

Planning Proposal for Refurbishment and Up-gradation of Airport in Surat, Gujarat, India

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Abstract— With globalization, the role of airports in the trade and commerce as well as in the travel industry has become extremely crucial. Airport influences the development of business location and promotes Urban Development in the 21st century. Having a regional airport is an important asset for retaining the existing and attracting new companies and economic activities in the region. Surat is the fourth fastest growing city in the world, its gross domestic product is the highest in India and thus fully developed air connectivity is a major requirement. At present Surat Airport has air connectivity with Delhi, Mumbai and at trial bases to Bhavnagar. This paper highlights planning proposal of International Airport for development of Surat city. The upgraded Surat Airport is envisaged to offer direct air connectivity to important destinations within India and abroad. This is expected to boost commercial activities in the city and in its surrounding areas (or within the region).

Keywords—International Airport, Refurbishment and Development, Trade and Commerce

I. INTRODUCTION

THE world is undergoing the largest wave of urban growth. World is coming closer and business is spreading over large scale by technologies so, the demand for air transport has been increasing rapidly over the years and all forecasts suggest that this trend will continue. Airports play a substantial role in the economic growth and development of cities and regions. Development of a region is dependent on the economic growth of the region and transportation facilities boost up the economy. In today's knowledge economy, far and away, the most precious cargo it moves is people. Airports shape business location and promote urban development in the 21st century as much as highways did in the 20th century, railroads in the 19th and seaports in the 18th. Airports move two kinds of things—goods or cargo and people. In fact, a good deal of the argument about airports and economic development has focused on moving things and the business and industries that grow up around that.

II. NEED OF STUDY

Surat was the only city in the world, with a population of

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over 4.7 million people but without a functioning airport. Besides being the 4th fastest growing city in the world, its GDP is among the highest in India, thus the absence of fully functioning air-connectivity is a major obstacle in its development. Surat's economy is dependent on diamond and textile business. If Surat airport's planning is done in a systematic manner then, it can help these industries go global. According to economic study conducted by Bureau of Economic and Statistics, Government of Gujarat, the facts and figures have indicated that Surat is one of the ideal places in western India that can be developed as an important economic hub.

It may be mentioned that textile and diamond units in Surat contributes:

- i. 42 percent of the world's total rough diamond cutting and polishing
- ii. 70 percent of the nation's total rough diamond cutting and polishing
- iii. 40 percent of the nation's total diamond exports.
- iv. 40 percent of the nation's total manmade fabric production
- v. 28 percent of the nation's total manmade fiber production
- vi. 18 percent of the nation's total manmade fiber export,
- vii. 12 percent of the nation's total fabric production

III. STUDY AREA

The study area is Surat city of Gujarat state having population 4.462 million (census 2011) and area 326.52 square kilometre as shown in fig. 1. The city is divided in seven zones of Surat Municipal Corporation. Surat Airport is a domestic airport, located at state highway No. 66 towards Dumas Road at an elevation of 7.62 metre AMSL, 16 kilometre from Surat railway station in South-West zone. The total area of the airfield is 312 Hectares. [5]

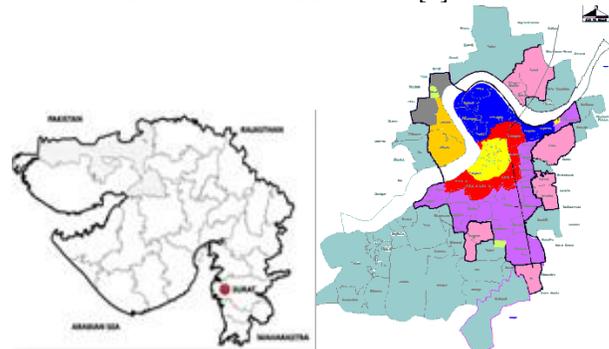




Fig. 1 Study area and entrance of present airport

IV. AIM

To prepare a planning proposal for refurbishment of Surat airport.

V. CURRENT SCENARIO

Surat airport was built and owned by the State government of Gujarat. Airports Authority of India (AAI) took over the airport for modernisation in 2003. Figure 2 gives the location of Surat Airport. A new Surat airport terminal building was inaugurated on 27 February 2009 by Union Minister of State for Petroleum, Dinsha Patel. The terminal building, constructed at a cost of Rs 40 Crore, has a total floor area of 8,500 square metre. The new airport is accessible through Gaurav Path, a newly developed express-road at Piplod. City buses operate between the airport and city center and proposed BRTS network also have connectivity to airport.

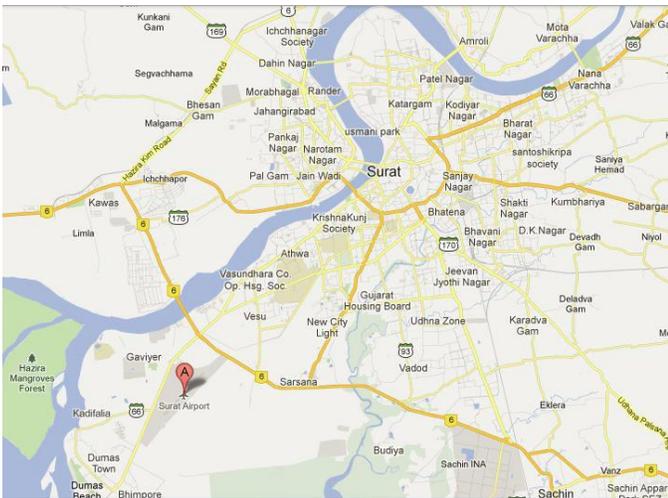


Fig. 2 Surat Airport Location Map

A. Capacity

Surat airport is feasible to operate ATR – 72 type of aircraft, having capacity of 50 seats as recommended by Airport Authority of India.

B. Runway

Existing runway is oriented 04/22 length is 2250 m and width is 45 m with 7.5 m shoulders on both side and turning blast pad of 60 m X 60 m at both the end. This Runway is suitable for Aircraft type A-319 / 320 / 321.

C. Taxiway

There are two taxiways. Length of taxiway is 200 m and width is 23 m with 3.5 m shoulders on either side. Apron of Surat airport is suitable for parking of aircraft type A-319 / 320 / 321. Total four parking bays are available with 235 m length and 90 m width.

D. Terminal Building

A modern and aesthetically appealing two storied RCC frame structure terminal building of Surat airport is suitable for handling 240 passengers per hour. Area of terminal building is 8474 square metre and is equipped with facilities as: Air-conditioning, Conveyor at departure and arrival hall, Hand Baggage X-Ray machine, Registered baggage X-Ray machine, Surveillance CCTV system, Fire alarm- detection, hydrant and sprinkler system, Back-up offices for Airlines / Reservation Counters, VIP lounge.

E. Ancillary Building

Ancillary building includes Fire Station, Workshop, Medical centre, ATC tower, Technical building, emergency facilities, maintenance facilities, depots, vehicle maintenance stations and other essential non-aircraft related structures. Details for ancillary building of existing airport are as follows:

- i. ATC tower cum technical block is 6 storeys building in 50 m X 50 m area
- ii. Fire Station of category IV in 100 m X 50 m area
- iii. E & M Work shop 50 m X 50 m
- iv. Medical centre 50 m X 30 m

Flights connecting Surat airport with their frequencies are as follows:

- i. Surat – Delhi – Surat Flights are run by Indian Airlines on daily basis
- ii. Surat – Mumbai – Surat flights are run by Spice jet on daily basis
- iii. Surat – Bhavnagar flights are run by spice jet on trial bases weekly

VI. AIRPORT CLASSIFICATION

Airports have many classifications, depending on their functions, size, and ownership. The most commonly accepted classifications by the FAA (Federal Aviation Administration), ICAO (International Civil Aviation Organization) are as shown in table 1 and table 2. [2]

TABLE I
FAA AIRPORT CLASSIFICATION

| Airplane Design group | Wing span |
|-----------------------|---|
| I | Upto but not including 15 metre |
| II | From 15 metre up to, but not including 24 metre |
| III | From 24 metre up to, but not including 36 metre |
| IV | From 36 metre up to, but not including 52 metre |
| V | From 52 metre up to, but not including 60 metre |
| VI | From 60 metre up to, but not including 80 metre |

TABLE II
ICAO AIRPORT REFERENCE CODE

| Airplane Design group | Wing span | Main gear wheel span |
|-----------------------|---|--|
| A | Upto but not including 15 metre | Upto but not including 4.5 metre |
| B | From 15 metre up to, but not including 24 metre | From 4.5 metre up to but not including 6 metre |
| C | From 24 metre up to, but not including 36 metre | From 6 metre up to, but not including 9 metre |
| D | From 36 metre up to, but not including 52 metre | From 9 metre up to, but not including 14 metre |
| E | From 52 metre up to, but not including 60 metre | From 9 metre up to, but not including 14 metre |

Surat airport is of type III as per FAA classification and type C as per ICAO Airport Classification.

VII. PLANNING PROPOSAL

A. Operational Area

Operational area or airfield area is the part of an airport directly involved in the arrival and departure of the aircraft. In determining the proper configuration for the airfield, the airport designer has to consider the aspects of resultant capacity of the runway group layout, spatial relation between the airfield and the terminal area, and geometric features to enhance operation and increase resultant capacity.

1. Runway

According to ICAO for 45 metre wide runway (code letter E), is accepted for domestic airports but for international airports a minimum of 60 metre wide runway (code letter F) is required. Runway also with RESA (Runway End Safety Area) of 240 metre x 150 metre at both the ends is required. [3] To run flights at international level airport should have one additional runway on stand-by basis to control air traffic. Surat is a very fast developing city of the world. Growth of industries and development of city is mainly dependent on its connectivity. Freight connectivity is one of the major factors for development of industries. To provide better and economically feasible freight connectivity, one more runway is provided. Many runway configurations exist. Most are combinations of several basic configurations: single runway, parallel runways, intersecting runways and open V- runways.

The direction of runways at an airport can be determined through graphical vector analysis on a wind rose diagram. Wind data for all conditions are collected from wind and weather statics then wind rose diagram is created as shown in fig 3.

As shown in fig 3 wind rose diagram, in Surat city wind is blowing only in two directions south-west and north-east. Existing runway is designed in same direction so for proposed runway South-West and North-East direction parallel to existing runway is suitable. Proposed independent parallel runway approach should be at minimum 1035 metre distance. Existing runway and Proposed runway is shown in fig 4.

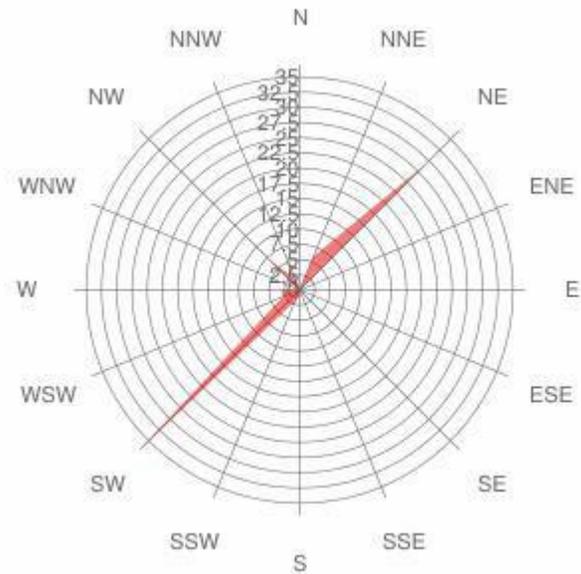


Fig 3 Wind Rose Diagram of Surat City

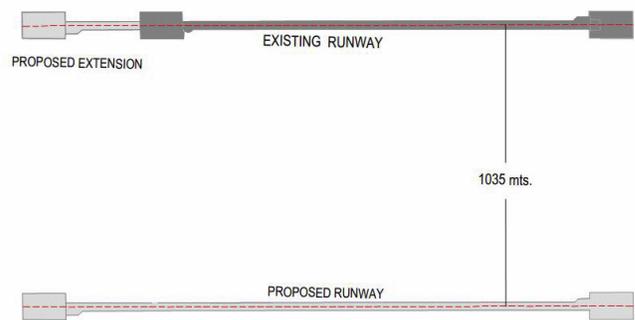


Fig 4 Existing Runway and Proposed Runway

Second runway is provided parallel at a 1035 metre distance from center line of existing runway. It is 3600 metre length and 60 metre width which can run flight of 380 ton capacity with RESA (Runway End Safety Area) of 240 metre X 150 metre at both the end.

2. Terminal

The Passenger Terminal Complex is designed with an emphasis on allowing natural light into the building. Thus, there is a huge expanse of glass throughout the building, and the spectacular roof has cut-outs for natural light to filter in. Duty free shopping spots are available. As there are international flights operating out from the airport, therefore terminal of the airport are equipped with immigration processing facilities and security scanning for all passengers including domestic passengers. Existing terminal building is having area 4100 square metre and proposed terminal building area is 8474 square metre.

Passengers have to travel to the terminal building via Underground bus. There is a wide array of duty-free shops and prestige brand boutiques in the satellite building. A number of

restaurants and international airlines' lounges are present. Also present is an Airside Transit Hotel. Within the terminal, wireless internet (Wi-Fi) is provided free of charge. The terminal also has prayer rooms, showers and massage service. Various lounge areas are provided, some including children's play areas and movie lounge.

The *Low Cost Terminal* is designed and built to suit the low cost carrier business model that requires only basic terminal amenities. In order to offer lower landing fees, handling fees and airport taxes, it cuts back on amenities such as aerobridges, rail connectivity, elaborate physical structures and decorations in the passenger terminal building. There is no transfer facility to the main terminal. Passengers, who need to make transfers need to clear immigration, collect their luggage, clear customs, make their way to terminal and re-check in with the respective airline.

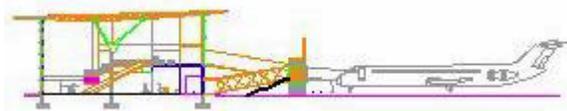


Fig 5 Low Cost Terminal Section

Low cost carrier terminal is located on the opposite side of the apron from the Main Terminal Building, near the air cargo area. Proposed Low cost terminal building has an area 4200 square metre and cross section of proposed low cost terminal building is as shown in fig 5.

3. Apron

Parking of aircraft while it is not working is very intriguing question for Airport Authority of India. Charges for parking are very high in busy airport like Mumbai, Delhi, etc. Surat has 4 parking bays. By providing additional parking bays as night landing facility, it enhances the finance of airport. Night landing area is provided with proposed second runway of 300 metre length and 100 metre width which can accommodate 4 aircrafts at a time and space for future expansion is also provided near it. For movement of passengers of aircraft which lands at second runway, another apron of 400 metre length and 100 metre width is provided so that both the runways can operate independently.

4. Taxiway

As per ICAO guideline for code F, minimum width of taxiway provided is 25 metre. So widening of taxiway is proposed, currently being 23 metre for all aprons. Taxiway for second runway has two alternatives one is direct connectivity with existing runway as shown in fig 6.

As shown in fig 6 providing taxiway between two runways having direct connectivity with apron gives easy operation but it restricts the take-off and landing operations of the existing runway. So this alternative creates delay in operation. Second runway is provided mainly for industrial use and flight schedule of industrial aircraft and private planes are not redefined so it creates congestion and difficulties in operation. Separate apron is provided for second runway in the second alternative.

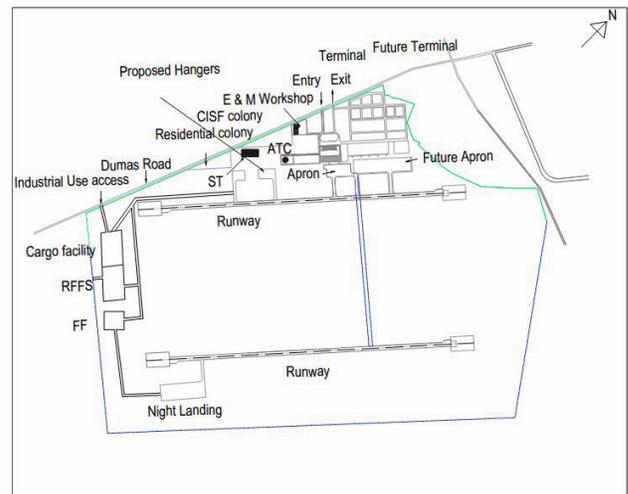


Fig 6 Alternative 1 for taxiway arrangement

Connectivity between apron and terminal is given by under pass bus service. By providing underground bus service both the runway can operate independently. Operation at terminal also is sophisticated for all aircraft passengers. When cargo aircraft lands at second runway the cargo is directly sifted to cargo storage facility by elevated transport vehicle from separate apron. It avoids delay in work and saves energy of fuel as well as manpower.

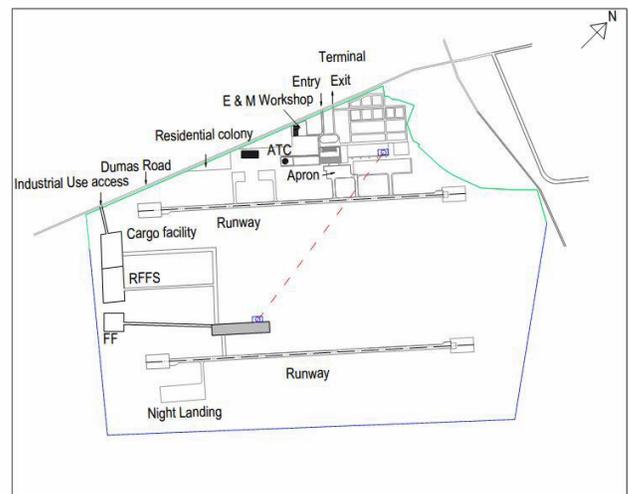


Fig 7 Alternative 2 for taxiway arrangement

As shown in fig 7 in alternative 2, apron is provided with taxiway connection of 200 metre × 25 metre and cargo storage facility is connected with apron for industrial use. Connectivity between a new separate apron and Terminal is provide by a Underground passage 1400 metre long by bus service.

Rescue and fire-fighting system and fuel farm also get direct and at shortest distance connectivity with apron. Red dotted line shows the underground path for bus service, which connects apron to the terminal.

5. Ancillary Buildings and Facilities

All apron operations require absolute attention to safety. Airports Council International (ACI) supports the establishment of an apron safety committee to coordinate campaigns, workshops, seminar and meetings to enhance apron safety so that accidents and consequently financial losses can be prevented. Area delineation for residential colony, transit accommodation and cargo complex within airport area is proposed. Up-gradation of fire station from category IV to VII with more equipment is proposed near the cargo terminal. Cargo terminal have personal access to main Dumas road for industrial usage so that passengers would not be disturbed.

The principal facilities to be considered in an airport plan include: Cargo terminals and aprons, Rescue and fire fighting services, Long-term and short-term parking, Access roads, Navies, Lighting, Flight kitchens, Fuel farm, Sewage treatment and pumping stations, Electrical substations, Security fences and control gates, Hotels, Industrial uses, etc.

B. Connectivity

Public transport facility is very important for international airport. BRTS has been proposed in Surat city which will be connected to airport site as shown in fig 8. Frequency of buses needs to be improved for airport from railway station. Outer Ring Road of Surat passes through the airport site, providing excellent connectivity to Navsari, Sachin, Valsad, Vapi. This will make Surat airport very convenient for industrial usage consequently boosting industries. There is a proposal for providing metro in Surat, for public transportation by Surat Municipal Corporation which gives direct connectivity from Surat Railway station to the airport. As in fig 8, blue dashed line shows direct connectivity from Surat Railway station to Airport. This metro connectivity reduces travel time, which in turn reduces load on Ahmadabad and Mumbai airport.

C. Restricted Area for Development

Airports must be sited in areas where airspace is free from obstructions that could be hazardous to aircraft turning in the vicinity or on takeoff or approach paths. It is also necessary to maintain the surrounding airspace free from obstacles, preventing the development and growth of obstructions to airspace that could cause the airport to become unusable. The regulations on the protection of airspace in the vicinity of airports are laid down by the definition of a set of imaginary or obstacle limitation surfaces, penetration of which represents an obstacle to air navigation. [1]

Primary Surface: A surface that is longitudinally centred on the runway, extending 60 metre beyond in each direction. This Surface is within airport boundary limits. **Horizontal Surfaces:** Fixed of 1220 m from center line of the runway at slope 7:1. This surface covers Proposed T.P. Scheme No. 78 of Bhimpore, final T.P. Scheme No. 32 of Vanta and Some part of Residential area.

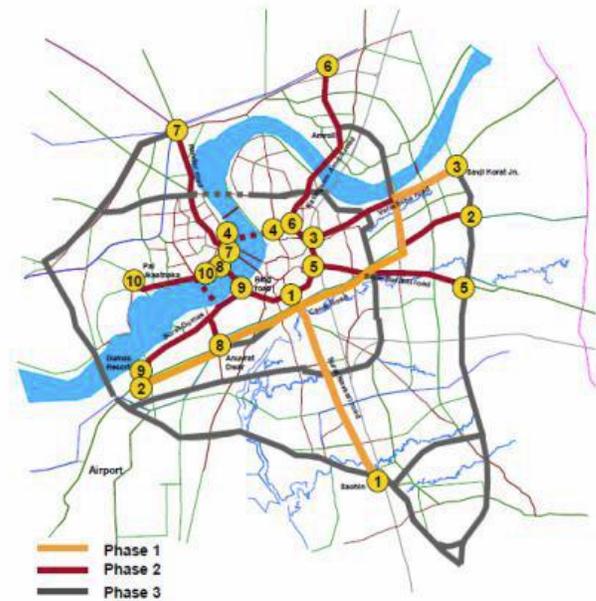


Fig 8 BRTS Route Map

Conical Surface: An inclined surface at a slope of 20:1 extending upward and outward from the periphery of the horizontal surface for a horizontal distance of 1220 m. this surface covers proposed TP Scheme No 78 of Bhimpore, final TP scheme No 31 of Gaviar, TP scheme No 7 Magdalla, TP scheme No 6 Vesu, TP scheme No 26 Abhava and TP scheme No 77 Dumas-Bhimpore.

Beyond conical surface in longitudinal direction slope 7:1 and in lateral direction slope 40:1. Constructions of any kind of structure have to get permission from Airport Authority of India and they will give allowable height as per surface slope.

VIII. FUTURE SCOPE OF STUDY

There are some areas suggested for the study in the area of airport master planning to make city growth at global level by providing air transport connectivity.

In the study, only layout design of airport master planning is proposed for future work detailed component of airport can discussed. Impact of airport master planning on Surat city can also be analysed. The financial part of the airport refurbishment is not considered in the study. Detail drainage infrastructure planning for Surat international airport.

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