Ted Stevens Anchorage International Airport
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2014 MASTER PLAN UPDATE

APPENDIX H - LEVEL OF SERVICE

FINAL
DECEMBER 2014

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TED STEVENS ANCHORAGE INTERNATIONAL AIRPORT MASTER PLAN UPDATE

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December 2014

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Prepared for:
Ted Stevens Anchorage International Airport
State of Alaska Department of Transportation & Public Facilities

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PREFACE

The Ted Stevens Anchorage International Airport (Airport) Master Plan Update (Master Plan Update) provides Airport management and the Alaska Department of Transportation & Public Facilities (DOT&PF) with a strategy to develop the Airport. The intent of the Master Plan Update is to provide guidance that will enable Airport management to strategically position the Airport for the future by maximizing operational efficiency and business effectiveness, as well as by maximizing property availability for aeronautical development through efficient planning. While long-term development is considered in master planning efforts, the typical planning horizon for the Master Plan Update is 20 years.

The Federal Aviation Administration provides guidance for Master Plan development in *FAA Advisory Circular 150 / 5070-6B, Airport Master Plans*. Although not required, the Advisory Circular strongly recommends airports prepare a Master Plan. Funding for the Master Plan Update is provided primarily by the Federal Aviation Administration through an Airport Improvement Program grant.

A comprehensive Master Plan Update was last prepared in 2002 and a partial update was undertaken between 2006 and 2008. This Master Plan Update was initiated in June 2012 and concluded in December 2014. The DOT&PF entered into a contract with the firm RS&H to lead this effort. The Master Plan Update included a robust public and stakeholder involvement program.

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LEVEL OF SERVICE DEFINED

The primary purpose of airport planning is to enable a given airport to efficiently accommodate existing and forecast demand. Demand is typically forecast forward 20 years and presented for passenger levels, aircraft operations, and cargo tonnage.

The efficiency of each facility assessed in the Ted Stevens Anchorage International Airport (Airport) Master Plan Update (Master Plan Update) was assessed by Level of Service. The concept of Level of Service has its origins in highway design and is referenced in the Transportation Research Board's Highway Capacity Manual. Essentially, Level of Service is a grading system to establish efficiency as a unit moves through a system. The efficiency of cars moving on a roadway would define Level of Service for a roadway, while aircraft moving through an airfield would define Level of Service for an airfield. As the demand (i.e. number of units) increases, greater capacity is generally required to maintain an efficient flow of units. Level of Service is used by airport planners to set a reasonable efficiency goal for planned airport infrastructure. Level of Service as it is applied to airports is described below.

Airports Cooperative Research Program (ACRP) Report 25, Airport Passenger Terminal Planning and Design, Volume 1, defines Level of Service as "a generic term that describes, either qualitatively or quantitatively, the service provided to airport travelers at various points within the airport terminal building. It often relates to the degree of congestion or crowding experienced by travelers at the passenger and baggage processing facilities in the terminal building. It may also be a measure of the amount of waiting or processing time, or the length of the queues or lines encountered by such travelers at these facilities." The Level of Service definition is broadened not only to efficiency in a certain flow of units, but also to a general comfort level experienced by users of a system and delay such as waiting time.

The International Air Transport Association (IATA) has identified standard Level of Service criteria as documented in the *IATA Airport Development Reference Manual*. As described therein, "Level of Service can be considered as a range of values, or as assessments of the ability of supply to meet demand. To allow comparison among the various systems and subsystems of the airport and to reflect the dynamic nature of demand upon a facility, a range of Level of Service measures from A through to F may be used, similar to the standard employed in highway traffic engineering."

IATA describes each Level of Service as follows:

- **A** - An Excellent Level of Service. Conditions of free flow, no delays and excellent levels of comfort.

- **B** - High Level of Service. Conditions of stable flow, very few delays and high levels of comfort.
- **C** - Good Level of Service. Conditions of stable flow, acceptable delays and good levels of comfort.
- **D** - Adequate Level of Service. Conditions of unstable flow, acceptable delays for short periods of time and adequate levels of comfort.
- **E** - Inadequate Level of Service. Conditions of unstable flow, unacceptable delays and inadequate levels of comfort.
- **F** - Unacceptable Level of Service. Conditions of cross-flows, system breakdowns and unacceptable delays; an unacceptable level of comfort.

As presented in **Table 1**, Level of Service is defined from the perspective of flows, comfort level, and delay in a system.

Table 1
IATA Level of Service Summary

Level of Service	Flows	Comfort	Delays
A = Excellent	Free	Excellent	None
B = High	Stable	High	Very Few
C = Good	Stable	Good	Acceptable
D = Adequate	Unstable	Adequate	Passable
E = Inadequate	Unstable	Inadequate	Unacceptable
F = Unacceptable	System Breakdown	Unacceptable	System Breakdown

Source: International Air Transport Association, *IATA Airport Development Reference Manual*, 9th Edition, 2004.

Level of Service is a critical component for airport planners because different Levels of Service may be acceptable to different airports. Further, it can generally be stated that planning facilities to always provide a Level of Service A would require increased development costs to construct larger facilities. Again, the purpose of this document is to define Level of Service. It also established what Level of Service was used to complete the facility requirements analysis for the Master Plan Update.

DESIRED LEVEL OF SERVICE FOR TED STEVENS ANCHORAGE INTERNATIONAL AIRPORT

Each airport should determine the desired Level of Service for planning purposes. In a general sense, more space results in a higher Level of Service and typically lowers delays and congestion. For instance, more passenger security screening checkpoint lanes generally mean passengers can flow through the checkpoint area in a shorter period. This would reflect a high Level of Service (with a Level of Service A or B designation). Consequently, the cost to construct and staff a larger security screening checkpoint may be more expensive. There are tradeoffs to make between available space, cost of providing the space, and resulting congestion that must be considered when defining the desired Level of Service.

Planners must also determine when lower Level of Service may be acceptable when defining the desired Level of Service. Demand fluctuates hourly, daily, monthly, and annually. Master plan facility requirements are generally analyzed using demand levels that occur on an average day during the airport's busiest month. In some cases, specific peak times (rolling 20-, 30-, or 60-minute peak times) on the average day of the peak month may be used. Peak periods throughout the year may occur for such a brief time (e.g. Thanksgiving), that the activity may not be fully accounted for on the average day of the peak month. Planners must determine whether potentially subpar Level of Service is acceptable during these extreme peaks. Planning facilities that operate at a high Level of Service during an airport's extreme peaks would increase construction and maintenance costs.

IATA recommends using Level of Service C for airport planning. Level of Service C was recommended initially by Transport Canada, the Canadian department responsible for most of the transportation policies, programs, and goals of the Government of Canada, and was later adopted by IATA as a Level of Service that "denotes a good service at a reasonable cost."

Planners must consider the Level of Service to apply during the planning process prior to determining facility requirements because the desired Level of Service for the Airport will dictate the metrics used to prepare facility requirements. For major international airports that cater to a very high proportion of international business travelers, a higher Level of Service may be appropriate. Major international hub airports in Europe and the Middle East provide examples of airports built to operate with a very high Level of Service at almost all times. Likewise, for smaller airports that do not cater to a high proportion of high-fare paying customers, planning more modest facilities that are more congested during busy periods may be appropriate. While the Airport is not a major international hub for business travelers, it is the largest hub in the State of Alaska and is a key transportation link for Alaska businesses and tourism.

The Airport is characterized by relatively high seasonality. Most United States airports are busiest during the months of July and August because of summer travel. This trend is more pronounced in Anchorage because Alaska is a major summer tourist destination, welcoming almost two million summer visitors each year according to the Alaska Department of Commerce, Community, and Economic Development. Therefore, if the Airport is planned to operate at Level of Service C during the busy summer travel season, the Airport will operate at an even higher Level of Service during the less busy, non-peak months that stretch roughly from September to May.

It is recommended that the facility requirements for the Master Plan Update be based on providing Level of Service C. This recommendation is based on IATA's guidance and a lack of extenuating circumstances at the Airport that would make planning to a higher or lower Level of Service appropriate. Providing facilities that meet Level of Service C during the busy tourist season will provide an enjoyable travel experience for tourists and reflects the importance of tourism for the State of Alaska's economy. Typically, the Airport is tourists' first and last impression of Alaska. It can be anticipated that tourists will arrive and depart with a positive impression of Alaska if their experience at the Airport is positive.

The desired Level of Service will dictate the planning factors used for determining the Airport's facility requirements (see **Chapter 4**, Facility Requirements). Planning factors (ratios of demand / capacity or adjusted utilization rates) are used to determine future space and infrastructure requirements that meet forecast demand. The planning factors used to represent Level of Service C are different from those used to represent Level of Service D or B.

Level of Service C, as defined and applied by IATA, pertains to terminal and landside facilities only. Airfield Level of Service can be quantitatively assessed using computer models and Federal Aviation Administration (FAA)-defined delay costs, which enable the use of benefit cost analyses. Therefore, a letter grading system for airfield Level of Service is unnecessary. Cargo and general aviation facilities are typically developed by third party tenants who will establish their own needs. Industry standards for general aviation and cargo Level of Service are based on consultant experience. IATA has not established uniform Level of Service definitions for cargo and general aviation facilities.

AIRFIELD LEVEL OF SERVICE

Airfield planning and the concept of airfield Level of Service deserves further discussion. It is an industry standard, and it is generally required by the FAA for airfield capacity studies to include benefit cost analyses. This is partly because the FAA has established some standards for assessing the airfield delays, including standard airplane delay costs in United State's dollars per minute of delay. This is not the case for the other functional components of the Airport. For example, the cost of passenger delays at the security screening checkpoint has not been uniformly established by any agency, though these delays obviously do have a cost. Therefore, while it is effective to use IATA's Level of Service grading system for the terminals and roadways, it cannot be applied to the airfield. In addition to the cost-benefit component, the acceptable amounts of delay may be determined by the airlines operating at the airport. As the threshold for acceptable delay is exceeded, airfield congestion increases, cost increases and airfield Level of Service declines.

Airfield planning at the Airport requires a more thoughtful approach to airfield delay analysis because of the dominance of international air cargo at the Airport. The FAA has established some guidance for annual delays at major United States airports. However, the impact of delay during peak periods at the Airport is critical even if annual delays are not high relative to other major United States airports.

The *Alaska International Airport System (AIAS) Planning Study* (AIAS Planning Study) presented a thoughtful approach to assessing acceptable delays at the Airport. The AIAS Planning Study noted that peak period delays are more critical to the Airport due to the high proportion of time-sensitive cargo operations. The AIAS Planning Study estimated that delays would become untenable to the air carriers when they exceed 30 minutes during peak periods, 10% of the time or more. This acknowledges that some amount of delay is acceptable to airlines, but there is a point at which the efficiency of operation at the Airport is severely interrupted with enough frequency that some action is necessary to address the problem.

The AIAS Planning Study modeled the operation of the Airport at higher demand levels. Results of the AIAS Planning Study airfield modeling showed that delays in excess of 30 minutes during peak periods can be anticipated to occur more than 10% of the time when annual landings and takeoffs exceed roughly 258,000 annual operations (this assumes that the existing airfield would be unchanged). This analysis was accepted by the Master Plan Update team. The results of additional demand capacity modeling completed for the Master Plan Update is described in **Chapter 5,** Alternatives Development and Evaluation and in **Appendix I,** Airfield Simulation. Unless results of additional modeling show a different result, the point at which Levels of Service for airfield operations reach a failing Level of Service is considered to occur at roughly 258,000 annual operations.

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TRIGGER POINTS AND DEVELOPMENT PLAN

Determining the point at which the Airport will need to invest in new facilities is the foundation of the Master Plan Update. The ability of an airport's facilities to efficiently accommodate demand degrades as the airport becomes gradually busier. In other words, when a new facility is constructed (e.g., a new terminal), it will provide a modern facility that efficiently processes passengers. As more and more passengers use the airport terminal, the facility will become less efficient and less comfortable, resulting in higher delays, more congestion, a poorer passenger experience, and a reduced Level of Service.

A trigger point is when the degradation in efficiency is no longer acceptable and a facility should be expanded or replaced. The trigger point can be expressed as a point in time if the increasing demand can be correctly forecast. However, accurately predicting growth is difficult. Trigger points can also be expressed as a demand level. The demand-based trigger point does not fluctuate, while the point in time when the trigger occurs does fluctuate.

Forecasting growth must consider an anticipated timeline. Doing so is elemental to forecasting future demand. However, planners acknowledge that trigger points are ultimately determined by demand, while timing can only be anticipated.

The relationship between Level of Service and trigger points is illustrated in **Figure 1** and described below.

Level of Service C is the recommended Level of Service. This means when a Level of Service D or E is reached, new or expanded facilities are needed or demand must be managed (e.g., reduced to prevent demand exceeding supply).

Expanding facilities, building new facilities, or adopting other means of maintaining an efficient operation often takes years of planning, design, and construction. Anticipating trigger points is essential to proactive facility management to avoid excessive deterioration of Levels of Service. Facility improvements must be planned long before they are implemented so the Airport is prepared to implement the improvement. Failure to plan improvements before they are needed may result in unacceptable Levels of Service materializing for long periods. Very low Levels of Service can be very costly to the airport and its users as delays and inefficiencies manifest. Preparing infrastructure development plans well in advance of the need for the infrastructure improvement will lessen the potential Level of Service failure.

Figure 1
Relationship Between Level of Service and Capital Improvement Programming

IATA = International Air Transport Association, LOS = Level of Service,
PAL = Planning Activity Level

Chapter 6, Implementation Plan, of the Airport Master Plan Update considers trigger points and development periods discussed in this document. A demand-driven, phased approach to airport development will enable the efficient management of the Airport. The following elements will be included in the Implementation Plan:

1. Trigger points
2. Lead time estimates and costs
3. Factors that influence the lead time / decisions that need to be made

The Airport Master Plan Update Implementation Plan includes a revised spending plan and defines the Airport's strategy for appropriate and responsible facility development for the ensuing two-decade period and possibly beyond.