Patent classifications for aeronautics and aviation, 1880-1918

Peter B. Meyer[1]

[1] *meyer.peter@bls.gov*
U.S. Bureau of Labor Statistics, Office of Productivity and Technology
2 Massachusetts Ave. NE, suite 2180, Washington, DC, 20002 (USA)
Findings and views are those of the author, not the Bureau.

Introduction

We have collected data on over 15,000 patents related to aeronautics and aviation filed around the world in the period from 1880 to 1918. The data are available online at http://econterms.net/aero/ and are described further in Meyer (2021a). They cover most patents in this field that were granted in that period.

The different national patent systems had substantially different technological classification systems. These classifications are designed to organize patent office work and to help search what has been patented, and which also can be useful to historical researchers. The agenda of this poster is to compare how these different classification systems adapted to the growth and change in the important concepts and designs of aeronautics, and the appearance of a commercial activity of aviation. The data gives us some cases of patents which were classified in more than one system.

National patent classification systems

Documentation of the classification systems and the practices of patent offices is spotty, and one cannot always tell how a patent was classified at the time. We have found many eclectic sources however and the research continues. We cite our sources on the website and in a longer draft paper, Meyer (2021b).

There were several families of patent classifications.

French and Belgian systems

Starting in 1853, the French system had about 20 major categories, and in 1904 these were divided into more than 90 smaller categories. The Belgian system was similar, with fewer categories. In both cases, the classification assigned to a patent is clearly shown on the granted patent specification.

German, Austrian, Scandinavian, and Dutch systems

The German patent system launches in 1877-78 with 89 categories, numbered alphabetically by their titles. It becomes more elaborated and detailed over time. Class 77, Sport, was the usual category for aeronautics in the 19th century. Class 77 was then subdivided and the usual category for aeronautics is then 77 group h. Nearly identical systems were adopted in Austria, Denmark, Norway, Finland, and eventually in the Netherlands. In all these class 77 is the main aeronautics category.

US and Canadian systems

The US had a series of patent classification systems, extending back to the 1830s. We have only partial documentation of them, but as in other countries the number of categories increased greatly over time. The long-lasting aeronautics category, number 244, appeared for the first time in 1912. Before this we do not see the categories that were applied at the time on the patent itself, although the post-1912 US patent categories, IPC, and CPC categories were applied after-the-fact by specialists. It is a multiple-classification system in which a patent can be classified in multiple categories at once. The Canadian system was similar to this U.S. one, with somewhat different numbering. Canadian patents retrieved from the CIPO system show each aero patent having a single classification, however.

The UK system

The British system has a storied history and it has been used in economic historical analyses of patents in the first half of the 19th century. It was revised over time. A patent specification does not show which class it was assigned to; the information is only in certain reports, and we have not computerized many of these cases yet.

Other systems

Many countries had a classification systems which were not part of the above families and are not clearly related to one another. We have some information based on our patent sample about the Australian, Belgian, Cuban, Hungarian, Italian, Swedish, Swiss, and other systems. Each of these classified patents by technology, and in most cases there was one main category for aeronautics and aviation. Some countries or colonies did not evidently classify patents by technology.

We discuss and compare these classification systems further in a draft paper, Meyer (2021b).

Foreign filings

A foreign filing is a patent application with the same invention that has already been filed, but in another country. The inventor had an incentive to link the

second patent to the first explicitly because for most of our period there was a treaty obligation for the second country to give legal priority to the invention back to the filing date of the first patent. In most countries Patent rights were strictly within a country at the time, though these practices are more internationalized since then. In the examples before the Paris Convention of 1883, one cannot usually tell just by looking whether a patent was a foreign filing; it makes no reference to its predecessor. After 1883, it would usually be clear that a patent is a foreign filing, but the information on the number of the original patent is not always explicit. In uncertain cases, our working principle is that if the diagrams in two patents are the same, one is a foreign filing of the other, and if the diagrams are not the same, they are distinct originals. There are many cases in which we can link the two patents; other time we cannot.

The difference between first/original patents and supplementary/child patents is important for measuring innovation. Foreign filings may look like new patents in the data but do not represent the same inventive significance. This project finds and explicitly records many such links that were not explicitly identified in the source documents.

Here is an example. In 1906, engineer Boo Henning Wallin filed for a Swedish patent on a design for a flapping wing for a flying machine. Our data on and sources for this patent is collected here: http://econterms.net/aero/Patent_SE-1907-23283. After filing this application but before it was granted, Wallin filed for a patent on the same invention in Britain, Denmark, France, Italy, Austria, Hungary, Switzerland, and perhaps other countries. Each patent office classified patent applications in its own system. In this case we see their choices because the patent specifications are online. There are over a hundred examples of this kind, although they do not usually cover so many countries. We do not cover all countries in this study, because some patent classifications are not clear on the specification or we have too few aero patents from that country.

Measure of distance between classifications

Consider the question of whether two patent systems classify patents in the same way, or in a "different" way, e.g. along different principles. Given a data set in which two discrete classifications have been applied, we can measure the "distance" between the classifications by whether they classify all patents which are together in one category in one system are also together in the same category in the other system. In data science terminology, the measure is the average of the "no-information" rates when predicting from each system to the other. The result is a number in the range of zero to 1, where 1 would mean each system is perfectly informative about how any element in the data is classified in the other.

The algorithm to compute the measure is, first, to construct a category-wise crosswalk from classification A to classification B, mapping each category in A to its most likely category in B based on the dual-coded data set. Then construct a similar crosswalk from B to A. Then compute the accuracy of each of these crosswalks as a proportion of the data set that is correctly mapped by them, and average these accuracy measures. This measure does not yet address what to do with multiple-classification systems or the bias from comparing a system with few categories to one with many.

Findings

So far the measurement suggests that the patent systems treated aeronautics and aviation similarly. We do not have statistical results from all the patents together yet. In general, each country's patent system had one subcategory into which balloons, kites, fixed-wing gliders, and ornithopters (with flapping wings) would be put throughout our study period. There are exceptions, notably when the patent is about a motor, instrument, or material. At a higher level, these was some incoherence in these systems, as the German category was Sport, including aeronautic devices with skis and playthings, whereas in the French system it was a category branching off from marine navigation, as a balloon can be thought of as navigating an aerial sea. The statistical measure proposed would therefore give different answers if we had a larger broader sample. The technique may yet be useful for this purpose, or for industry, occupation, and jurisdictional classification systems.

This project addresses another topic in the patent history literature. In general, the radically new technologies of aviation appear somewhere in the classification trees for each country, and then split to become more elaborated over time. This is a general property of how radical innovation is represented in patent systems. This has been observed before, and this project will provide a detailed example.

Acknowledgments

The author thanks Leo Zimmermann and John Russell Herbert for superb research assistance and advice on the aero patents and classification systems.

References

Meyer, P.B. 2021a. The great aeronautics patent spike of 1910. Working paper. Available from http://econterms.net/aero/User:Meyer

Meyer, P.B. 2021b. Patent classifications for aeronautics and aviation, 1880-1918. Working paper, long version. Available from: http://econterms.net/aero/User:Meyer