6. *Some Experiments on the Feathered Wing.*

(Preliminary Report.)

By Koroku WADA.

(Comm. by T. TAMARU, M.I.A., Jan. 12, 1928.)

Thin flexible narrow strips of paper were attached, with one of their longer edges pasted, to the upper surface of aeroplane wing models. The strip of paper will hereafter be called *the feather* and a wing thus furnished *the feathered wing*.

When the flow of air along the upper surface is from the leading to the trailing edge, the feathers offer no hindrance to the flow and the profile of the wing does not differ much from the original one without the feathers. But when the flow occurs in the reverse sense, the feathers act to check the motion of the air.

Experiments were made on the four sorts of model wings, namely :

Low cambered thin wing	(R.A.F. 15)
Medium cambered thin wing	(Hanriot training plane)
Medium thick wing	(Göttingen 389)
Thick wing	(Göttingen 387)

All the model wings, which were made of wood, have a rectangular plan form and the following dimensions :

Span 72 cm. Breadth 12 cm. Aspect Ratio 6.

The feathers were made of *Minogami* (Japanese paper about 0.037 mm. thick) and were made to extend over the whole span of the wing. The breadth of each feather is 9 mm. except the first and the second ones from the leading edge which are from 13 to 18 mm. wide. The feathers are attached to the upper surface of the wing with 6 mm. interspaces.

Measurements were also made with reduced numbers of feathers, in which they were taken off in order from the trailing edge side. (Nos. 5 and 6 of the figure below)

Experiments were also made with breadths of feathers so arranged that the contour of their free edges gives the profile of an efficient thick wing section, when each feather makes an angle of 30 degrees with the chord of the wing. (No. 3. of the figure)

A wing, whose feathers have the same arrangement with the one above described but are made of thicker paper (about 0.071 mm. thick) was also examined. (No. 10 of the figure)

The result of each measurement is given by expressing the lift and drag coefficients (c_a and c_w) as functions of the angle of incidence α . The lift and the drag coefficients are defined as follows:

$$A = c_a q F, \quad W = c_w q F,$$

where A is the total lift, W the total drag, F the area of the wing and q the dynamic pressure of the wind.

The general results are given in the annexed table and those obtained for R.A.F. 15 are shown in the figure.

Table.

	c_a maximum (non- feathered)	c_a maximum (feathered)	Increase of maximum c_a in percentage	Stalling angle. (non- feathered)	Stalling angle (feathered)
Thick wing (Göttingen 387)	1.38	1.40	1.4	18°	28°
Medium cambered thin wing (Hanriot)	1.27	1.42	11.6	18°	25°
Medium thick wing (Göttingen 389)	1.19	1.34	12.5	16°	24°
Low cambered thin wing (R. A. F. 15) (Thin feather)	0.98	1.17	19.4	15°	22°
R.A.F. 15 (Thin feathers with variable breadths)	„	1.20	22.5	„	24°
R.A.F. 15 (Thick feathers with variable breadths)	„	1.34	36.8	„	26°