

AIRPORT DESIGN AND OPERATION

Second Edition

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AIRPORT DESIGN AND OPERATION

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INVESTOR IN PEOPLE

Dedication

We have written this book for all the fools who love the beautiful fragrance of the burnt kerosene.

Tony Kazda and Bob Caves

We would like to thank our wives for their understanding during our writing, because the time involved for this work was stolen from our families. Also we thank 'little' Zuzana and Tom for their help with language and the manipulation of computer software. We appreciate all the help from the professionals who have contributed to the text or have given freely their time and expertise to advise and correct our draft texts.

PREFACE

This book is titled 'Airport design and operation'. However, the reader will not find chapters devoted exclusively to airport design or airport operation. Airport design and airport operation are closely related and influence each other. A poor design affects the airport operation and results in increasing costs. On the other hand it is difficult to design the airport infrastructure without sound knowledge of the airport operation. This is emphasized throughout the book.

The book does not offer a set of simple instructions for solutions to particular problems. Every airport is unique and a simple generic solution does not exist. Some of the differences that relate to the political and economic situations in Eastern and Western Europe are reflected here. The book explains principles and relationships important for the design of airport facilities, for airport management and for the safe and efficient control of operations. We hope that we have been able to overcome the traditional view that an airport is only the runway and tarmac. An airport is a complex system of facilities and often the most important enterprise of a region. It is an economic generator and catalyst in its catchment area. However, this book is focused on one narrow part of the airport problem, namely design and operation, while bearing the other aspects in mind.

This second edition includes some important changes in the international regulations covering design and operations. It reflects the greater attention being given to security, safety and the environment, together with changes in the technology and the way the air transport industry operates. New sections on collaborative decision making and low visibility operations strengthen the operational content of this book. Two completely new chapters have been added covering the topical problems of cargo and radio –navigation aids and the chapter on passenger terminals has been enhanced considerably.

Tony Kazda and Bob Caves

Zilina, Slovakia and Loughborough UK, April 2007

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AIR TRANSPORT AND AIRPORTS

Tony Kazda and Bob Caves

1.1 DEVELOPMENT OF AIRPORTS

First, consider the well-known question: ‘Which came first?’ In the context of this book, it does not refer to the notorious problem about a chicken and an egg, but about an airport and an aeroplane. In fact, the answer is clear. The aeroplane came first. When aviation was in its infancy, the aviator first constructed an aeroplane, and then began to search for a suitable ‘airfield’, where he could test the machine. The aerodrome parameters had to be selected on the basis of performance and geometrical characteristics of the aircraft. That trend to accommodate the needs of the aircraft prevailed, with some notable exceptions like New York’s La Guardia airport, until the end of the 1970s. This was despite the increasing requirements for strength of pavements, width and length of runways and other physical characteristics and equipment of aerodromes. The aerodromes always had to adapt to the needs of the aircraft.

The first aeroplanes were light, with a tail wheel, and the engine power was usually low. A mowed meadow with good water drainage was sufficient as an aerodrome for those aeroplanes. The difficulty in controlling the flight path of these aeroplanes required the surrounding airspace to be free of obstacles over a relatively wide area. Since the first aeroplanes were very sensitive to cross wind, the principal requirement was to allow taking off and landing always to be into wind. In the majority of cases, the aerodrome used to be square or circular without the runway being marked

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out. The wind direction indicator that was so necessary in those days still has to be installed at every aerodrome today, though its use now at big international airports is less obvious. Other visual aids that date from that period are the landing direction indicator and the boundary markers. The latter aid determined unambiguously where the field was, and where the aerodrome was, this flight information for the pilot not always being evident in the terrain.

Immediately after World War I in 1919-1920, the first air carriers opened regular air services between Paris and London, Amsterdam and London, Prague and Paris, among others. However, in that period no noticeable changes occurred in the airport equipment, or in the basic operating concept, other than some simple building for the processing of passengers and hangars for working on the aeroplanes.

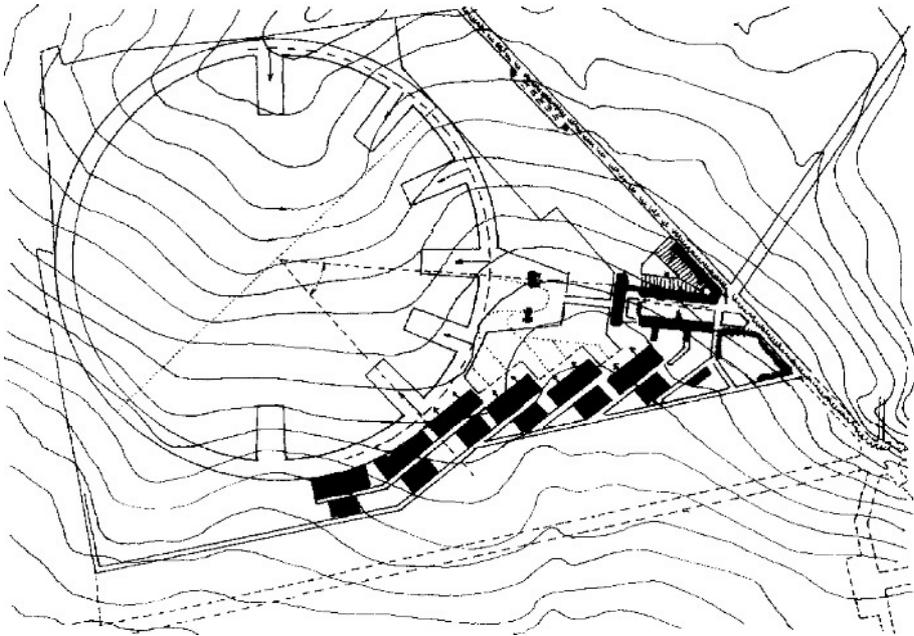


Figure 1-1 *The second prize winner in a competition in 1931 for the design of Praha-Ruzyně airport development; (Source: Czech Airports Authority)*

Even in the 1930s, the new technology of the Douglas DC-2 and DC-3, which were first put into airline service in 1934 and 1936 respectively, was not sufficiently different to require large changes in the physical characteristics of aerodromes, so the development of airports up to that period may be characterised as gradual. The first passengers on scheduled airlines were mostly business people or the rich and famous, but this was a small scale activity, most of the flying being

done by the military. The main change in the airfield's physical characteristics was the runway length. The multiengine aircraft required the length to increase to approximately 1 000 m.

The increasing number of aircraft, and the training of the military pilots required more support facilities at airfields, such as hangars, workshops and barracks.

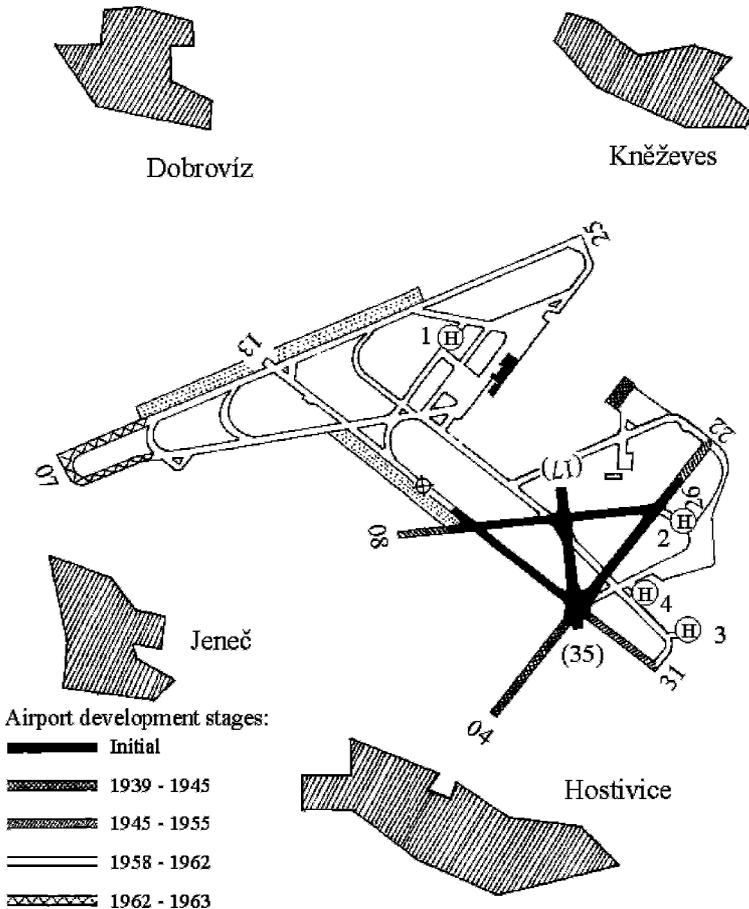


Figure 1-2 *Development of Praha-Ruzyně runway system*
 (Source: J. Čihař, *Letiště a jejich zařízení I.*, Alfa Bratislava 1973)

War does not benefit mankind but, for aviation, it has always meant a rapid step change in development. After World War II, there were unusually favourable conditions for the development of civil aviation and air transport. On one hand there were damaged ground communications, while on the other hand, there were plenty of surplus former military aircraft. There was also the