Front End Planning and Basic Planning Services for Airport Business

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Abstract:

JGC has a range of experience in several aspects of the airport business including jet fuel hydrant systems, MRO (Maintenance, Repair & Overhaul) facilities, and baggage handling systems, and is eyeing expansion into the airport EPC and investment business. Focusing on the airport EPC business, JGC is now seeking to propose front end planning and basic planning services to clients in the project forming stage. In this article, this approach will be described.

1. Introduction

In the urban social infrastructure field (infrastructure field), airports are one of the most important facilities, and especially in Asia, the number of passengers is expected to double over the next 20 years (* 1). As the number of passengers increases, airports are expected to be newly constructed and renovated, and the airport field, particularly in the Asian region, is recognized as an important EPC field that we should focus on.

2. Our efforts in the airport EPC field

The beginning of activities in the airport field was refueling facilities. Since 1972, we have accumulated results in domestic airports such as Narita International Airport, Kansai International Airport and Chubu International Airport, and countries such as Indonesia and Kenya. In the 1990s, we also worked on an aircraft maintenance factory at Narita International Airport and a baggage handling system at Haneda Airport.

In recent years, the company has been aiming for further involvement in the entire airport field, while building on its track record in single facilities such as refueling facilities. As part of the expansion into the entire airport field, we have been challenging airport business projects since 2011 and have gained knowledge regarding the upstream design of the entire airport. When the authors had the opportunity to collaborate with leading overseas airport operators in airport business projects, we recognized that they

had highly-developed Master Plan planning ability as leading experts in the airport planning field, while keeping initial investments down. The plan was designed to cope with future fluctuations in passenger demand. On the other hand, we have the ability to carry out EPC after detailed design, and if combined with the planning ability of upstream design (Master Plan, conceptual design, etc.), we will be able to provide consistent services from upstream to downstream.

Later, in the process of the privatization of airports in Japan, when we received the opportunity to work on multiple projects involved in the privatization of airports, we made use of our experience thus far. Our airport upstream design capability has been greatly improved, and we have created a foundation for providing consistent services from upstream to downstream, centered on our company. Fig. 1 shows our performance in the airport field. In this figure, the results shown in green are the results of upstream design implemented after 2011.

Fig. 1 JGC's Airport Experience

3. Proposal approach that leads to airport EPC

Our core business field is EPC, and we are focusing on EPC development in the airport field.

In the future, when accelerating our entry into the airport EPC, we will promote a proposal-type approach that provides consistent services from upstream design services such as Master Plan and conceptual design to downstream EPC, while leveraging our experience and knowledge in airport-related fields.

An example of an upstream design service is a domestic airport privatization project. In the technical support business (technical service) for customers who are engaged in bidding for business rights, upstream design such as Master Plan and conceptual design was implemented. By making proposals that take downstream workability and construction processes into consideration at the upstream design stage, we have demonstrated our strength and led to customer satisfaction. Based on these upstream design capabilities, we as an engineering company will fulfill client needs by integrating upstream design to EPC. Fig. 2 shows our service provided in the airport field.

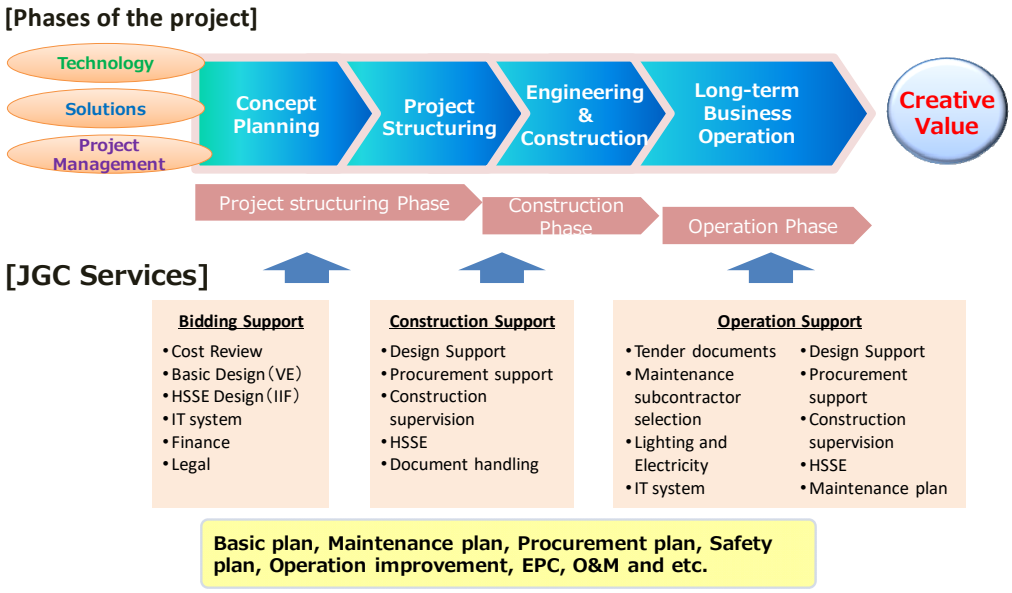

Fig. 2 JGC's Value in Airport Business

On the other hand, the needs of airport operators are diversifying, and in order to make proposals that are more attractive to airport operators, solutions to correctly grasp customer needs and enhance satisfaction for each airport operator are necessary. Recent customer needs are to take the latest trends in airport operations (security advancement, enhanced passenger experience, labor saving, etc.) into account, and the upstream design (Master Plan, conceptual design) mentioned above, it is essential to propose appropriate hardware and software that match the customer's business according to comprehensive understanding and analysis of the personnel flow, material, and information,. Currently, we are also deeply cultivating the ability and technology to provide consulting, proposals and upstream design from the aspects of operations and systems in airport operation.

4. Upstream design service

In this chapter, we will explain in detail, our experience in upstream design services done.

1) Long-term demand forecast and peak concentration rate

Fig. 3 shows the relationship between long-term demand forecasts and facility scale. Long-term forecasts of aviation demand over decades are often made using regression models that use economic indicators such as gross domestic product (GDP) and population as variables, and approximation models created from information regarding neighboring airports and airports of the same scale. Short-term forecasts of about 10 years may be further augmented by interviewing airlines.

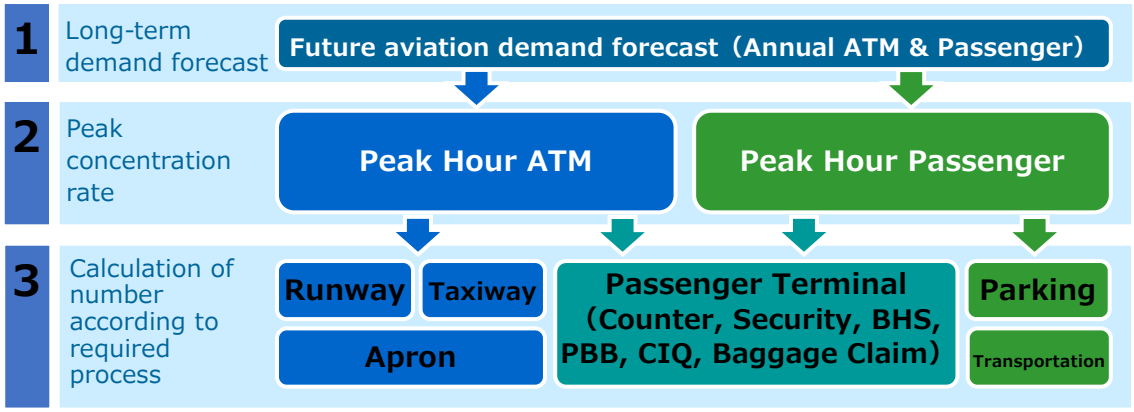

Fig. 3 Relations between demand forecast and facility size

The method of calculating the number of departures and arrivals at peak times and the number of passengers from long-term demand forecasts differs by FAA (Federal Aviation Administration), IATA, BAA (British Airports Authority), and airport engineering (semi-guideline in Japan). We need to consider various characteristics such as seasonal matters. However, in any case, the number of passengers during peak hours is planned for except for the busiest holidays (in our case-New Year holidays, Golden Week, Obon). In the busiest holiday case, we assume the passengers will tolerate the great crowding, to optimize the scale of facilities. Table 1 shows the ratio of the passengers during peak hours to the annual passengers in the long-term demand forecast listed by FAA and IATA. This is a ratio for calculating the peak demand, which can be used as a reference for the ratio of the peak hour passengers to the annual passengers annually.

Table 1 Ratio of peak hour passengers to annual passengers in demand forecast

Total passengers/yr	FAA	IATA
Above 30million	0.035%	0.030%
20M to 30M	0.040%	
10M to 20M	0.045%	0.035%
1M to 10M	0.050%	0.040%

(Sources: FAA(Federal Aviation Administration), IATA(International Air Transport Association))

2) Take-off / landing capacity of the runway

Minimizing the aircraft's time on the runway (runway occupancy time) will maximize the takeoff / landing capacity. The relationship between runway configuration and takeoff / landing capacity is shown in Fig. 4. Compared to the runway + apron (parking station) only, runways with a parallel taxiway have a shorter runway occupancy time. The maximum possible number of departures and arrivals for runway + apron is about 20 times (visual flight), while the latter configuration makes possible up to about 40 movements. Furthermore, by providing a double parallel taxiway, complete one-way guidance is possible, and a further increase in the number of departures and arrivals can be expected.

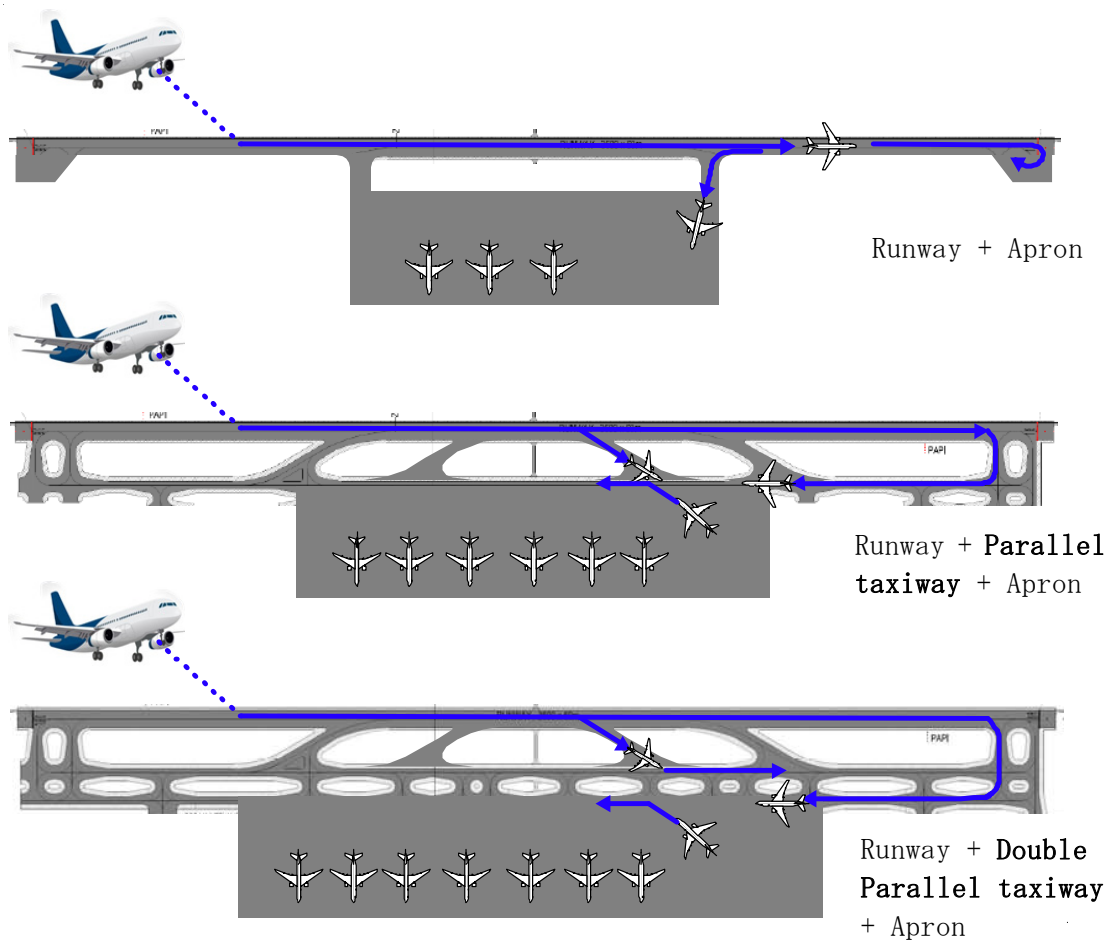

Fig. 4 Runway composition and takeoff and landing capacity

3) Apron plan

The apron (parking lot) is a place where aircraft are parked, passengers get on and off, cargo is loaded and the aircraft fueled. The number of gates that connect the necessary apron and passenger terminal building is calculated and arranged in anticipation of the number of departures and arrivals at peak times including delays. Since the gate interval (spacing) varies depending on the size of the aircraft; large, medium, and small, flexible planning anticipating future changes is necessary.

Figure 5 shows the gate arrangement we proposed for the domestic airport project. Possession of aircraft equipment assumed in the route plan calls for a large proportion of small aircraft in the future so existing gate arrangements were one aircraft per gate regardless of the aircraft size. A proposal was made to significantly increase the number of small aircraft that can be parked, using a multi-gate system that can park two small aircraft or one large aircraft. In addition, the fixed bridge allows passengers to get on and off 2 different flights at the same time by dividing the departure flow line, so as not to cause a delay due to waiting for getting on and off. See Fig. 6.

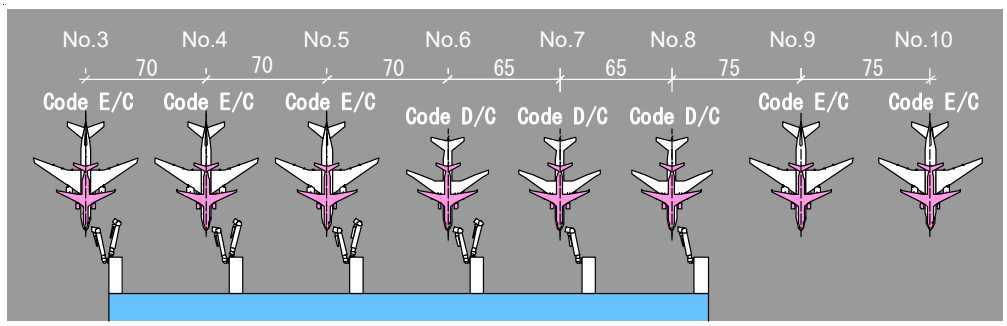

Fig. 5-1 Gate layout (Existing)

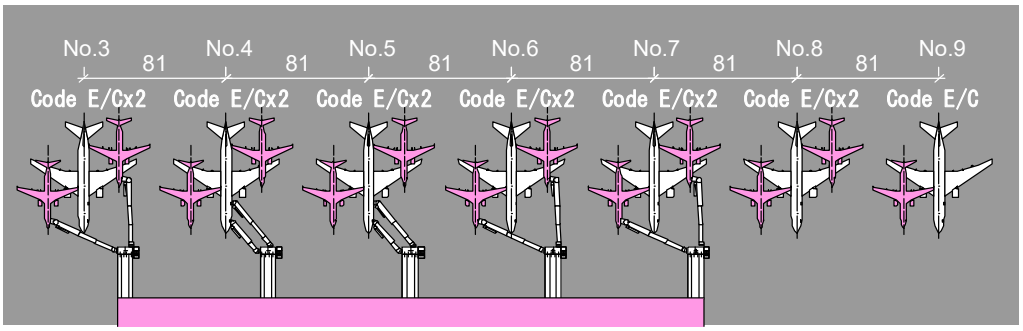

Fig. 5-2 Gate layout (Proposed)

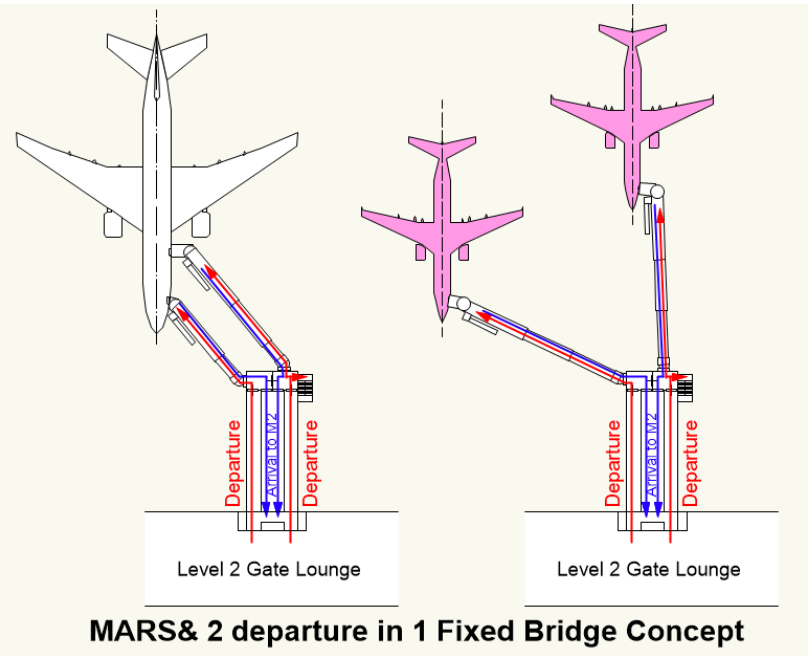

Fig. 6 Multi gate with separated traffic lines

4) Passenger terminal building plan

Figure 7 shows the planning concept proposed in the domestic airport project. By securing the depth of the passenger terminal building, it is easy to expand each function constituting the passenger terminal building. In general, the peak hour for international and domestic flights rarely match, so facilities for international and domestic operations can be shared (for example, security equipment can be shared, and the movable partitions can be moved according to the peak for each type of operation. This will allow reduction of the passenger terminal building size such as the amount of equipment and the installation / waiting space. Furthermore, in the future, it will be possible to respond flexibly even if the ratio of international and domestic passenger numbers differs from the forecast. Figure 8 shows the layout of this airport project promoting the sharing of facilities for international and domestic flights.

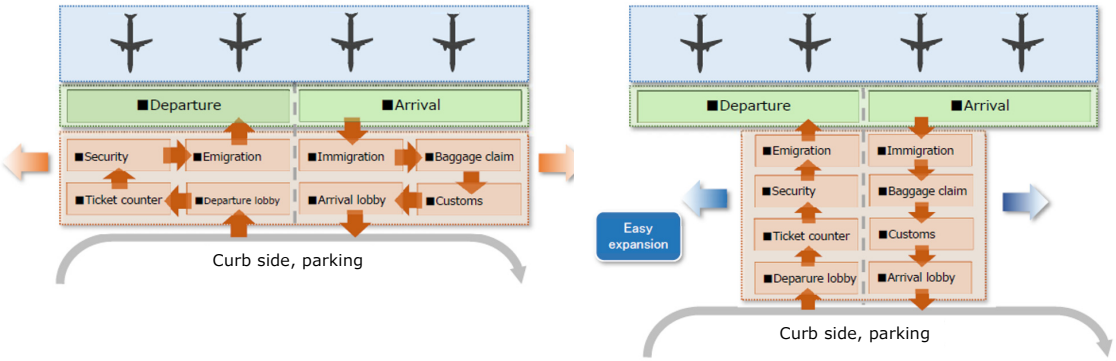

Fig. 7 Comparison between typical PTB in Japan and Square layout

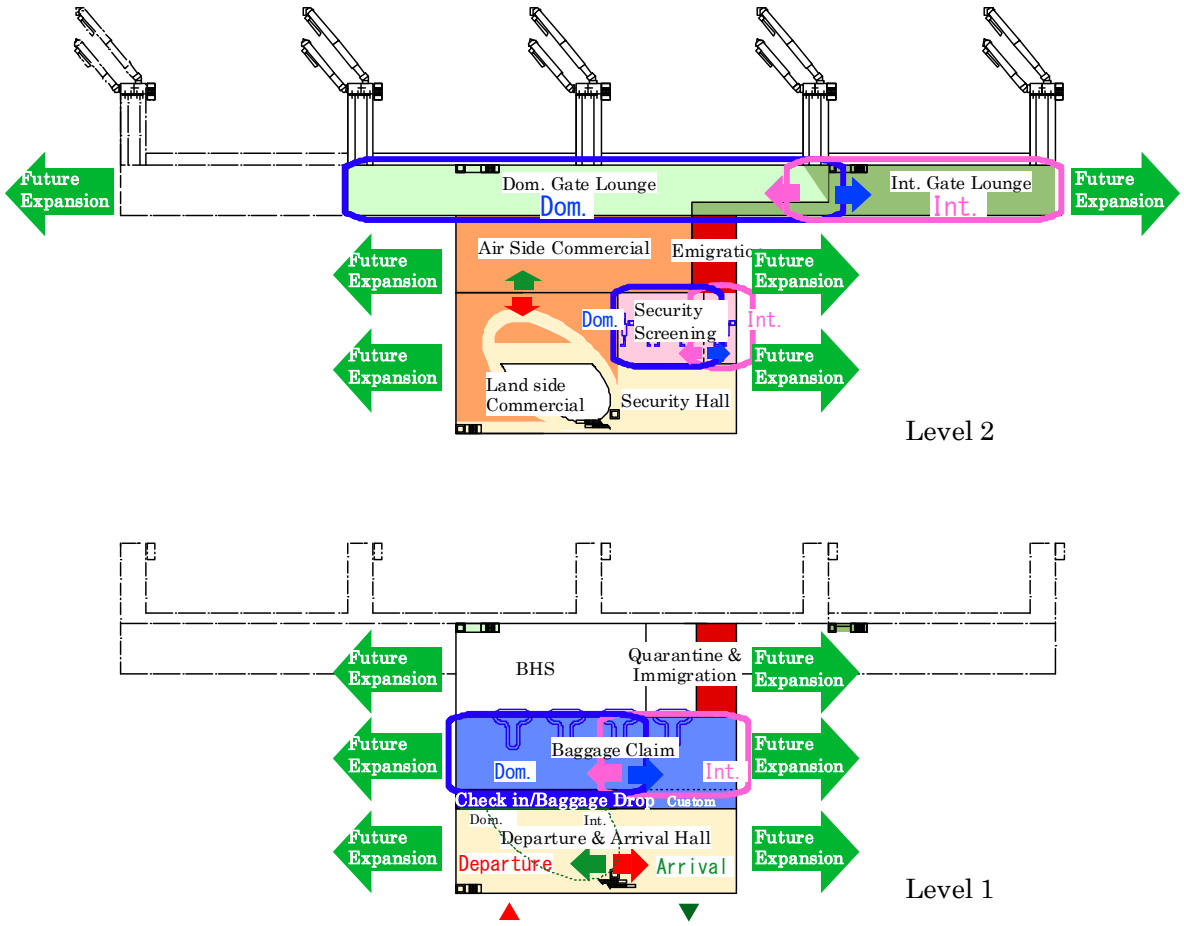

Fig. 8 Common use of facilities for domestic and international passengers

5. Future considerations

Our efforts so far have improved our recognition as an airport player, and we have steadily built up airport knowledge and customer trust. In the future, we will select and implement construction methods suitable for different countries in Southeast Asia, and maintain quality and cost reduction. For issues such as cost reduction, we will make full use of not only the knowledge and experience of in-house human resources, but also cooperation with airport operators, airport consultants, general contractors, etc. And realize the airport EPC implementation unique to our company (upstream to downstream EPC contractor).