

PLANNING AND ORGANIZATION OF TRANSPORT AND TECHNICAL OPERATION OF INTERNATIONAL AIRPORTS

Ladislav Kusovský- Vladimír Begera

My thesis „Planning and Organization of Transport and Technical Operation of International Airports“ discusses about processes commercial handling of passengers and technical handling of aircrafts. Summarize the findings about the planning, organization and documentation used at airports. Informs the reader about the importance and capacity matters of airport terminal. Acquaints with the ways, activities and means related to ground handling of aircrafts. In conclusion are proposed improvements or suggestions for optimizing the technical operation at international airports.

K e y w o r d s: airport operations, General of airport, airport terminal, ground handling of aircrafts, optimization of technical operations

1 INTRODUCTION

Airports as hubs must develop a rational and effective conditions for air carriers and the public in the provision of logistics services required to ensure aviation. To meet these demands requires to have the necessary airport technical means, trained service staff, good coordination of individual activities and efficient exchange of information between the different components of airport operations.

In this thesis I will devote the issue of transport operation of passengers at international airports. On the following pages I will also describe the topic related to ground handling of aircraft, which includes processes performed on airfields and on aircraft itself. The length of these processes depends on many factors (type and size of the aircraft, category of standing, the type of flight, capacity of apron), by which is possible to largely influence of time when aircraft can be spent on the airport.

2 PLANNING AIRPORT OPERATION

The basic obligations of airport management, associated with the operation of the airport, is an idea of his future development. Planning airport operation can in principle be defined as the creation of an organizational strategy for future management in relation to operational activities, device parameters of airports, its layout, financial budget and profit, requirements of environmental and organizational structure. Through the planning system it is possible to define the needs of individual airports to the needs of communities in the region. Content of the plan depends on the time defined for a specific activity of management. Various plans on level staff activities tend to be short-term (e.g. three months). Conversely plans involving, for example reconstruction of the runway and terminal building can have a horizon from five to ten years.

In terms of time and content orientation can be divided the planning of airport operations into:

- **Long-term (strategic) planning** - from 5 to 10 years or more.
- **The medium-term planning** - 2-5 years
- **Short-term planning** - from half year to two years.

To solve the demands for airport development must be approached systematically. This means, that it is necessary to assess the capacity of each airport device separately (RWY, taxiways system, configuration of aprons, passenger and cargo terminals, access roads to the airport, etc.). The result is a proposal solution of airport construction at certain stages, processed according to the General of airport (airport master plan).

2.1 Airport master plan

Each airport has prepared a basic document Airport Master Plan (General of airport, Main plan of airport). Presents guidance to how to assign optimally development of the airport. In financial planning are include various alternatives, but it is not processed a particular program. Provides direction for development, is the most fundamental land use planning document, that contains the deployment of various operational activities such as handling of passengers, cargo handling, repairs within the airport complex. It is used for long-term planning, economic planning, environmental protection, financial planning.

It should be emphasized that the Master Plan is a guide to:

- development of airport facilities and structures,
- development and use of land in the vicinity of the airport,
- determine the impact of airport development on the environment,
- determine the requirements to connect the airport with the city.

3 ORGANISATION OF AIRPORT OPERATIONS

Notion organization of transport and technical operation of the airport can be characterized as “control of airport operations”; including the whole running of airport, functions which carried out and the services it offers to reach the economic, efficient, safe and smooth flow of passengers, cargo and mail.

Nowadays airports are one of the most used resources on the planet. Therefore, that the airport fulfills its function as best as possible, requires efficient flow of passengers, cargo and aircraft. Only when these three elements are synchronized, operation can be converted

from unpredictable to predictable, from reactive to proactive, from the monitored to controlled and from tactical to strategic . [2]

Airports of considerable size must have an organization that will provide or manage the following resources :

- ❖ Handling of passengers.
- ❖ Maintenance, repair and management of the aircraft.
- ❖ Activity of airlines including crews, air and ground staff and other terminal and administrative staff.
- ❖ Business needed for economic stability of airport.
- ❖ Support for aeronautical equipment (ATC, meteorology).
- ❖ Government functions - Agricultural inspection, customs, immigration department, health.

4 TRANSPORT OPERATIONS AT INTERNATIONAL AIRPORTS

Relationships between airports and airlines are taking into account the fact that most airports are state property and airlines have in turn largely private owner, specific. It should also be recognized that airlines are major customers of the airport.

Because the sentence is true in aviation, the aircraft earns only if it is in the air, it is very important to check-in processes occurring at the airport were the most effective, fastest, comfortable and had a certain level. Check-in process and its items are described in detail in the Airport Handling Manual (AHM), which is defined exactly, what the process involves, what procedures must be implemented, what documentation is completed, what types of messages are transmitted, who is responsible for various actions and the like.

By management and the provision of transport operation of passengers at international airports deal with workers of commercial handling. These airport staff carry out various activities, which each other gradually and logically follow.

4.1 Airport terminal

The airport terminal is the most important part of airport infrastructure in terms of transport operation of passengers. Passengers get through check in, waiting for departure and upon arrival in the destination end their journey by air in air transport process in terminal. It follows that, in addition to the actual transport by plane in airport terminals passenger will spend the most time.

Air passengers make their own image and views on the international airport by appearance and terminal facilities. Therefore, I will issue an airport terminal in more detail.



Fig. 1 Bratislava Airport Terminal

The airport terminal itself is a tool that performs the following three functions :

- **Change of mode:** providing a physical link between the aircraft and ground mean, designed with the location of all control units.
- **Processing:** Providing the necessary resources, such as handling, administration and control of passengers and cargo.
- **Change of movement type:** Conversion of inbound cargo on trucks and passenger entering by cars or public transportation to " batch of aircraft " , with take off according to the schedule that the process could be converted to the destination process.

5 TECHNICAL OPERATION AT INTERNATIONAL AIRPORTS

Technical operations at international airports constitutes ground handling of aircraft (GHA). To ensure GHA is necessary to have established specific procedures and methodology to carry out the necessary actions. It is necessary to have a trained, qualified staff and resources to ensure GHA.

Ground handling of aircrafts is a set of activities carried out at airports for the operation and serviceability of the aircraft. It is about specific activities which include except well-known to passengers loading and unloading baggage, ensuring they boarding and getting out also other activities, such as e.g. electricity supply for aircrafts, filling aircrafts by fuel, by oxygen , by nitrogen , de-icing of aircrafts, and many other activities. Ground handling of aircrafts adjusts fairly comprehensive technical and related documentation and legislation. A very important area is the certification of persons and equipment for ground handling of aircrafts.

5.1 The means used for ground handling of aircrafts

Airports dispose of either mobile technical means or stationary means have built . To the ground handling of aircraft means we include:

1 Aircraft Towing and Pushing Tractors. Aircraft tractors provide aircraft movements – towing, pushing after operational areas.



Fig. 2 Aircraft Towing Tractors

2 Ground Power Units (GPU). Means for external electricity supply and start the aircraft engines. During GHA use an external power source to ensure the functionality aircraft systems which at the time of handling of aircrafts must be in operation.



Fig. 3 External power supply

3 Aircraft Refuelers. These means ensure compliance with aviation gasoline or kerosene in aircraft fuel tanks.



Fig. 4 Refuelling of aircraft from hydrant by dispenser

4 Means for embarking / disembarking of passengers and disabled passengers. (Passengers Stairs, Disabled Passengers Ramps, Ambulifts). This group might include the airport buses that are used for transfer of passengers from the terminal to the aircraft and vice versa.

5 Baggage and Cargo Handling Equipment. Cargo is a general name for the air transported cargo and mail.



Fig. 5 Loader of baggage

6 Aircraft Catering Trucks. Catering is the term for food (food and drinks) delivered on board the aircrafts in order to minimize the time of preparation on board, it is a full service of galleys.

7 Potable Water Trucks. Water is put into the aircraft (toilet facilities or galley) must be certified that it is drinkable, it is apparent from safety standards .

8 Cabin Service Trucks. These means serve to ensure the aircraft cabins and their accessories for flight.

9 Ground Air Conditioners and Heaters. Provides heating and air-conditioned of cabins and accessories of aircrafts during ground handling them.

10 Toilet Service Trucks. Provide pumping sewage from toilet systems of aircrafts and associated services.

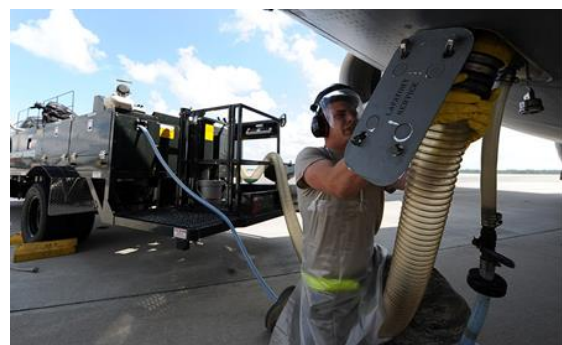


Fig. 6 Service toilets

11 Air Start Units – ASU. Starts aircraft engines. Compressed air supply system needed to spin the turbine air starter plane, which runs through the main engine gearbox.

12 De-icing, Anti-icing Units. These means will be used during GHA if necessary to provide the removal of icing phenomena from surface of aircrafts (de - icing), or

preventive ensure the surface of the aircraft before the expected icing (anti - icing) .



Fig. 7 De-icing of aircraft

6 OPTIMIZATION OF TECHNICAL OPERATIONAL ACTIVITIES OF INTERNATIONAL AIRPORTS

Optimization of activities carried out in the technical operation of aircraft in international airports is directly connected to the means for GHA.

Optimality means for GHA depends mainly on the universality of their use (the wider use, the preferable means), extent of environmental pollution and meet the requirements imposed on these means, thus ensuring the needs of air carriers.

In my opinion, should start in the technical handling of aircrafts used means of electric or hybrid drive. Benefits and advantages of such facilities would be for example:

- reduce noise levels at airports and their around
- significantly lower emission production
- less burden on the environment

The international airport would use means for GHA with alternative drive definitely receive a better image. Also, the airport would be less difficulty in obtaining various certifications and ISO standards.

In the future, of course, the primary objective perspective means of ground handling but also all transport vehicles will use a variety of alternative drives, especially electric, hybrids, hydrogen-powered and not least the powertrain using biofuels.

6.1 Airport Visualiser

In the field of optimization processes of check surfaces for aircrafts raises a number of systems to increase the efficiency of resources GHA and also the staff and in particular to reduce the cost of operation. One of these systems is the Airport Visualiser.

Airport Visualiser is a comprehensive software and hardware solution for ground handling of aircrafts, which provides management and planning of all mobile mechanization at the airport in real time. Locates every means on apron, his driver and allows the operator more flights with fewer amount of resources. Also reduces the

risk of delay lines and increases customer satisfaction. Helps to optimize processes of ground handling of aircrafts leading to increased productivity and safety. This solution is made up of integrated modules that help solve business requirements.

Airport Visualiser modules consist of:

- ❖ Display (ProView)
- ❖ Operations (ProOperations)
- ❖ Security (ProSafety)
- ❖ Maintenance (ProMaintenance)
- ❖ Facts (ProFacts) . [5]

Airport Visualiser is used for example in airports like Abu Dhabi and Amsterdam. I think that similar optimization solution should be used at each international airport that serves as a significant and important transport hub for air transport.

6.2 Alternative procedure for de-icing and anti-icing protection of aircraft

In countries where there is not a tropical climate, it is necessary to provide in winter de-icing of aircraft. On most international airports this is done through various deicing vehicles. These vehicles use defrosting and deicing mixture.

I suggest that on international hub airports with operational performance 25 million and over passengers per year, using alternative solutions for de-icing and anti-icing aircraft protection. One such solution offers the company Radiant aviation. It is a heating system of the aircraft on the basis of infrared radiation in an open hangar and associated removal of snow, frost and ice from aircraft. Aircrafts are clean in a short time and capable of flight, and it going about environmentally friendly solution without using glycol, special retraining of staff and the need for special physical security. The advantage is without-riskiness of the operation, the impossibility of damage to the aircraft by the operator (aircraft taxiing directly into the hangar).

After parking the aircraft in a hangar on the roof of the hangar trigger infrared emitters and everything else will happen naturally based within couple of minutes. If necessary, an aircraft after the pull down from the hangar will be treated with a protective layer (anti - icing) and is then capable of flight.



Fig. 8 Infrared hangar at New York JFK airport

6.3 The WheelTug system

WheelTug system is a unique concept in aircraft ground operations. This patented electric drive system uses high-performance electric motors, powered using APU, which are integrated into the front wheel landing gear of aircraft and ensures full mobility on the ground without using main engines of the aircraft or trucks. Built-in motor allows scrolling with the main engines turned off from apron to the runway and vice versa after landing scrolling up to the handling Stand. Likewise eliminates the use of existing trucks to move backward. The resulting improvement in efficiency, flexibility, lower fuel consumption, reduce engine wear will bring airlines savings of at least 600,000 USD per aircraft per year, equivalent to 6-7 % per year of fuel consumed.



Fig. 9 The WheelTug system

6.3.1 The main benefits of the system

Savings for extrusion

On the Stands of the type "nose - in" progress normally, after disconnecting ground power unit and towing the bridge or stairs pushing the aircraft. Extrusion takes place using special equipment, either drawbar fastened to the front chassis and tractor, or specialist tractor behind the front suspension. Extrusion by system WheelTug (reversing of aircraft) only occurs in conjunction with two membered ground personnel that visually guides the pilot using conventional "extrusion" procedures. In the future, this method is still possible to replace the camera system on the aircraft. Elimination of extrusion reduce redundant ground staff, necessary in the normal course of extrusion, completely eliminated the need to remove security pin of steering of nose gear. And mainly it will not need to use towing or pushing trucks, which will result in reduced costs for their maintenance, fuel, insurance, etc. For the entire extrusion process per one flight will save about 25 USD, per year then nearly 41,000 USD.

Increase operational safety

Exhaust stream exiting from engines is one of the main causes of accidents on the air side of airport. Threatens ground staff and is dangerous for other aircrafts. Ground staff must at moving around the aircraft

with the engine running strictly observe safety precautions. These actions are causing a lot of limitations. Running engines on aprons can also soak up luggage or small items, which after crushing them inside the motor act literally like unguided missiles. Eventually eliminate the using of the pushing and pulling tractors can increase operational safety.

7 CONCLUSION

Air travel can not exist without the appropriate airports, airport technical and transport equipment and technical facilities that serve the interconnection of air routes. Individual airport facilities, equipment and processes are functionally related to each other. Airport operations is a dynamic activity, which is necessary to plan, organize, manage and optimize.

Air transport demand in developed countries is constantly increasing. The most important airports in the world are on top of their operational capacity, and it is therefore necessary to look for new solutions, that could be applied to airport operations.

BIBLIOGRAPHY

- [1] FERENC, J. – KOŠČÁK, P. – PETRUF, M. – KRCHOVÁ, L.: *Ekonomika prevádzky letísk*. Košice: TUKE-LF, 2011. 251 s.
- [2] Žihla, Z.: *Provozování podniku leteckej dopravy a letišť*. Brno: CERM, 2010. 301 s.
- [3] KERNER, L.: *Provozní aspekty letišť*. Praha: ČVUT v Praze-Fakulta dopravy, 2003. 270 s.
- [4] FERENC, J. – STRAKOVÁ, E.: *Prostriedky pre pozemnú obsluhu lietadiel*. Košice: TUKE-LF, 2011. 140s.
- [5] *Ground Handling Optimisation for Airports*. Available at internet: http://www.access-fusion.lk/ground_handling_optimisation_for_airports.php
- [6] *Radiant aviation*. Available at internet: <http://www.radiantenergycorp.com/>
- [7] *System WheelTug*. Available at internet: <http://uld.fd.cvut.cz/magazindta/system%20wheeltug.pdf>

AUTHOR'S ADDRESSES

Bc. Ladislav Kusovský, LF TUKE, Rampová 7, 04021 Košice, email: ladislav.kusovsky@gmail.com

Ing. Vladimír BEGERA, PhD., LF TUKE, Rampová 7, 04021 Košice, email: vladimir.begera@tuke.sk