are operations across airports coordinated?

Financial plan - overview

- **Goals of the financial plan**
- **Necessary objectives**
- **Items required for a complete proposal include**
 - alternative funding mechanisms
 - construction cost estimate
 - revenue forecast by source (landing fees, rental cars, concessions, etc.)

Development schedule

- Phasing plan
- Permits required
- Construction plan

Questions, Questions, Questions

THE END

robeylal@gmail.com 9810514616