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Part 19 - Control Surfaces
Part 20 - Slots and Flaps

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ABBREVIATIONS


C.A.H.I. - Central aero-hydroodynamical institute, Moscow.

C.I.N.A. - Commission internationale de navigation aérienne, Genève.


D.V.L. - Deutsche versuchsanstalt für luftfahrt, Berlin.


R.A.F. - Royal air force (Great Britain)

R.A.S. - Royal aeronautical society (Great Britain)

Rend. Instituto sper. aer. - Rendiconto dell'Istituto, sperimentale aeronautico, Roma.

S.A.E. - Society of automotive engineers, New York.


V.D.I. - Verein deutscher ingenieure, Berlin.


Z.F.M. - Zeitschrift für flugtechnik und motorluftschifffahrt, München.
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Improvement of aileron effectiveness by the prevention of air leakage through the hinge gap as determined in flight, by Hartley A. Soulé and W. Gracey. Washington, 1938. 7 p. diagrs. (N.A.C.A. Technical notes no. 632)


Experimental research on the effectiveness of ailerons and elevators, by T. Ogawa and K. Ito. Tokyo, Tokyo imperial university, 1937. 72 p. illus., tables. (Aeronautical research institute report no. 151)


Flight investigation of the lateral control characteristics of short wide ailerons and various spoilers with different amounts of wing dihedral, by Fred E. Weick, Hartley A. Soule and Melvin N. Gough. Washington, U.S. Govt. print. off., 1935. 16 p. diagrs., illus., tables. (N.A.C.A. Report no. 494)


Wind tunnel research comparing lateral control devices, particularly at high angles of attack. Auxiliary airfoils used as external ailerons, by Fred E. Weick and Richard W. Noyes. Washington, U.S. Govt. print. off., 1935. 32 p. diagrs., illus., tables. (N.A.C.A. Report no. 516)


Wind tunnel research comparing lateral control devices, particularly at high angles of attack, by Fred E. Weick and Joseph A. Shortal. Washington, 1933. 13 p. diagrs., tables. (N.A.C.A. Technical notes no. 445)

Wind tunnel research comparing lateral control devices, particularly at high angles of attack. Handley Page tip and full-span slots with ailerons and spoilers, by Fred E. Weick and Carl J. Wenzinger. Washington, 1933. 20 p. diagrs., tables. (N.A.C.A. Technical notes no. 443)

Wind tunnel research comparing lateral control devices, particularly at high angles of attack. Tapered wings with ordinary ailerons, by Fred E. Weick and Carl J. Wenzinger. Washington, 1933. 14 p. diagrs., tables. (N.A.C.A. Technical notes no. 449)

Wind tunnel research comparing lateral control devices, particularly at high angles of attack. Various control devices on a wing with a fixed auxiliary airfoil, by Fred E. Weick and Richard W. Noyes. Washington, 1933. 16 p. diagrs., tables. (N.A.C.A. Technical notes no. 451)

Wind tunnel research comparing lateral control devices, particularly at high angles of attack. Various floating tip ailerons on both rectangular and tapered wings, by Fred E. Weick and Thomas A. Harris. Washington, 1933. diagrs., tables. (N.A.C.A. Technical notes no. 456)

A Design formula for ailerons, by Taitiro Ogawa. Tokyo, Tokyo imperial university, 1932. 15 p. diagrs., illus., tables. (Aeronautical research institute report no. 88)


Wind-tunnel research comparing lateral control devices, particularly at high angles of attack. Part III. Ordinary ailerons rigged up 10° when neutral, by Fred E. Weick and Carl J. Wenzinger. Washington, U.S. Govt. print. off., 1932. 12 p. diagrs., illus., tables. (N.A.C.A. Report no. 423)


Control of airplanes at low speeds by means of conventional ailerons. U.S. Department of commerce. Washington, U.S. Govt. print. off., 1931. 24 p. diagrs., illus., tables. (Aeronautics bulletin no. 15)


Effet d'un aileron à charnière sur les caractéristiques aérodynamiques d'un plan, par Milton J. Thompson. Travaux de l'Institut aérodynamique de Varsovie, 1930. 70 p. diagrs., illus., tables.


Determination of stability from flight test stick force data. Washington, U.S. Govt. print. off., 1929. 10 p. diagrs., illus. (Air corps information circular no. 625)


Wind tunnel tests on a model of a monoplane wing with floating ailerons, by Montgomery Knight and Millard J. Bamber. Washington, 1929. 13 p. diagrs., illus., tables. (N.A.C.A. Technical notes no. 316)


Full scale experiments with a Bristol fighter fitted with slots and flaps and slot and aileron control, by K. V. Wright. London, H.M. Stat. off., 1928. 6 p. diagrs., illus., tables. (A.R.C. R. & M. no. 1180)

The Longitudinal control of an aeroplane beyond the stall, by H.M. Garner and K.V. Wright. London, H.M. Stat. off., 1928. 8 p. tables. (A.R.C. R. & M. no. 1183) (investigation of an aeroplane in which elevators are controlled in different ways)


Researches on ailerons and especially on the test loads to which they should be subjected, by J. Sabatier. Washington, 1927. 25 p. illus. (N.A.C.A. Technical memorandums no. 598) (From La Technique aéronautique, Paris, Nov. 15-Dec. 15, 1926)


Wind tunnel tests on DH-4B model fitted with various fins and rudders. Washington, U.S. Govt. print. off., 1927. 11 p. illus. (Air corps information circular no. 603)


Wind tunnel test for elevator hinge moment coefficients on the horizontal tail surface no. 5, with balanced elevator, by P. M. Lyons. Washington, U.S. Govt. print. off., 1926. 3 p. diagrs., illus. (Air corps information circular no. 567)


Wind tunnel test of aileron characteristics as affected by design and by airfoil thickness. Washington, U.S. Govt. print. off., 1925. diagrs., tables. (U.S. Air corps information circular no. 535)


The Induction factor used for computing the rolling moment due to the ailerons, by Max Michael Munk. Washington, 1924. 5 p. illus. (N.A.C.A. Technical notes no. 187)


On the distribution of lift along the span of an airfoil with displaced ailerons, by Max Michael Munk. Washington, 1924. 8 p. diagrs. (N.A.C.A. Technical notes no. 195)

Rolling moment due to ailerons, by Max Michael Munk. Washington, 1924. 5 p. diagrs. (N.A.C.A. Technical notes no. 187)


Effect of airfoil thickness and plan form on lateral control, by H.I. Hoot. Washington, U.S. Govt. print. off., 1923. 11 p. diagrs., illus., tables. (N.A.C.A. Report no. 163) (test to determine the effectiveness of ailerons were made on six airfoils)


The Effect on rudder control of slip stream body and ground interference, by Henry I. Hoot and David L. Bacon. Washington, 1922. 7 p. diagrs. (N.A.C.A. Technical notes no. 110)


Some suggestions for improving airplane control at low speeds, by A. Fage. London, H.M. Stat. off., 1922. 6 p. diagrs., tables. (A.R.C. R. & M. no. 855) (devices to be used in conjunction with ailerons)


Balance portion for the rudder of the F.3 flying boat, by J. H. Parkin, H.C. Crane and S. L. Galbraith. Toronto, Toronto university, 1921. diags., illus. (School of engineering research bulletin no. 2, p. 111-14)


Rudder balance for F.3 flying boat, by J. H. Parkin, E. V. Ahara and J.S.E. MacAllister. Toronto, Toronto university, 1921. diags., illus. (School of engineering research bulletin 2, p. 118-24)


Équilibre automatique de l'aéroplane, par Joseph Rodet. Lyon, A. Rey, 1914. 30 p. illus.


Section II

PERIODICAL ARTICLES, BOOKS, PAMPHLETS, ETC.,
ON CONTROL SURFACES CLASSIFIED BY SUBJECT

AILERONS


Improvement of aileron effectiveness by the prevention of air leakage through the hinge gap as determined in flight, by Hartley A. Soulé and W. Gracey. Washington, 1938. (N.A.C.A. Technical notes no. 632)


Experimental research on the effectiveness of ailerons and elevators, by T. Ogawa and K. Ito. Tokyo, Tokyo imperial university, 1937. 72 p. illus., tables. (Aeronautical research institute report no. 151)


Wind tunnel research comparing lateral control devices, particularly at high angles of attack. Part VIII - Auxiliary airfoils used as external ailerons, by Fred E. Weick and Richard W. Noyes. Washington, U.S. Govt. print. off., 1935. 32 p. diagrs., illus., tables. (N.A.C.A. Report no. 510)


CONTROL SURFACES - AILERONS


Servo control system. Aviation engineering, New York, Apr. 1933, v. 8, no. 4, p. 20. diagrs.


Wind tunnel research comparing lateral control devices, particularly at high angles of attack. Part. VII - Handley Page tip and full span slots with ailerons and spoilers, by Fred E. Weick and Carl J. Wenzinger. Washington, 1933. 20 p. diagrs., tables. (N.A.C.A. Technical notes no. 443)

Wind tunnel research comparing lateral control devices, particularly at high angles of attack. Part VIII - Straight and skewed ailerons on wings with rounded tips, by Fred E. Weick and Joseph A. Shortal. Washington, 1933. 13 p. diagrs., tables. (N.A.C.A. Technical notes no. 445)

Wind tunnel research comparing lateral control devices, particularly at high angles of attack. Part X - Various control devices on a wing with a fixed auxiliary airfoil, by Fred E. Weick and Richard W. Noyes. Washington, 1933. 15 p. diagrs., tables. (N.A.C.A. Technical notes no. 451)

Wind tunnel research comparing lateral control devices, particularly at high angles of attack. Part XI - Various floating tip ailerons on both rectangular and tapered wings, by Fred E. Weick and Thomas A. Harris. Washington, 1933. diagrs., tables. (N.A.C.A. Technical notes no. 458)


A Design formula for ailerons, by Taitiro Ogawa. Tokyo, Tokyo imperial university, 1932. 15 p. diagrs., illus., tables. (Aeronautical research institute report no. 88) (Also Journal of the Society of naval architects of Japan, Tokyo, Oct. 1932, v. 50, p. 153-64)


Why they spin the way they do, by P. E. Hovgard. Aviation, New York, Apr. 12, 1930, v. 28, no. 15, p. 758-62. diagrs., illus. (Frise type ailerons)


The Tanager and some of its history, by Robert R. Osborn. Aviation, New York, Feb. 8, 1930, v. 28, no. 6, p. 242-48. diagrs., illus. (Floating ailerons described in detail)


Effet d'un aileron à charnière sur les caractéristiques aérodynamiques d'un plan, par Milton J. Thompson. Travaux de l'Institut aérodynamique de Varsovie, 1930. 70 p. diagrs., illus., tables.

Full scale determination of the motions at the stall of a Bristol fighter aeroplane with slot and aileron control on both planes, by K. W. Clark. London, H.M. Stat. off., 1930. 7 p. diagrs., tables. (A.R.C. R. & M. no. 1341)


Theoretical investigation of the effect of the ailerons on the wing of an airplane, by C. Wieselsberger. Washington, 1929. 25 p. diagrs. (N.A.C.A. Technical memorandums no. 510) (From Tokyo imperial university aeronautical research institute report no. 30)


Wind tunnel tests on a model of a monoplane wing with floating ailerons, by Montgomery Knight and Millard J. Bamber. Washington, 1929. 13 p. diagrs., illus., tables. (N.A.C.A. Technical notes no. 316)


Full scale experiments with a Bristol fighter fitted with slots and flaps and slot and aileron control, by K. V. Wright. London, H. M. Stat. off., 1928. 6 p. diagrs., illus., tables. (A.R.C. R. & M. no. 1168)


Dispositivi per il controllo laterale e l'aumento della portanza nell'ala dell'aeroplano e dell'uccello, di R. Giacomelli. L'Aerotecnica, Pisa, Apr., June, 1927, v. 7, no. 4, p. 167-204, 351-69. illus.


Researches on ailerons and especially on the test loads to which they should be subjected, by J. Sabatier. Washington, 1927. 25 p. illus. (N.A.C.A. Technical memorandums no. 398) (From La Technique aéronautique, Paris, Nov. 15-Dec. 15, 1926)


CONTROL SURFACES - AILERONS


The English stalling demonstration. Aviation, New York, May 25, 1925, v. 18, no. 21, p. 577; illus. (aileron slots and slotted flaps)


Wind tunnel test of aileron characteristics as affected by design and by airfoil thickness. Washington, U.S. Govt. print. off., 1925. diagrs., tables. (U.S. Air corps information circular no. 535)


The Induction factor used for computing the rolling moment due to the ailerons, by Max Michael Munk. Washington, 1924. 5 p. illus. (N.A.C.A. Technical notes no. 187)

On the distribution of lift along the span of an airfoil with displaced ailerons, by Max Michael Munk. Washington, 1924. 8 p. diagrs. (N.A.C.A. Technical notes no. 195)


CONTROL SURFACES - AILERONS


New fliers seen at the Paris show. Aero, St. Louis, Nov. 12, 1910, v. 1, no. 6, p. 9-10. diagrs., illus. (aileron design)


BALANCING

A Flight investigation of the reduction of aileron operating force by means of fixed tabs and differential linkage, with notes on linkage design, by Hartley A. Soulé and James A. Hootman. Washington, 1938. 12 p. diagrs., tables. (N.A.C.A. Technical notes no. 653)


CONTROL SURFACES - BALANCING

Pushing 'round a corner; Simmons-Brewster control, by Alexander Klemin. Scientific american, New York, May 1934, v. 150, no. 5, p. 259-60. (auxiliary balancing surfaces on the rudder, elevator or aileron)

Balanced controls. Flight, London, Jan. 26, 1933, v. 25, no. 1257, p. 77-78. diagrs., illus. (new aileron balance may be applicable to elevators and rudders)


Wind tunnel test for elevator hinge moment coefficients on the horizontal tail surface no. 5 with balanced elevator, by P. M. Lyons. Washington, U.S. Govt. print. off., 1926. 3 p. diagrs., illus. (Air corps information circular no. 567)


Balance portion for the rudder of the F. 3 flying boat, by J. H. Parkin, H. C. Crane and S. L. Galbraith. Toronto, Toronto university, 1921. diagrs., illus. (School of engineering research bulletin no. 2, p. 111-14)


Rudder balance for F. 3 flying boat, by J. H. Parkin, E. V. Anara and J. S. E. MacAllister. Toronto, Toronto university, 1921. diagrs., illus. (School of engineering research bulletin no. 2, p. 118-24)


CONTROL SURFACES - BALANCING


CONTROL SYSTEMS

Hydraulic controls; a complete system for operating both main and auxiliary services. Aircraft engineering, London, June 1938, v. 10, no. 112, p. 189-91. diagrs., illus.


CONTROL SYSTEMS


Improving the control system, by Dwight Huntington. Aviation engineering, New York, Mar. 1932, v. 6, no. 3, p. 15-17. illus.
CONTROL SYSTEMS


Single unit control, by Mario de Bernardi. Aero digest, New York, Oct. 1931, v. 19, no. 4, p. 72, 74. illus.


Determination of the maximum control forces and attainable quickness in the operation of airplane control, by Heinrich Hertel. Washington, 1930. 31 p. diags. (N.A.C.A. Technical memorandums no. 583) (From Z.F.M., München, Jan. 28, 1930, v. 21, no. 2, p. 36-45)


A New index to control cable endurance, by T. Ogawa and S. Suzuki. Tokyo, Tokyo imperial university, 1929. 15 p. diags., illus. (Aeronautical research institute report no. 49)


The Blondin control. Aeronautics, New York, Dec. 1912, Apr. 30, 1914, v. 11, 14, no. 6, 8, p. 172; 118. illus.


The New Wright aeroplane control. Scientific american, New York, Feb. 28, 1914, v. 110, no. 9, p. 188.


CONTROL SYSTEMS


Details of the new Curtiss rear control explained. Aero, St. Louis, Aug. 5, 1911, v. 2, no. 18, p. 391. illus.


Differentialsteuerung für drachenflieger, von Heinz Elpel.

Sketch illustrating the control on the Blackburn monoplane.


The Pfitzner monoplane. Aeronautics, New York, Mar. 1910, v. 6, no. 3, p. 82-85. diagrs. (Pfitzner system of control)

Construction aids. Aeronautics, New York, Jan. 1910, v. 6, no. 1, p. 8-9. diagrs. (descriptions and diagrams of control surfaces on various aeroplanes)


Experimental research on the effectiveness of ailerons and elevators, by T. Ogawa and K. Ito. Tokyo, Tokyo imperial university, 1937. 72 p. illus., tables. (Aeronautical research institute report no. 151)


Über die längenschwingungen eines flugzeugs mit freiem höhensteuer, von Hermann Blenk. Z.F.M., Berlin, July 14, 1933, v. 24, no. 15, p. 365-70. diagrs.


CONTROL SURFACES - ELEVATOR

Uber die längsstabilität eines flugzeuges mit losgelassenem höhensteuer, von Hermann Blenk. Z.F.M., München, Apr. 28, 1930, v. 21, no. 8, p. 189-96. diagrs.


Messung der höhensteuerkräfte und der längsstabilität eines flugzeuges vom muster Junkers F 13 GE, von Walter Hübner. (In Jahrbuch 1930 der D.V.L., München und Berlin, p. 638-44. diagrs., illus.)

Spinning characteristics of airplanes, by M. Watter. S.A.E. journal, New York, May, Aug. 1929, v. 24-25, no. 5; 2, p. 474-78; 527. diagrs., illus. (experiment with ailerons, rudders and elevators; suggested design for control surfaces)


The Longitudinal control of an aeroplane beyond the stall, by H. M. Garner and K. V. Wright. London, H. M. Stat. off., 1928. 6 p. tables. (A.R.C. R. & M. no. 1195) (investigation of an aeroplane in which elevators are controlled in different ways)

Study of horizontal tail surfaces of Consolidated XPT-3 (NY-1). Washington, U.S. Govt. print. off., 1928. 8 p. illus. (Air corps information circular no. 615)


Wind tunnel test for elevator hinge moment coefficients on the horizontal tail surface no. 5, with balanced elevator, by P. M. Lyons. Washington, U.S. Govt. print. off., 1926. 3 p. diagrs., illus. (Air corps information circular no. 567)


CONTROL SURFACES - ELEVATOR


Tests on a model of the dreadnought postal type monoplane, by E. Ower. London, H. M. Stat. off., 1921. 6 p. diagrs., tables. (A.F.C. R. & M. no. 780) (lift drag and pitching moments about C. G. were measured for various tail and elevator settings)


Correcting the longitudinal balance of JN-6H airplanes. Aviation, New York, June 1, 1920, v. 8, p. 357-58. illus.


Methods of correcting the longitudinal balance of JN-6H airplane. Washington, U.S. Govt. print. off., 1920. tables. (U.S. Air service information circular no. 27)


CONTROL SURFACES - ELEVATOR

Full-scale experiment on the moment about the hinge of the air forces on an elevator. Experiment on R.A.F. whirling arm. London, H. M. Stat. off., 1916. 5 p. diagrs., illus., tables. (A.R.C. R. & M. no. 284)


Wright improves elevator control. Aero and hydro, Chicago, Apr. 25, 1914, v. 8, no. 4, p. 40.


Experiments in the wind channel to determine forces and moments on parts of aeroplanes. London, H. M. Stat. off., 1913. 18 p. diags., tables. (A.R.C. R. & M. no. 74) (moment on elevator measured for purpose of design of pilots control, tests on model body with and without rudder and tail plane with elevator)


Nouveaux plans à l'échelle. L'Aviation industrielle et commerciale, Casteau, June 1912, v. 1, no. 6, p. 48.

CONTROL SURFACES - ELEVATOR


FIN


Wind tunnel tests of DH-4B model fitted with various fins and rudders. Washington, U.S. Govt. print. off., 1927. 11 p. illus. (Air corps information circular no. 603)


RUDDER


Two engines or one. Aeroplane, London, Aug. 16, 1933, v. 45, no. 7, p. 277-78, 80, 82, 84. (rudder control)


Servo rudder on the Boeing 80A. Aviation, New York, Sep. 1932, v. 31, no. 9, p. 396.


CONTROL SURFACES - RUDDER

Etude sur les gouvernails compensés, par Léon Kirste.  

Full scale experiments with Servo rudders, by J. E. Serby.  
(A.R.C. R. & M. no. 1514)

Further experiments on a model Fairey III F seaplane, by  
1932. 6 p. diags.  (A.R.C. R. & M. no. 1564)  
(determination of fin and rudder rolling moment and  
control due to rudder setting)

Querruderform und querruderwirkung, von Gotthold Mathias.  
Jahrbuch des D.V.L., München und Berlin, 1932,  
p. 32-34. diags.

Westland rudder bias gear.  Flight, London, Dec. 4, 1931,  
v. 23, no. 49, p. 1188. diags., illus.

A Relief gear for the pilot.  A device for reducing the load  
on the controls by permanently off-setting the rudder.  
Aircraft engineering, London, Dec. 1931, v. 3, no. 34,  
p. 313-14. diags.

De Arens overbreenging.  Het Vliegveld, Amsterdam, Nov. 1930,  

Structural strength requirements for civil aircraft, in  
Great Britain and the U.S.A., by H. A. Mettam.  Aeroplane,  

no. 31, p. 950.  (Also Aeroplane, London, Aug. 13,  
1930, v. 39, no. 7, p. 417-16)

Die Lastverteilung über höhen- und seitenteilwerk eines  
F 6 C-4 jagdflugzeuges bei aussergewöhnlichen flug-  
bewegungen, von Richard V. Rhode.  Z.F.M., München,  

Amendments to air commerce regulations.  Aero digest,  

Directional stability of high speed aircraft, by W. G.  
diags., tables.  (A.R.C. R. & M. no. 1340)  (tests  
by several pilots using various conditions of rudder  
cable rigging, and rudder hinge friction)

Maximum force on rudders, by F. B. Bradfield.  London,  
H. M. Stat. off., 1930. 4 p. diags., illus.  
(A.R.C. R. & M. no. 1329)


Wind tunnel tests on DH-4B model fitted with various fins and rudders. Washington, U.S. Govt. print. off., 1927. 11 p. illus. (Air corps information circular no. 603)


The Effect on rudder control of slip stream body and ground interference, by Henry I. Hoot and David L. Bacon. Washington, 1922. 7 p. diagrs. (N.A.C.A. Technical notes no. 110)


Experiments in the wind channel to determine forces and moments on parts of aeroplanes. London, H. M. Stat. off., 1913. 19 p. diagrs., tables. (A. R.C. R. & M. no. 74) (moment on elevator measured for purpose of design of pilots control, tests on model body with and without rudder and tail plane with elevator)


CONTROL SURFACES - STABILIZER

Curtiss-Wright model 20 transport, by T. P. Wright. Aviation, New York, Aug. 1938, v. 37, no. 8, p. 28-29, 31, 42, 46, 78. diagrs., illus. (complete details of stabilizer and control)


Efficiency of tail plane behind wing of R.A.F. 34 section,  
by D. M. Hirst and A. S. Hartshorn. London, H. M.  
Stat. off., 1932. 4 p. diagrs., illus., tables.  
(A.R.C. R. & M. no. 1478)

Effectiveness and balance of horizontal control surfaces,  
by M. Pillard. Aviation engineering, New York,  

Structural strength requirements for civil aircraft, in  
Great Britain and the U.S.A., by H. A. Mettam. Aeroplane,  
London, Oct. 29, 1930, v. 39, no. 18, p. 973-74, 976,  
978, 980. diagrs.

Determination of the slope of the lift curve of horizontal  
tail surfaces, by Benjamin F. Ruffner Jr. Aviation  
diagrs. (effect of changing stabilizer angle)

The Effect of the various types of lateral stabilizers on  
the take off of a flying boat, by L. P. Coombes and  
diagrs., tables. (A.R.C. R. & M. no. 1411)

The Tail plane area to give longitudinal stability, by  
v. 21, no. 26, 30, p. 522f-522h; 778a-778c.

Two practical methods for the calculation of the horizontal  
tail area necessary for a statically stable airplane,  
by Walter S. Dienl. Washington, U.S. Govt. print. off.,  
1929. 19 p. (N.A.C.A. Report no. 293)

The Temple monoplane, by Frederick Knack. Aviation, New York,  
Feb. 27, 1928, v. 24, no. 9, p. 512-13. diagrs.,  
illus. (stabilizer adjustable in flight)

Study of horizontal tail surfaces of Consolidated XPT-3  
8 p. illus. (U.S. Air corps information circular  
no. 615)

Note on the longitudinal stability of aeroplanes with  
special reference to tailplane design, by W. Laurence  
v. 29, no. 179, p. 586-89.

Static test of the Curtiss PW-8 single seater pursuit plane,  
by E. R. Weaver. Washington, U.S. Govt. print. off.,  
1924. 24 p. diagrs., illus. (U.S. Air corps  
information circular no. 492)

Damping coefficients due to tail surfaces in aircraft, by  
diagrs. (N.A.C.A. Report no. 136)


GENERAL


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