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## COST CLASSIFICATION AND ANALYSIS OF CONSUMER DEMAND TO OPTIMIZE AIR TRANSPORTATION AND ENSURE THE ECONOMIC STABILITY OF KAZAKHSTAN AIRLINES IN THE FACE OF PANDEMICS

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<sup>1</sup>Boranbayev S.N., <sup>2</sup>Assanbek G.D.

<sup>1,2</sup>L. N. Gumilyov Eurasian National University,  
Nur-Sultan, Kazakhstan

### ABSTRACT

This article analyzes the costs of aviation companies in the context of the pandemic, including for the airline of the Republic of Kazakhstan. The classification of airline costs is considered. Cost classification and analysis of consumer demand, taking into account the epidemiological situation in different regions, are the basis for optimizing air transportation, reducing costs and ensuring the economic stability of the airline in the face of pandemics.

**Keywords:** aviation, air transportation, airline, information technology, expenses, economic

### 1. INTRODUCTION

The coronavirus pandemic has caused incredible losses in all areas of activity, but airlines have suffered the most. Every day more and more carriers cancel flights. The reason for this phenomenon was not only the legislative acts of various countries that close air traffic, but also the lack of demand. In such a difficult time, residents of the entire planet prefer to stay at home and refuse to travel even within their own state. Airlines around the world are doing their best to get by with minimal expenses during these turbulent times. To the average person, it may seem that everything is simple: no flights, no expenses. However, this is not the case in reality. Let's try to figure out what expenses are carried out by companies at a time when their planes do not fly. The cost or cost of an airline's products is the main indicator for the economic assessment of the feasibility and efficiency of the industry as a whole and of each airline in particular. Planning, accounting and analysis of operating costs is carried out in two main aspects - by economic elements and by cost items. This ensures the completeness and correctness of accounting and planning of production costs. Economic elements are

grouped into costs that are homogeneous in their economic content, which allows you to determine the amount of resources of each type required for production.

### 2. TYPES OF EXPENSES

Agreeing to the IATA classification of working costs, coordinate and backhanded costs are distributed first. Direct costs coordinated taken a toll bunches for each sort of transport. These costs are related to the preparation and coordinate execution of the pertinent flights. Each thing of consumption can be straightforwardly ascribed to a specific flight (airline). Indirect costs are related to the company's inner bolster of the airline's exercises, the arrangement of different organizational issues, as well as the arrangement and development of the advertise specialty. This gather of costs relates to transportation exercises in Common, without being isolated into isolated sorts of administrations. In this manner, the exchange of these costs to the taken a toll of transportation is carried out in extent to the proposed ton-kilometers, seat-kilometers, flight hours, air ship flights, etc. [1].

With the purpose of analytical accounting of indirect costs are grouped in two areas: other production and overhead costs aimed at ensuring transportation activities, i.e. connected with the promotion

-provide services to the market and increase the number of potential customers (i.e., implementation of advertising campaigns, improving the image of the company and the conduct of the sponsorship activities), the organization of own sales, maintenance of representative offices, occupational health of flight crews.

-administrative expenses are directed to the maintenance of the airline's management staff and its divisions, management and coordination issues.

Direct operating costs, in addition to relying on measurement parameters, but this dependence is not directly proportional, since different groups of costs react differently or do not react at all to fluctuations in volumetric indicators. Therefore, the direct costs of the airline, according to the principle of their dependence, are divided into two components:

-direct variable costs include variable cost items that depend on specific flight conditions and are calculated based on the use of actual or predicted information about the type of aircraft, its load, jet fuel consumption, time and flight path characteristics;

-direct fixed costs include expenses related to the maintenance of flight personnel, maintenance and repair of aircraft. These expenses are aimed at ensuring the availability of production assets (depreciation, aircraft leasing) and maintaining them in good working order, as well as paying the time-based part of employees' wages.

The specificity of air transport activities is that in addition to the above classification, the performance of a commercial flight is divided into two distinct functions: the implementation of direct flight of the aircraft and passenger service. In this regard, direct variable expenses are divided into:

-expenses incurred during passenger service include the cost of providing service to passengers both on the ground (pre-flight) and on Board;

-expenses incurred during flight maintenance include the cost of servicing the aircraft before the flight and during the flight. The structure of the cost of air transportation used to calculate the amount of coverage and profit from the flight is shown below [2].

Direct variable flight costs:

1. expenses related to the transportation of passengers (cargo)

- meals for passengers on Board the aircraft (expenses are calculated on the basis of the approved price list of prices for the diet for each class of passengers carried by aircraft type);

- flight deck;

- on-Board service (blankets, pillows, sanitary and hygienic supplies, etc.);

- passenger service at the airport of departure (landing) (fee for using the terminal, fee for screening passengers at the airport along the route on the basis of rates and fees approved by the FAS and ICAO);

- passenger and cargo insurance (the annual payment amounts set by the insurance company for each type of aircraft are evenly distributed over periods and per flight through the volume of ton-kilometers);

- handling of cargo;

- booking expenses (maintenance of booking facilities used by the airline);

- other expenses (expenses for souvenir-printed and advertising products on Board the aircraft, etc.);

2. expenses related to the flight of the aircraft itself:

- aviation fuel;

- take-off and landing fees at the airport EN route;

- technical and commercial services and other aviation services at the airport;

- fees for air navigation services at the airport and on the highway;

- maintenance of pilots and flight attendants on relay races;

- variable (piece-rate) wages of pilots;

- variable (piecework) wages for flight attendants.

3. Direct fixed costs per flight:

- maintenance of flight crew and flight attendants, i.e. their time component of salary;

- expenses for training and retraining of flight personnel and flight attendants (training);

- expenses for capital and current repairs, periodic maintenance of aircraft and AD;

- expenses on lease payments for aircraft and AD (the amount of annual expenses is evenly distributed over the payment periods and divided by flight hours by type of aircraft);

- depreciation;

- insurance expenses for aircraft and aircraft engines (evenly distributed over the periods of insurance payments for the actual (planned) flight hours).

4. Indirect flight costs:

4.1) other operating and overhead costs •

- passenger service costs at the base airport;

- the cost of maintenance of aircraft in the base airport;

- maintenance costs of the airline's representative offices;

- costs associated with the sale of air transportation;

- expenses related to the airline's advertising activities;

- other expenses related to the maintenance of pilots and flight attendants;

- other overhead costs [3-4].

4.2) administrative expenses.

Indirect costs for a flight are calculated through the costs of structural divisions only if the airline fully or partially performs the above functions, namely, provides arrival and departure of its own flights, and serves passengers at the airport. Otherwise, the costs for these items are determined through the approved rates and fees at the airport and are taken into account when calculating the economic efficiency of the airline's operation on the airline in the block of direct variable costs (Fig.1).

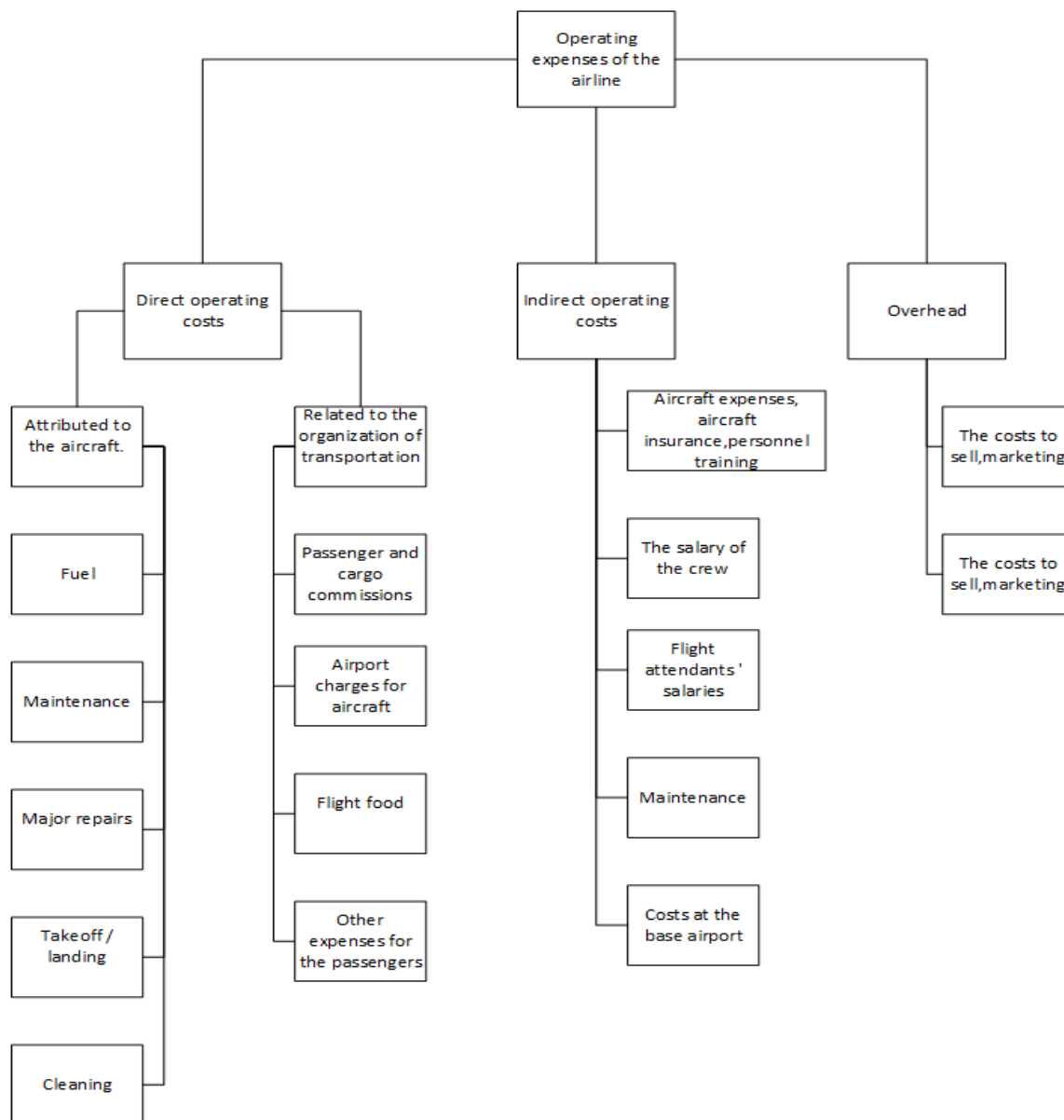


Figure 1 - IATA classification [5]

Labor is the most important operating cost of an airline (32.3%), followed by fuel (17.7%). Labor represents about 75% of all non-fixed costs of airline operations. Layoffs are consequently the first strategy used by the airline industry for rationalization during a downturn. Since about two-thirds of the operating expenses are fixed, the marginal costs of taking an extra passenger are very small. This leads to overbooking and highly discounted seats if several remain unsold in the days before the flight as a money-losing fare is better than no fare at all. To cover its costs, an airline must have on average 65% of its seats occupied (passenger load factor), a share that increased since deregulation. The average passenger load has ranged from 66% to 69% over the years, and in the years leading up to the pandemic exceeded 80% due to better available capacity [6-7].

The cost of aviation fuel for Kazakhstan airlines is 30%, air navigation services and weather support costs reach 11%, airport services for airlines – 2%, passenger services (catering and other services) - 11%, engineering and technical maintenance of aircraft is up

to 10% of the structure of the cost of air transport. The share of operating costs may vary depending on the age of the aircraft. Depreciation and amortization is 3%. Airlines spend up to 10% on staff salaries, and aircraft leasing accounts for up to 8.5% of total expenses. Ticket sales and Commission fees can be up to 5.5%, and crew expenses can be up to 4.5%. General and administrative expenses in Kazakhstan airlines reach 4% [8].

### 3. CONCLUSION

As the analysis above shows, aviation companies are currently incurring high costs. One of these and the main one is fuel. There are also air navigation services and metrological support and airport services that include food and cleaning. At the time of pandemic these costs, the impact on the economy of these companies. According to the Association's forecasts, passenger traffic will decrease by 66 percent in 2020, and demand will decrease by 68 percent in December. Although airlines are taking measures to reduce costs, about 50 percent of them are fixed or semi-fixed. As a result, expenses are not reduced as quickly as income. For 76 percent of airlines, operating expenses were

down 48 percent and revenues were down 73 percent. Increased use of modern information technology and data analysis techniques should help reduce these costs. Cost classification and analysis of consumer demand, taking into account the epidemiological situation in different regions, are the basis for optimizing air transportation, reducing costs and ensuring the economic stability of the airline in the face of pandemics.

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### МОДЕЛЬ ИЕРАРХИЧЕСКОЙ АССОЦИАТИВНОЙ ПАМЯТИ ДЛЯ ИСКУССТВЕННЫХ КОГНИТИВНЫХ АГЕНТОВ ОБЩЕГО НАЗНАЧЕНИЯ

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*Душкин Р.В.*

*Агентство Искусственного Интеллекта  
(Москва, Россия)*

*Семёнов Д.С.*

*ФГБОУ ВО «Московский государственный университет  
технологий и управления имени К. Г. Разумовского (ПКУ)»  
(Москва, Россия)*

### HIERARCHICAL ASSOCIATIVE MEMORY MODEL FOR ARTIFICIAL GENERAL-PURPOSE COGNITIVE AGENTS

*Dushkin R.V.*

*Chief Science and Technology Officer,  
Artificial Intelligence Agency*

#### АННОТАЦИЯ

В настоящей работе представлена модель иерархической ассоциативной памяти, которая может быть использована в качестве основы для построения искусственных когнитивных агентов общего назначения. При помощи этой модели может быть решена одна из важнейших проблем современного машинного обучения и искусственного интеллекта в целом — возможность для когнитивного агента использования «жизненного опыта» для обработки контекста той ситуации, в которой он находился, находится и, возможно, будет находиться. Эта модель применима для искусственных когнитивных агентов, функционирующих как в специально сконструированных виртуальных мирах, так и в объективной реальности. Использование иерархической ассоциативной памяти в качестве долговременной памяти искусственных когнитивных агентов позволит последним эффективно ориентироваться как в общих знаниях, накопленных человечеством, так и в своём жизненным опыте. Новизна представленной работы основывается на авторском подходе к построению контекстно-зависимых искусственных когнитивных агентов с использованием междисциплинарного подхода, в частности, базирующегося на достижениях искусственного интеллекта, когнитологии, нейрофизиологии, психологии и социологии. Актуальность настоящей работы базируется на остром интересе научного сообщества и высоком социальном запросе на создание систем искусственного интеллекта общего уровня. Одним из важных компонентов искусственного интеллектуального агента общего уровня становится ассоциативная иерархическая память, основанная на использовании подхода, сходного с гиперколонками коры человеческого головного мозга. Статья будет интересна всем исследователям, работающим в области построения искусственных когнитивных агентов и смежных областях.