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WING, AILE, FLÜGEL

The origin and development of central aeronautical terms in some languages
Second, improved edition

Flying without feathers is not easy
(Quotation by Plautus on the wall of
the Royal Air Force Museum in Hendon)

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ABBREVIATIONS

AE = American English

BS = British Standard

DE = German

ICAO = International Civil Aviation Organization

BE = British English

dt. = German (explanation in German extracts)

frz. = French (explanation in German extracts)

*a term = term in question is reconstructed, it never existed in reality.

LIST OF ILLUSTRATIONS

Curtiss biplane

Deperdussin monoplane

Pusher type of aeroplane

Lilienthal's Flugapparat

Albatros biplane of 1911/12

R-E-P monoplane

Santos-Dumont monoplane

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Major versions of ailerons

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2. TERMS FOR HEAVIER-THAN-AIR AIRCRAFT

2.1. Survey

As mentioned in the chapter 1.6., all terms discussed in the present work, save most of the English terms for aircraft, were gathered by the writer. The emphasis lies on English terms, whereas German and French terms are discussed as comparisons, occasionally accompanied by Finnish and Swedish terms. Yet in the subsequent chapter on terms for aircraft, French and German terms are preponderantly considered, and English terms play a minor role. This reverse approach is based on the fact that English terms for aircraft have already been studied by Stubelius very commendably, whose results can only be augmented in few cases. It would thus be advisable first to read the two works by Stubelius and then to proceed to the subsequent chapter. Unfortunately, this preliminary can only seldom be taken, for the works in question were sold out a long time ago.

Terms for aviation were used long before the first successful powered flight by the Wrights. According to GIBBS-SMITH 1962: 245, the term **aerial navigation** was used for aviation by Cayley as early as 1804, whereas aerostation was designated by him as **balloon navigation**; Cayley did not use the terms **aerostation** and **aviation**.

What Lilienthal called **Luftschiffahrt** in 1893, was translated as **aerial navigation** by Chanute in 1894 (cf. LILIENTHAL 1889–96: 83 and CHANUTE 1894: 276). At the next hierarchical level, the concept [**aerodyne**] was already explained by Chanute in his work CHANUTE 1894: 1, in which he equates the type labelled as **flying machine proper** with the **apparatus heavier than the air**, the former one was then displaced by the latter.

Aeronautics and its two main branches and major representatives are mentioned as early as 1909 in the French *Règlement du quatrième Congrès international d'Aéronautique*, unfortunately without any explanations:

- [...] branches suivantes de l'Aéronautique:
 - 1^o Aérostation;
 - 2^o Aviation;
 - 3^o Législation et divers. (AÉRONAUTIQUE 1909: 11)
- [...] l'**aviation**, cette branche de la **navigation aérienne** [...].
(AÉRONAUTIQUE 1909: 23–24)

3.3. The term **car** and its equivalents

In aerostation, i.e. aeronautics lighter-than-air, the term **car** occurs very frequently in early works. It refers both to the basket of a balloon and to the longish car of airships. As widely known, the term **car** was also used with reference to motor-cars (cf. e.g. OEDS 1972: I 434). The car of balloons predominantly served the same purpose as the fuselage of an aeroplane, i.e. the housing of the crew, the motor(s), the fuel tank and the like. The material, structure and form of a car were very similar to those of an early fuselage. But in one respect there was a difference: the fuselage is a major part of an aeroplane, but the most essential part of an airship is the envelope, whereas the car can be barely noticed in some cases. The term **car** appeared very frequently in the literature on balloons and airships, and thus it may be assumed that this term could also refer to the fuselage. However, this was relatively seldom the case. For instance, this term enjoys relatively wide currency with airships in HARPER - FERGUSON 1911 (e.g. pp. 11 and 122), but even so it was not able to penetrate into use with aeroplanes as well.

In 1799, George Cayley designed a fixed-wing aeroplane with a place for the pilot in a gap between the wings (cf. GIBBS-SMITH 1962: 7 and 246). In his notes published on page 8 (o.c.), the pilot's place is labelled as the **car**. He also used this term for the nacelle of an airship planned by him in 1804, choosing this time the explanatory phrase "**car** or boat" (o.c. p. 13). Another instance of the term **car** dates from the experimental stage of aviation; in CHANUTE 1894: 52, there is a description of the helicopter designed by Bright in 1859. The main body of the helicopter is *ibidem* called a **car**. The aeroplane project of 1842 by Henson had a **car** as well (cf. CHANUTE 1894: 83).

According to CHANUTE 1894: 88, Viscount Carlingford patented an aeroplane in 1856 both in England and in France, in the centre of which was a '**car or chariot**', in the original of 1856 designated as the **aerial chariot**. The apparatus of 1864 patented by D'Esterno was to have a main body named the **central car** in CHANUTE 1894: 96, a designation of the type relatively frequent in several languages later on. A third designation of this group appears in CHANUTE 1894, namely **carriage** used by Phillips in the description of his machine in 1893:

The frame holding the sustainers is set up on a light canoe-shaped **carriage**, composed principally of two bent planks like the two top streaks of a whale boat [...].
(CHANUTE 1894: 171).

4.2.6. The term **pro**

The term **pro** already appeared with aerostats referring to the front part of the envelope. For instance, Cayley used it in 1816 in his description of 'the great [air] resistance upon the **pro**', published in GIBBS-SMITH 1962: 75. The referent could, however, be the front end of aerodynes as well (cf. o.c. p. 248).

This aeronautical application is not quoted in OED, but it had very obviously been influenced by the two nautical ones (in OED the uses no. 1 and 2):

1. The fore-part of a boat or ship; the part immediately about the stem.
2. A point or pointed part projecting in front, like the **pro** of a ship.
(OED 1933: VIII 1530).

It can be inferred on the basis of these definitions that the term **pro** can also occur in two uses in aviation, i.e. the narrower one 'foremost point of a fuselage' and the broader one 'front section of a fuselage'.

The term **pro** being used with flying boats with reference to the front part of the hull is not at all unexpected. This means that the nautical use continued in the aeronautical language; the use is expressly continued, not broadened, because the nautical and the aeronautical applications concur in this case. The description of a Curtiss flying boat mentioned below reveals that the shape of the part designated as a **pro** is triangular. It indicates its function of displacement as well:

Between the decks of the elevator, and also extending a little above the top deck, is a triangular **pro**, which serves the purpose of a cutwater to give sensitiveness to direction. (FLIGHT of July 3, 1909: 390).

The term **pro** 'front section of a fuselage' appears five times in LOUGHEED 1909. There are two instances of it in the descriptions of vertical movements of an aeroplane (e.g. on p. 263) and two with a horizontal movement as well (e.g. on p. 263), the terminological whole being designated as a **machine**. The explanation of the term **pro** as 'a forwardly extended framework, or **pro** [...]' is in figure 206 between pages 416—417. It can be recognized in figure 206 (o.c.) that the referent of the expression **framework** is here a partly open girder fuselage and the term **pro** appears here with reference to the front part of the fuselage. There is, however, no expression **pro** mentioned in LOUGHEED's 1909 glossary.

5.3. The term **aerofoil**

Besides the term **aerocurve** there is another learned term particularly created for supporting surfaces, namely the term **aerofoil** appearing since 1907, according to OEDS 1986: I; it is *ibidem* explained as

a wing, aileron, tailplane or other lifting surface of an aircraft; any surface designed on similar principles.

Lift production makes here an essential characteristic of the concept designated as the **aerofoil**; all vertical surfaces are thus excluded. However, the camber, through which the lift can be increased, is not mentioned. It is quoted in STUBELIUS 1958: 287 that the term **aerofoil** had been introduced in 1907 by F.W. Lanchester, a researcher of aerodynamics, in order to

to denote a supporting member, or organ of sustentation of undefined form. Thus a plane aerofoil is an aeroplane, or pterygoid **aerofoil** is an **aerofoil** of wing-like form.

The term **aerofoil** is mentioned in LOUGHEED's 1909 glossary on page 465 as a proposed substitution for the term **aeroplane** 'wing', to which there is a reference save. **aerofoil**. Thus, the definition of the term **aeroplane** is of relevance with the term **aerofoil** as well; **aeroplane** is *ibidem*

a generic term applied in common use in all classes of sustaining surfaces.

However, in the body of LOUGHEED 1909 the term **aerofoil** does not occur; in other words Lougheed knew this term, but did not find it appropriate. The same is true with FERRIS 1910 as well: the term **aerofoil** does not appear in the body of this source either, but it is still defined in the glossary:

another name for the aeroplane, suggested as more accurate, considering that the surfaces are not true planes. (FERRIS 1910: 453).

The insufficiency of the term **aeroplane** as the expression of a curved surface is *ibidem* expressly mentioned; the aforementioned proposal of the term **aerofoil** to be introduced instead of **aeroplane** is very obviously based on this. This advantage of the term **aerofoil** was early recognized as can be seen from TURNER's 1910 glossary, page 309:

6.2.3. The term **warping** and its equivalents

Majority of special language expressions being nouns and this work predominantly discussing terms for concrete referents, terms for abstract phenomena are only in few cases focused on. One of these exceptions is the term **warping** for a certain system of lateral control. In warping, one trailing edge near the wing tip goes down, whereas the opposite one goes up, this differential function brings about the banking of aeroplanes. In other words, the banking is not done by ailerons, but by twisting the wing.

Otto Lilienthal had developed a simple system of warping described by him in 1896 in a letter to Alois Wolfmüller (cf. GIBBS-SMITH 1985: 78); however, this plan was not put into practice. Warping is basically a phenomenon recognizable with birds; according to LOUGHEED 1909: 215 (footnote), there are several birds able to use warping. It is mentioned in GRAHAME-WHITE - HARPER 1917: 65 that the Wrights imitated the movements of a bird's wing, when they were developing the warping. It was Chanute who introduced the term **warping** in 1903, according to GIBBS-SMITH 1985: 94–95. This term was then adopted by the Wright brothers despite its misleading nature. It is *ibidem* additionally quoted that the brothers had spoken of a **twisting** or **helical twisting** until 1903; the AE term **warping** was then translated into the French noun **gauchissement** based on the verb **gauchir**. As regards the role of Chanute, the verb **warp** occurs in CHANUTE 1894: 196 in the following description of birds' flight: '[...] the soaring birds [...] perform their manoeuvres with peculiarly curved and **warped** surfaces [...]'. Thus, the term **warp** was familiar to Chanute as early as around 1890 at the latest. Although the term **warping** can in BE be traced back to the choice of terms by Chanute and the Wrights, the brothers also used other terms for this means of lateral control, namely 'a peculiar **torsion** of the main surfaces' and 'our system of **twisting** the surfaces' chosen by Wilbur Wright in 1909 (cf. AERO MANUAL 1909: 8–9). The French aeronautical term **gauchissement** had in turn indirect influence on the BE term. Gibbs-Smith admits on page 95 (o.c.) that he has also continued to use the misleading term **warping**, because of its having been fully rooted as an aeronautical expression. The term **wing warping** is explained in WRAGG 1973: 12 by the expression **flexing**. The term **twisting**, previously used by the Wrights, also occurs remarkably later; on page 281 (o.c.), there is the statement of the wing warping requiring a **twisting** of the wing.