FORECASTING METHODOLOGY
PART 1: DATA REQUIREMENTS AND THE PROCESS OF FORECASTING

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The contribution contains brief information on the aviation forecasting process. The paragraphs discuss the importance of forecasting in aviation activities, define forecasting itself and provide information on the data requirements when forecasting. The last part of the contribution discusses the forecasting time horizon which also affects the selection of the proper forecasting method, which will be discussed in further contribution following on this one.

K e y w o r d s. forecast, forecasting process, forecasting time horizon, the need of forecasting, data requirements

1 INTRODUCTION

Forecast methods used for planning aviation activities should reflect causal relations supporting these activities. Levels of activity in this area are the result of the interaction of supply and demand factors. Air transport demand is a function of demographic factors and economic activities across the state. Supply-side factors influencing the level of activity include costs, competition and regulations.

Forecast methods should be selected and used to measure the fundamental causal relationships, for example the number of passengers can be modelled as a function of variables that can be real personal income and real income (as a measure of tariffs). Number of commercial operations in turn can be described as a function of the passenger number and operational factors (including the average load and the average number of seats in airplanes). Aviation activities are largely dependent on the local population and income level of the population of the catchment area and are affected by the cost of flying and the number of aircraft at the airport. [1]

When planning and designing aviation activities, it is necessary to evaluate the results arising from the use of appropriate forecast methods and relationships. The evaluation of expected results is an essential part of the forecasting process.

2 DEFINITIONS AND THE IMPORTANCE OF FORECASTS

There are several definitions to forecasts and forecasting itself, while the scope of these definitions, approaches and views on them is very wide. Therefore, for the purposes of this contribution, only some of them are given.

According to Holcr, prognosis or forecast is a form of prediction meeting following requirements:

- need to contain a space or time interval of the appearance of the forecasted phenomenon, while this interval must be finite,
- possibility for establishing the likelihood of the appearance of the forecasted phenomenon,
- possibility of the forecasted phenomenon verification,
- clear and accurate formulation of forecasts. [2]

According to Gal, prognosis is a conditional and scientific knowledge based on a statement about an object´s or phenomenon´s future state. Prognosis is considered as a method of transforming past experiences to expected future states. [3]

Based on previous definitions, it can be concluded that the forecasts and forecasting process itself is associated with the planning and

decision-making processes. They are linked to forecasting due to the fact that prognostic conclusions bound the framework for decision making and planning, so the forecast is a set of futures and decision making process represents a selection from this set. The need of forecastingcan be expressed by the relationships between the relevant factors. (Figure 1) [4]
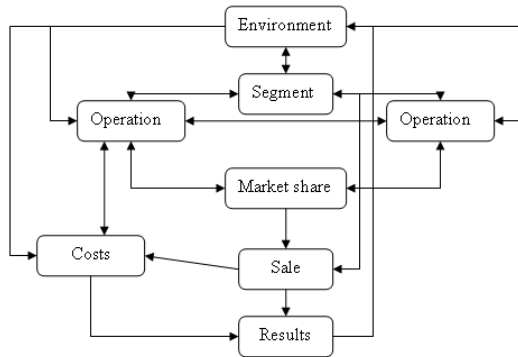

Fig. 1 The need of forecasting in aviation companies

(Source: ARMSTRONG, J.S.: Long-Range Forecasting. New York: Willey New York, 1985)

For a comprehensive look at the company and its management is important that all factors are interrelated, so that there is a linkage between forecasting and other functions of management (rate and weight is determined depending on specific conditions). This fact also highlights the role and function of forecasting and its importance to the company. [4]

3 THE FORECASTING PROCESS

The forecasting process is composed of several activities listed below.

3.1 Identification of aviaton activity parameters and measures to forecast

The parameters that must be forecast are determined by the level and type of expected aviation activity, as well as the nature of planning being done. Generally, the most important activity forecast for airfield planning is the level and type of aviation demand, because it defines reguirements for further development of airlines

and airports. Some aviation planning is conducted on a regional basis and would include both regional demand and the distribution of demand among airports in the region. Passenger enplanements, operational factors, and operations represent the logical progression for developing forecasts of commercial activity. Even though the primary forecast need may be aircraft operations, the forecast for commercial airports should begin by projecting air carrier and commuter enplanements and then apply forecasts of average seats per aircraft and average load factor by category in order to develop air carrier and commuter operations. [1]

3.2 Collection and review of previous forecasts

The next step after determining what elements should be forecast is to collect and review previous forecasts. Review of forecasts can provide important information about the previous economic outlook and air transportation demand projections. In addition, reviews can be used to obtain historic data relevant to the current forecasting effort. Previous projections of aviation activity need to be assessed to determine if they are out of date. [1]

3.3 Data gathering

The data to be gathered will depend on the parameters to be forecast as well as data available from previous forecasts. Consideration has to be given to the number of years of historical data to be collected.

Significant effort should be made to establish accurate baseline data from which to forecast. As noted in FAA AC 150/5070-6A, *"In many cases, more accurate and useful forecasts can be obtained through extra efforts on improving the data base than on more sophisticated forecast methods."* [1]

The process of data gathering is composed of these activites:

- determining data requirements,
- identification of data sources – the most important data sources are:
    - operational data,
    - passenger data,
    - fleet mix,
    - specialized databases maintained by airlines and airports,

- socio – economic data,
- collection and evaluation of historical and forecast data - after identifying the necessary data and data sources, it is necessary to gather and evaluate relevant historical and predictive data for compiling the forecast to detect possible anomalies and errors that can affect the outcome of the aviation forecast, (eg air transport demand, respectively number of passengers per route may be affected by unusual factors - weather, Olympic games, concerts, etc.) The result of evaluation of previous data and forecasts may require adjustment in the timeline or limit the use of some data that seem to be useless. [1]
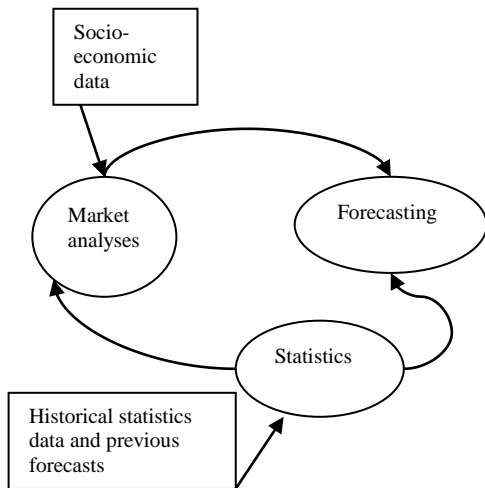

Fig. 2 The processs of forecasting
(Source: ICAO Aviation Data Presentation_NT_29_Sep2010)

The next step in preparing forecasts of further development of air transport is the selection of appropiate forecasting methods.

3.4 Application of the selected forecast method and evaluation of results

After the list of forecast elements has been identified, appropriate forecast methods have been selected, and data has been gathered, the methods need to be applied in order to obtain the forecasts of aviation activity. Evaluation of the results is essential. A useful step in evaluation is

to graphically present the key forecast results against historic trends, to determine whether the forecast appears reasonable. Another method to evaluate the forecast is to compare the history and forecast for the same parameter. The third way to evaluate the forecast is to review the operational factors implicit to the forecast. [1]

3.5 Summary and documentation of results

The next step in the process of forecasting is to summarize and document the results. A planning forecast write-up should summarize each forecast element, explain the forecast methods used, highlight significant assumptions, clearly present the forecast results, and provide a brief evaluation of the forecast. [1]

Tables of historical and forecast data should be included for each forecast element, and graphs of key time series and forecasts are suggested. Explanations should be provided if major changes from historic trends are expected in the future. [1]

4 FORECASTING TIME HORIZONS

According to ICAO, forecasting time horizons can be classified into:
- short – term: up to 1 year,
- medium – term: from 1 to 5 years,
- long – term: more than 5 years. [5]

The length of time used to describe each of these three categories may vary for the particular type of application concerned. (Manual on air traffic forecasting)

Short – term forecasts involve some form of scheduling, which may include for example the seasons of the year, for planning purposes and in these cases the cyclical and seasonal factors are the most important. Such forecasts are prepared every sixth months or on a more frequent basis. [5]

Medium – term forecasts are prepared for planning, scheduling, budgeting and resource requirements purposes. The year – to – year variations in traffic growth are an important element in the planning process, therefore in the medium – term forecast plays a key role the trend factor as well as the cyclical component. [5]

Long – term forecasts are used in connection with strategic planning to determine the level and direction of capital expenditures and to decide on ways in which goals can be accomplished. In long – term situations dominates the trend element which must be considered in the determination of any long – run decisions. Due to the fact that the forecast horizon is long, it is also important to calibrate and revise forecasts at periodic intervals (every two or more years depending on the situation). [5]

One of the useful criteria for matching a specific forecasting situation with the appropriate methodology also depends on the time horizon involved.

5 CONCLUSION

As written in the introduction, forecast methods as well as the process of forecasting used for planning aviation activities should reflect causal relations supporting these activities. Due to this fact, selection of proper data and measures to be forecast and evaluation of previous forecasts are the most important parts of the forecasting process. The selection of appropriate forecast methods mostly depends on the time horizon of the forecast. Different types of forecast methods will be discussed in the contribution following this one.

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