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Mineral Deposits of Strategic Importance in the Countries Bordering on Greater Germany. (P. Ruprecht, W.T.M., Vol. 42, No. 7, July, 1938, pp. 296-300.) (59/1 Germany.)

The following table gives the principal conclusions:—

Mineral.	Per cent. of total requirements met by home production.	Possible external source of supply.
Coal	100 per cent.	——
Iron ores	40 ,, ,,	France
Oil	15 ,, ,,	Roumania, Russia
Copper	12 ,, ,,	Jugoslavia
Zinc	100 ,, ,,	——
Lead	31 ,, ,,	Jugoslavia
Aluminium	?	Jugoslavia, Hungary
Manganese	16 ,, ,,	Czechoslovakia?
Mercury	20 ,, ,,	——

Other important mineral, such as nickel, chromium, tungsten, molybdenum, antimony and tin are not produced in measurable quantities either in Germany or in the territories within reach of its boundaries.

Application of Statistical Analysis to Ballistic Problems. (L. Filloux, Revue d'Artillerie, Vol. 120, Dec., 1937, pp. 429-457.) (59/2 France.)

The proper evaluation of gunnery (ballistic) tests requires the knowledge of a certain number of factors pertaining respectively to the gun, the shell and the trajectory.

The author shows that a minimum of 26 factors are necessary to fully define the conditions underlying the test (gun 6, shell 10, trajectory 10). By a proper system of nomenclature, each factor can be expressed by a number which may range from 1 to 6 digits. These numbers represent 80 separate columns marked on a special index card. The numbers are not written in by hand, but holes are punched by a special machine in appropriate positions. Each card expresses the results of one ballistic test, and by means of the holes, the cards can be readily sorted out mechanically so that all the cards of one set will have one factor number in common. Repeated sorting shows the effect of variation of one or more factors on the others.

As an example, suppose 6,000 cards are available representing more or less complete results of 6,000 tests on a certain gun. It is required to obtain the variation in range and displacement relative to target with length of projectile fired and state of wear of gun.

With the machine these factors can be separated within 2½ hours, using unskilled labour. If the analysis is carried out without mechanical help, the author reckons that at least one month will be required using two fully trained assistants.

The Effect of the Weather on the Spotting of Aircraft by Sound Waves. (D. Lautner, Luftwehr, Vol. 5, No. 7, July, 1938, pp. 282-284.) (59/3 Germany.)

The rays of sound are only straight lines if the atmosphere is at a uniform temperature and at rest. The normal temperature lapse rate (.6°C. per 100 m.) causes the sound rays to bend upwards, the radius of curvature being of the order of 100 k.m. Similar deflections are produced by the presence of wind. In this case, however, the curvature is no longer symmetrical with regard to the source. An increase in wind velocity with altitude of the order of 1 m/sec. per 100 m. is approximately equivalent to a decrease in temperature of 1.7°C. per 100 m. altitude on the windward side of the source together with an increase of the same amount on the lee side.

The rays of sound are thus bent downward on the lee side and the area of response considerably increased. Beside these relatively simple effects due to continuous change in temperature and wind speed, the sound wave may be reflected, if there is a sudden change in these factors. For temperature jumps of the order of 10° or changes in wind speed of the order of 5 m./sec., the limiting angle for total reflexion is of the order of 80°.

In addition, acoustical spotting is complicated by the phenomena of absorption and dispersion, both of which depend markedly on atmospheric conditions.

Replacement of Aircraft Material During the World War. (Luftwehr, Vol. 5, No. 7, July, 1938, p. 279.) (59/4 Great Britain.)

According to calculations carried out by Jones (The War in the Air), in order to maintain a squadron of 18 British aircraft at full strength, a further 18 aircraft were required, of which:—

6 were available as immediate reserves,
6 were stationed in close proximity to the front aerodrome,
6 were used at home for training.

On the Western Front, the average monthly losses amounted to:—

66 per cent. of the fighters (single seat)
50 ,, ,, ,, ,, ,, (two seat)
50 ,, ,, of the reconnaissance
33 ,, ,, of the bombers.

On the other fronts, the average losses only amounted to 20 per cent.

The Composition of the Russian Air Force. (Luftwehr, Vol. 5, No. 7, July, 1938, p. 279.) (59/5 Czechoslovakia.)

According to the Czech paper " Nenkow " the following table represents the present strength of the Russian Air Force:—

Army	
Fighters	1,792
Ground attack	390
Reconnaissance	2,300
Heavy Bombers	1,400
Light Bombers	900
Trainers	1,400
Total	8,182

Navy	
Fighters	2,400
Battle planes	220
Reconnaissance	490
Heavy Bombers	104
Light Bombers	300
Trainers	696
Total	4,210

It is also claimed that during the first three months of the year 50 National Factories in the U.S.S.R. produced approximately 4,000 aircraft.

Conditions for the Successful Strategical Employment of an Air Force. (G. Kitcheeff, Rev. de l'Arm. de l'Air, No. 109, August, 1938, pp. 843-857.) (59/6 France.)

The successful strategical employment of an air force depends on the proper choice of targets. Since the depth of possible penetration by air is roughly of the order of 200 miles (unless the attacker has an overwhelming superiority) it is necessary for the aircraft to be stationed relatively close to the frontier, whilst the aircraft bases as such should be well to the rear. An ideal position for the attack occurs if both jumping-off aerodromes and supply bases can be arranged along circles surrounding the enemy. Interior lines of communication which were of definite advantage to the central powers in the world war thus lose their significance and may become even a source of danger in aerial warfare.

The possibility of forcing a quick decision may have tempted an aggressor State in the past to start a war. The author considers that with the advent of the air force the chances of ending a war quickly have become much more remote, unless one side or the other can establish from the start a clearly marked mastery of the air.

According to the author this entails at least a three-fold superiority in numbers, the aircraft material being equally efficient.

Fire Sectors on Aircraft. (P. Etienne, Rev. de l'Arm. de l'Air, No. 109, August, 1938, pp. 858-870.) (59/7 France.)

The author differentiates between two types of aircraft armament:—

(1) The guns are mounted in such a way that all the vital zones can be covered irrespective of the motion of the aircraft.

(2) Certain zones of fires can only be covered if the aircraft itself is properly orientated, *i.e.*, manœuvred into position.

Obviously, the amount of orientation possible differs according to whether the aircraft operates alone or in formation. In the latter case a sufficient degree of manœuvrability may generally be obtained by adopting the so-called "dynamic formation," in which only the leader follows a fixed course. In cases, however, where a fixed formation is considered essential, the necessary manœuvres may be carried out by mobile auxiliary aircraft accompanying the main squadron.

The author is of the opinion that the type of armament requiring a certain amount of orientation of the aircraft is preferable to the type in which the gun mountings are such as to enable all zones to be covered.

Flying Display at Touchino. (Les Ailes, No. 899, 8/9/38, p. 5.) (59/8 U.S.S.R.)

The display took place over the aerodrome of Touchino (near Moscow) on August 18th. The programme consisted of four parts:—

(1) Fly past of about 100 aircraft belonging to Ossoaviakhim (workers' flying clubs).

(2) Presentation of new civil and military types.
(3) Mock attack on ground targets placed on the aerodrome.
(4) Mass parachute jumps.

According to the French author, the display was much less interesting than that of last year. All the machines shown were several years old, with the exception of a six-seater transport, obviously inspired by the American Northrop.

The absence of new military types in the display may be accounted for by the military situation. A more probable explanation is the whole-sale " purging " of scientific staffs which is known to be taking place, and which must render new work practically impossible.

The Attack on Aerial Bases. (Rev. de l'Arm. de l'Air, No. 108, July, 1938, pp. 723-725.) (59/9 France.)

The war in Spain has shown that successful attacks on aerial bases are relatively rare. Yet bearing in mind the size of our own military aerodromes such attacks should be relatively easy, provided the bombers can get through.

Now the absence of highly organised signalling devices over the Spanish territory, together with the relatively small distances involved, should make interception a matter of difficulty. If attacks are nevertheless rare, the reason must be sought in the rudimentary nature of the bases, their small size and dispersion. Actual war conditions have demonstrated that the large aerodromes, comfortably fitted up, are unnecessary. Instead of a large flying field with a perfect surface, a single runway is provided and the machines are housed at some distance. The simple equipment makes frequent changes of locality possible, and it becomes a matter of difficulty to spot the actual position. Only low altitude bombardment can be effective and machines capable of carrying out this form of attack can ill be spared from the fighting front.

On the Stability of a Viscous Liquid between Rotating Co-axial Cylinders. (J. L. Synge, Proc. Roy. Soc., Series A, Vol. 167, No. 929, 5/8/38, pp. 250-256.) (59/10 Great Britain.)

The differential equations of the characteristic value problem for the small disturbance of a viscous liquid contained between two rotating co-axial cylinders are put into convenient form. From these is deduced an expression for the real part of the characteristic number occurring in an exponential time factor, the expression involving integrals in which the integrands contain the product of a characteristic function or one of its derivatives by the complex conjugate. If the circulation at the outer cylinder is greater than that at the inner cylinder and has the same sign ($w_2 r_2^2 > w_1 r_1^2 > 0$) the signs of these integrals are known without knowledge of the characteristic functions, and it is found that the steady motion is stable under the condition stated. Unlike the work of G. I. Taylor on this problem, the present theory involves no approximations based on the thinness of the layer of liquid, but (as in Taylor's work) the only disturbances considered are those which are independent of the azimuthal angle and periodic in the direction of the generations of the cylinders.

The Dornier Wind Tunnel. (H. Schlichting, L.F.F., Vol. 15, No. 3, 20/3/38, pp. 95-100. Available as Translation T.M. 868.) (59/11 Germany.)

After completion of the required calibrations, the Dornier open-throat tunnel is now in operation.

The following are the principal characteristics :—

Elliptic working section	3 × 4 m.
Length	7 m.
Max. air speed	60 m./sec.
Max. h.p.	800

The tunnel compares favourably with other installations (both German and foreign) as regards uniformity of velocity, static pressure and direction of air stream. The turbulence factor is low. The present equipment includes one three-component and one six-component balance.

Concerning Secondary Flow in Straight Pipes. (L. Howarth, Proc. Camb. Phil. Soc., Vol. 34, Part 3, July, 1938, pp. 335-44.) (59/12 Great Britain.)

The condition for the existence of a secondary flow in a straight non-circular pipe is determined according to the modified vorticity transfer theory, using Goldstein's assumed form for the tensor. It is shown that a secondary motion arises if the mixture length is not constant on the curves along which $|\operatorname{grad} u|$ is constant u being the velocity parallel to the axis of the pipe.

When turbulent flow problems are treated by this theory, the quantity $p+\frac{1}{2}\rho\overline{q'^2}$ plays a part analogous to that of pressure in laminar flow ($\overline{q'^2}$ being the mean value of the square of the velocity fluctuation and p the mean pressure). In two-dimensional flow through a channel the theory shows the existence of a gradient $p+\frac{1}{2}\rho\overline{q'^2}$ across the channel from the central plane to each wall. Qualitative arguments are employed to show that a secondary flow is to be expected near the short sides in the case of turbulent flow through a straight rectangular pipe of large length/breadth ratio.

Equations are given for the secondary flow through an almost circular elliptical pipe, the mixture length being assumed constant on ellipses similar to and concentric with the pipe section. As a first approximation the problem is reduced to the numerical solution of three simultaneous ordinary, linear differential equations.

Airfoil Theory for Non-Uniform Motion. (T. v. Kármán and W. R. Sears, J. Aer. Sci., Vol. 5, No. 10, August, 1938, pp. 379-90.) (59/13 U.S.A.)

The basic conceptions of the circulation theory of aerofoils are reviewed briefly, and the mechanism by which a " wake " of vorticity is produced by an aerofoil in non-uniform motion is pointed out.

The general results are applied first to the case of an oscillating aerofoil and then to the problem of a plane aerofoil entering a " sharp-edged " gust. In the latter case the rate of increase of the lift after the entrance of the aerofoil into the gust boundary is determined, and it is shown that during the entire process the lift acts at the quarter-chord point of the aerofoil.

The intention of the authors has been to make the aerofoil theory of non-uniform motion more accessible to engineers by showing the physical significance of the various steps of the mathematical deductions, and to present the results of the theory in a form suitable for immediate application to certain flutter and gust problems.

Investigation of a Flow of Compressible Gas in a Curved Channel. (V. G. Galperin, Trans. Centr. Hydrodyn. Inst., Moscow, No. 302, 1936, pp. 1-15.) (59/14 U.S.S.R.)

In a previous paper F. Frankl discussed a simple case of a curved channel in which the gas flow contains a supersonic region (velocity distribution being continuous). The form of the channel was obtained by approximate calculations based on existing theory. The present paper describes an experimental investigation of the above-mentioned channel. The data obtained show the presence of a supersonic region which undergoes transition into the subsonic one, not continuously, but in the form of shock waves. An attempt is made to explain this disagreement between theory and experiment.

Eddy Resistance of Theoretical Aerofoils. (A. Kosmodemiansky, Rept. Centr. Aero-Hydrodyn. Inst., Moscow, No. 317, 1937, pp. 1-58.) (59/15 U.S.S.R.)

The drag caused by break away of the flow on circular and elliptical cylinders and on symmetrical profiles is determined by means of Kármán's vortex streets. The calculation necessitates a knowledge of the breadth of the vortex street and of the intensity of the vortex. The author assumes that in the case of potential flow around a cylinder in a uniform flow parallel to its axis, the actual flow conditions shortly after break away of the first vortex can be represented with good approximation by means of two symmetrically placed vortices, at an as yet undetermined distance from the suction side. The position and intensity of the vortex are determined from the following conditions :—

1. Distance between the vortices (breadth of the vortex street) must be equal to the distance between the points of break away on the upper and lower sides of the body.

2. The velocity of the vortex at right angles to the direction of incident flow must be zero.

3. The points of break away corresponding to the theoretical flow as defined above must agree with those observed. For the sake of simplicity, the last condition is replaced by that stating that the pressure minima in the theoretical and actual flows must agree. Calculations are carried out for the laminar flow condition; the turbulent condition was investigated only in the case of a circular cylinder. Numerical values for the vortex drag are given only for the circular and the elliptical cylinder. Agreement between calculation and measurement is quite satisfactory.

On Some Reciprocal Relations in the Theory of Non-Stationary Flow. (I. E. Garrick, N.A.C.A. Report No. 629, 1938.) (59/16 U.S.A.)

In the theory of non-stationary flows about aerofoils, the lift functions, proposed by Wagner and Theodorsen, respectively, are of fundamental significance. This paper reports on some interesting relations of the nature of Fourier transformations that exist between these functions. General problems in transient flows about aerofoils may be given a unified broad treatment when these functions are employed. Certain approximate results also are reported which are of notable simplicity, and an analogy with transient electrical flows is drawn.

On the Stability of Vortex Sheets. (G. I. Petrov, Rept. Centr. Aero-Hydrodyn. Inst., Moscow, No. 304, 1937, pp. 1-23.) (59/17 U.S.S.R.)

By using the method of small vibrations the author first of all investigates the case of a plane, infinitely thin vortex sheet and finds that this is unstable under all kinds of disturbances. This result is then applied to the layer of separation of a circular jet. In this case an ideal fluid is assumed. When the vortex sheet is of finite thickness it is found to be unstable to disturbances above a certain wave length, but is stable to disturbances below this wave length. A disturbance wave length is found for which the amplification of the disturbance motion reaches a maximum value. Two plane parallel vortex sheets of finite thickness behave similarly so that they break away in a vortex sheet of unsymmetrical arrangement. The cylindrical circular ring vortex sheet also behaves in an analogous manner.

Wing Profiles under Conditions of Imperfect Lift. (F. Weinig, L.F.F., Vol. 15, No. 8, 20/8/38, pp. 383-391.) (59/18 Germany.)

The lift and moment of an aerofoil are materially affected by the position of the confluence point (juncture of air streams at the rear of the wing). The position of this point is affected by the Reynolds number, the degree of turbulence of the air stream, surface roughness and boundary layer control.

If the point of confluence lies exactly on the trailing edge of the wing, the lift is said to be perfect. The author shows that the moment of the air force is independent of the position of the point of confluence, provided the moment is referred to a special point, designated as the centre of the profile.

The moment can, therefore, be calculated if the lift is known, and vice versa.

Alternatively, knowing the lift, the position of the point of confluence and the pressure distribution along the profile surface can be calculated (except for the region in close proximity to the trailing edge).

Calculation of the Critical Velocity for the Two-Dimensional Case of an Aerofoil Fitted with Aileron. (G. Ellenberger, L.F.F., Vol. 15, No. 8, pp. 395-404.) (59/19 Germany.)

The object of this paper is to supply a simplified method suitable for preliminary investigations, damping being neglected. In an appendix, the author shows how aileron damping can be allowed for.

The principle of the method is similar to that first published by Kussner in 1929 (L.F.F. Vol. 4, No. 2, pp. 41/62). The author, however, introduces the aerodynamic force in a novel form, so that the effect of a variation in the relative chord ratio, *i.e.*, $\left\{\frac{\text{chord of aileron}}{\text{chord of complete wing}}\right\}$ can be readily investigated.

Propeller Efficiencies at High Flying Speeds. (G. Bock and R. Nikodemus, L.F.F., Vol. 15, No. 7, 6/7/38, pp. 334-339.) (59/20 Germany.)

The author shows that the possible efficiency of a propeller can be most suitably expressed in terms of two dimensionless factors. The first of these (so-called tip speed characteristic) combines the engine and propeller characteristics and is of the form

$$(n^2N/\rho)^{1/5}/V_R$$

whilst the second factor is the dimensionless flying speed V/V_R.

In the above

N = h.p. of engine.
n = r.p.m.
ρ = density.
V = flying speed.
V_R = resultant air speed at propeller tip.

It appears that propeller efficiency maxima occur at flying speeds of the order of 650 km./h. and that the efficiency diminishes rapidly for greater flying speeds. The rapid increase in rotary losses is mainly responsible for this decrease and it as yet impossible to state whether the difficulty could be overcome by fitting contrary rotating propellers or guide surfaces.

An increase in efficiency is theoretically possible if the tip speed characteristic is reduced below current values (large diameter propeller rotating very slowly).

It seems, however, that in this case the increase in weight of propeller and reduction gear will more than make up for any possible gain in efficiency.

Hydrodynamic and Aerodynamic Tests of Models of Floats for Single-Float Seaplanes. (J. B. Parkinson and R. O. House, N.A.C.A. Tech. Note No. 656.) (59/21 U.S.A.)

Tests were made in the N.A.C.A. tank and in the N.A.C.A. 7- by 10-foot wind tunnel of two models of transverse-step floats and three models of pointed-step floats considered to be suitable for use with single-float seaplanes. The models were designed at the N.A.C.A. tank as part of a programme having for its object the reduction of the water resistance and spray of single-float seaplanes without reducing the angle of dead rise believed to be necessary for the satisfactory absorption of the shock loads.

All the models were tested in the N.A.C.A. tank free to trim at one gross load. The results indicated that all the models have less resistance and spray than the model of the Mark V float and that the pointed-step floats are somewhat superior to the transverse-step floats in these respects.

The aerodynamic drag of the models was also determined in the N.A.C.A. 7-by 10-foot wind tunnel at angles of pitch from $-10°$ to $16°$.

Operating Characteristics of Large Flying Boats. (W. K. Ebel, J.S.A.E., Vol. 42, No. 8, August, 1938, pp. 7-12.) (59/22 U.S.A.)

The author discusses the operating characteristics of the present-day large flying boats and probable future trends as affected by the operating conditions, as compared with land transports. Among the various operating characteristics considered are water-handling (including spray formation and porpoising), flight characteristics, arrangement of crew and equipment, flying models, and seaworthiness. Of special interest is a discussion of the use of flying models, carrying pilot and observer, as an engineering tool to supplement wind-tunnel and towing-basin tests.

Theoretical Study of Various Aeroplane Motions after Initial Disturbance. (Fr. Haus, Bull. du Service Technique de l'Aeron., No. 17, June, 1937. Available as Translation T.M. 867.) (59/23 France.)

The study of the dynamic stability of aeroplanes by the method of small motions involves the determination of oscillatory and aperiodic motions. There are a great number of well-established methods for the calculation of the periods and the damping factors of these motions but which do not, in general, give any indication of the amplitudes of the motions set up. In the present paper the author, with the aid of a number of numerical examples, attempts to clarify the phenomena arising after a series of typical initial disturbances. It will be found that the results of these calculations contribute to an understanding of the mechanism of the motions which are set up, and it is hoped that the results, although limited to particular cases, will facilitate the study of the motions and flight paths. In the present study, the longitudinal and lateral motions are considered separately and the general theory is not considered.

Tank Tests to Show the Effect of Rivet Heads on the Water Performance of a Seaplane Float. (J. B. Parkinson, N.A.C.A. Tech. Note No. 657, July, 1938.) (59/24 U.S.A.)

A 1/3.5 full-size model of a seaplane float constructed from lines supplied by the Bureau of Aeronautics, Navy Department, was tested in the N.A.C.A. tank, first with smooth painted bottom surfaces and then with round-head rivets, plate laps, and keel plates fitted to simulate the actual bottom of a metal float. The percentage increase in water resistance caused by the added roughness was found to be from 5 to 20 per cent. at the hump speed and from 15 to 40 per cent. at high speeds. The effect of the roughness of the afterbody was found to be negligible except at high trims.

The model data were extrapolated to full size by the usual method that assumes the forces to vary according to Froude's law and, in the case of the smooth model, by a method of separation that takes into account the effect of scale on the frictional resistance. It was concluded that the effect of rivet heads on the take-off performance of a relatively high-powered float seaplane is of little consequence but that it may be of greater importance in the case of more moderately powered flying boats.

Wind Tunnel Tests of Three Lateral Control Devices in Combination with a Full-Span Slotted Flap on an N.A.C.A. 23,012 Airfoil. (C. J. Wenzinger and M. J. Bamber, N.A.C.A. Tech. Note, No. 659, Aug., 1938.) (59/25 U.S.A.)

A large-chord N.A.C.A. 23,012 aerofoil was tested in the closed throat 7- by 10-foot wind tunnel. The aerofoil extended completely across the test section, and two-dimensional flow was approximated. The model was fitted with a full-span slotted flap having a chord 25.66 per cent. of the aerofoil chord. The ailerons investigated extended over the entire span and each had a chord 10 per cent. of the aerofoil chord. The types of ailerons tested were: retractable ailerons, slot-lip ailerons using the lip of the slot for ailerons, and plain ailerons on the trailing edge of the slotted flap.

The data are presented in the form of curves of section lift, drag, and pitching-moment coefficients for the aerofoil with flap deflected but with ailerons neutral, and of rolling-moment, yawing-moment, and hinge-moment coefficients calculated for a rectangular wing of aspect ratio 6 with a semispan aileron and a full-span flap.

For the ailerons investigated the data indicate that, from considerations of rolling and yawing-moments produced and of stick forces desired, the retractable aileron is the most satisfactory means of lateral control for use with a full-span slotted flap.

Moments, Centrifugal Force and the Variable Pitch Propeller. (M. Baumann, Schweiz. Bauztg, 1938, Vol. III, pp. 113-117.) (59/26 Germany.)

Various types of variable pitch propellers are described and the problem of determining the balance weights for propellers of this type is discussed in detail.

Wind Tunnel Investigations of Aeroplane Spin, taking into Account the Radius of Rotation. (P. Jourachenko and E. Verjanskaya, Trans. Centr. Aero-Hydrodyn. Inst., Moscow, No. 260, pp. 1-74, 1936.) (59/27 U.S.S.R.)

The operating principle of the C.A.H.I. arrangement for investigations of spin depends on the simplifying assumption that the axis of spin passes through the centre of gravity of the aeroplane, consequently the radius of spin $r=O$. Experimental operation with values of r differing from zero leads to considerable complication of the apparatus and the technique of measurement (this has been done in a few foreign laboratories). As far as the calculation is concerned, the authors get round this difficulty by transforming and simplifying all the general equations of motion for spin, so that they obtain an easily applicable correction formula for $r \pm O$; thus the previous apparatus can still be used. It is shown that the correction factors for the aerodynamic forces and moments are nearly all unimportant. On the other hand the moments of the centrifugal forces require considerable correction. The present experiments are modified so that by means of special mass balance the inertia ellipsoid is converted into a sphere. The experiment thus only evaluates the aerodynamic effects. The rolling moment correction and the centrifugal force moments are then calculated. The method and scheme for calculation are illustrated by calculations for two types of aeroplanes.

Temperature Distribution on an Aircraft Wing: Application to the Problem of De-Icing. (E. Brun, Publ. Sci. Tech. Ministere de l'Air, No. 119, 1938, 47 pp.). (59/28 France.)

Contents. 1. Theoretical study of the distribution of temperature on a solid undergoing relative motion in a fluid. 2. Experimental arrangement for studying the distribution of temperature on an aeroplane wing. 3. Results of tests carried out on a model. 4. Results of tests carried out on a wing. 5. Applica-

tion of the temperature measurements made on the wing. 6. Note on ice formation on aircraft.

Ice can only commence to form on a wing at a temperature of less than or equal to o°C. Since the aeroplane is everywhere at a higher temperature than the atmosphere, the cloud must be at less than o°C. The thermal effects produced at the contact boundary between the wing and the air tend to oppose ice formation, since the temperature differences between different parts of the aeroplane and the air increase approximately as the square of the velocity, the frequency of ice formation should diminish in the future as speed increases. The best thermal-electrical method of preventing ice formation appears to be that of covering the external surface of the leading edge of the wing with a resistance. Ice formation is most likely to occur at air temperatures above $-8°$, *i.e.*, when the wing temperature is just below zero, hence the electrical power required to prevent ice formation will not be great. Formation of frost on the wing is accompanied by a rise in temperature which raises the deposit to o°C. A curve is given showing the energy in kilojoules necessary to remove ice.

Assumed Loads Due to Aerodynamic Forces on Aircraft. (G. Siegel, 173 pp., 1938, published by C. J. E. Volckmann, Berlin, Charlottenburg.) (59/29 Germany.)

Contents. I. Evaluation of Assumed Loads:—Effect of constructional data (flying weight, surface loading, span, profile, aircraft drag, airscrew thrust, dimensions of ailerons and landing flaps, shape of tail unit, etc.). Effect of performance data (highest horizontal dynamic head, diving flight dynamic head, diving from the serviceable ceiling height, rate of descent when landing).

II. Summary of the Necessary Data:—Evaluation of polars, longitudinal moment equilibrium, lift distributions, calculation of the maximum horizontal dynamic head in the neighbourhood of the ground, the dynamic head during diving and the rate of descent at 0.9Ca max.

III. Preliminary Discussion of Load Cases:—The fundamental load condition; load condition under the action of gusts and when using the ailerons, elevator or rudder; additional stress due to the airscrew; overlapping of the load conditions; unsymmetrical reduction of the air forces from one side; summary of all cases of loading.

IV. Calculation of Individual Important Cases of Loading.

V. Calculation of Loads on the Tail Unit.

Bibliography.

Floating Islands, Catapult Ships, Pick-a-Back Aircraft. (W. Zuerl, No. 25 of Handbooks for the Aircraft Constructor, published by C. Pechstein, Munich, 1938, 95 pp.) (59/30 Germany.)

The booklet is almost entirely devoted to aircraft catapults and descriptions are given of the four German Catapult ships Westfalen, Schwabenland, Ostmark and Fuesenland.

Effect of Shape of Wing on the Distribution of Load Along the Span and on the Longitudinal Stability. (A. B. Risberg, Rept. Centr. Aero-Hydrodyn. Inst., No. 335, 1937, pp. 1-80.) (59/31 U.S.S.R.)

Lift distribution is calculated for a wing of any shape, in particular for a trapeze wing, with and without a rectangular central section, by a method which is a modification of that proposed by Lotz. Instead of using the angle of incidence function $a(\delta) \sin \delta$ and the chord function $\{ t_0/t(\delta) \} \sin \delta$ the functions $a(\delta) \{ t(\delta)/t_0 \} \sin \delta$ and $t(\delta)/t_0$ are developed. The chord function used by the author is often easier to expand than that of Lotz. The system of equations which is obtained for the unknown coefficients of the Fourier expansion for the circulation distribution, is not so sharply defined as in Lotz system; it can,

however, be solved by successive approximations. The author gives a complete explanation of the calculation for plane and twisted wings, with and without ailerons. The lift and moment coefficients for trapeze wings, with and without rectangular central sections, and of various aspect ratios and tapering are given in numerous diagrams. Comparisons are made between the calculated results and experimental results obtained by Wolkoff, Glass, Silman, Blenk and the Göttingen Research Institute. They show good agreement.

Wing Flutter when Taking into Account the Vibrations in the Direction of Greatest Stiffness. (P. M. Riz, Rep. Centr. Aero-Hydrodyn. Inst., Moscow, No. 340, 1937, pp. 1-20.) (59/32 U.S.S.R.)

When calculating the critical velocity it is usual to take into account only two degrees of freedom, namely, torsion and bending at right angles to the surface of the wing; the third degree of freedom, namely, bending in the direction of the wing surface, is neglected and the angle of incidence put equal to zero. Experiments carried out on a symmetrical streamlined strut showed that instead of it having the calculated critical velocity of 60 m./sec., flutter already occurred at a velocity of 8 m./sec. and at an angle of incidence below 7-8°. On increasing the angle of incidence, this flutter disappeared. In this case the vibration occurred noticeably in the direction of the greatest axis. This provided a reason for carrying out the calculation with all three degrees of freedom; this was done by Galerkin's method starting out from the steady air forces, with the result that at small angles of incidence the critical velocity came down to zero. Consequently in the case of very slim wings, particularly in presence of an airscrew, all three degrees of freedom must be taken into account.

On the Disturbed Motion of a Gas with a Boundary Layer. (D. Kuchemann, Z.A.M.M., Vol. 18, No. 4, 6/9/38, pp. 207-222.) (59/33 Germany.)

The two-dimensional motion of an inviscid compressible fluid is considered, the flow being parallel to a wall. The velocity is constant outside the boundary layer and decreases linearly inside the layer. If a small disturbing wave motion is superposed on the flow, two cases may arise:—

(1) For a set of characteristic discrete values of the wave velocity, the disturbance vanishes at infinity.

(2) Waves of finite amplitude at infinity may exist on the other hand for a continuous manifold of wave velocity values.

Typical flow diagrams are given by the author for both kinds of motion. In case 1, no trace of eventual turbulence could be detected. For case 2, the waves penetrate into the boundary layer and are reflected by it. The diagram shows in this case certain zones of return flow near the wall.

Measurement of Aileron and Flap Moments in Flight. (R. Schmidt, L.F.F., Vol. 15, No. 8, pp. 405-408.) (59/34 Germany.)

The force in the control lever is recorded by incorporating a special measuring device consisting of two tubes sliding one inside the other. The relative displacement of the tubes is controlled by a number of leaf springs arranged on a cross-head, the deflection being recorded by the D.V.L. scratch method. Knowing the force in the control rod, the couple follows at once from the dimensions of the lever system.

The results in flight differ appreciably from those obtained on a model in the wind tunnel. It appears that the air flow round the flap or aileron is not affected to a very marked extent by the presence of the wing if the width of slot is appreciable.

The flow is thus determined by the Reynolds number of the fitting (flap or aileron) rather than that of the complete wing.

To obtain reliable data thus may require models of relatively large size.

Surface Finish Related to Wear in Internal Combustion Engines. (K. W. Connor, J.S.A.E., Vol. 42, No. 8, August, 1928, Transactions pp. 305-12.) (59/35 U.S.A.)

Until recently, investigation of wear, lubrication, and maintenance of operating tolerances in internal combustion engines have been handicapped by the lack of factory type equipment which would permit standardised measurement in all conditions of manufacture and service.

The adoption of this combined new equipment indicates new opportunities for expansion of existing investigating technique; promises greater correlation of data on the causes of wear, and increased efficiency in production processing.

Cylinder Wear. (C. G. Williams, Autom. Eng., Vol. 28, No. 374, 17/8/38, pp. 289-294.) (59/36 Great Britain.)

The following are the main conclusions of the fourth Interim Report of the I.A.E. Research Committee:—

(1) Both cylinder and piston ring wear is reduced by increasing the width of the rings.

(2) Cylinder wear is principally due to the rings and the nature of the piston material (*i.e.*, cast iron or Al. alloy) has no effect, provided other factors such as ring groove clearance remain normal.

(3) The cylinder wear is the same for fresh or used oil.

(4) A chromium plated barrel with normal rings under intermittent operating conditions showed very marked reduction in cylinder and ring wear.

Continuous tests with chromium plated rings in a plain barrel also showed a considerable reduction in ring/cylinder wear.

Measurement of Mechanical Power. (C. V. Drysdale, Jun., Inst. Eng. Journal, Aug., 1938, pp. 499-531.) (59/37 Great Britain.)

Methods of mechanical power measurement are surveyed and it is concluded that there is a need for instruments and devices for measurement of engine power under operating conditions.

Brief descriptions are given of such instruments as belt dynamometers, pivoted electric generators (torque reaction) and torsion meters. Modern electrical devices are discussed with reference to an Air Ministry torsion meter based on the Ford induction meter, and a mechanical watt meter depending for its working on the voltage phase difference of two alternators mounted on the driving shaft. Suggestions are made regarding power measurement devices of low cost and small size, adaptable to motor vehicles.

Acoustic Vibrations and Internal Combustion Engine Performance, Part I, Standing Wave in the Intake Pipe System. (P. M. Morse, R. H. Boden and H. Schecter, J. Appl. Physics, Vol. 9, 1938, pp. 16-23.) (59/38 U.S.A.)

The vibration process in the intake pipe system of a single-cylinder four-stroke Otto engine has been investigated mathematically. The valve control produces stationary waves in the inlet pipe which can cause large pressure variations at the valve; these are considerably affected by the length of the pipe. The pressure variations at the inlet valve become greater if one of the harmonics of the engine speed should coincide with the national vibration frequency of the pipe or one of its harmonics. The equations of the vibration process are deduced for a simplified intake system. In particular, the conditions under which the vibration can produce additional charging of the working cylinder are indicated.

Testing of Hypoid Lubricants. (C. F. Prutton and A. O. Willey, J.S.A.E., Vol. 42, No. 8, August, 1938, pp. 325-34 (Transactions).) (59/39 U.S.A.)

A comparison is made of a number of test methods including: film-strength machine tests; various types of continuous-load tests; laboratory shock tests; and

road shock tests. This work has been in progress for more than fifteen months, has involved more than 50 lubricants, and more than 150 individual gear tests, each test requiring the use of a new set of gears.

The results of these tests indicate deficiencies in some of the lubricants under certain of the extreme conditions employed. Of the commercial lubricants studied, those that passed the laboratory shock test lubricate hypoids quite satisfactorily under practically all other test conditions where normal temperatures were used. The performance of the lubricants in the gear tests seems to bear but a slight relation to film-strength data as obtained on laboratory test machines.

Alternative Fuels—The Case for Vegetable Oils. (Autom. Eng., Vol. 28, No. 374, Aug., 1938, p. 298.) (59/40 Great Britain.)

The operation of transport Diesel engines on certain vegetable oils present no special difficulties apart from preheating the oil in order to reduce its viscosity. In general a reduction in power output of the order of 10 per cent. together with an increase in specific fuel consumption of the same order has to be reckoned with compared with standard oil.

Certain of the oils (ground nut and palm oil) are likely to have a corrosive effect on copper and iron, but it is thought that this is only a minor problem which could be overcome by the metallurgist once a demand for this type of fuel arises.

The high cost of these oils in England (£10-£20 a ton) rules them out for transport work, but different considerations apply in the east and in certain colonies where petroleum fuels are more expensive and the vegetable oils are produced locally.

For this reason the question is receiving the official attention of the French, Belgian and Italian governments.

Sensitivity of the Immersed Venturi Pitot Head at Low Speeds. (C. Salter, Phil. Mag., Vol. 26, No. 174, August, 1938, pp. 272-289.) (59/41 Great Britain.)

The simple venturi combined with a total head tube is not so convenient as the vane anemometer, but it can be made to give a pressure difference of many times that of the pitot static at speeds of the order of 10 feet/sec.

Unfortunately the immersed venturi is subject to a considerable scale effect at low Reynolds numbers and the performance of the instrument depends both on its overall size and shape.

The author carried out experiments with a series of venturis fitted with various inlet cones, the maximum diameter being app. 1in. and the overall length 4in. The wind speeds ranged from 0-10 feet/sec. For the best arrangement finally adopted, the sensitivity (at 10 feet/sec.) was app. 5 times that of the standard pitot static, falling off to $2\frac{1}{2}$ times at air speeds of the order of $2\frac{1}{2}$ feet/sec.

On account of difficulties in reproduction the author concludes that this type of instrument is not suitable to act as an accurate standard low speed anemometer, but that the information obtained during the course of the experiments may prove useful in low airspeed researches.

A Mechanical Optical High Speed Indicator. (S. G. Bauer, Engineer, Vol. 166, No. 4310, 19/8/38, pp. 196-198.) (59/42 Great Britain.)

The pressure element consists of a twisted steel tube at the end of which a stainless steel mirror is attached. Under the action of the gas pressure, the tube undergoes a further twist which is recorded optically on a rotating film. Such torsional movement cannot be induced by any ordinary engine vibration and the camera can thus be supported separately, which is the outstanding advantage of the instrument. T.D.C. or any other reference marks are marked by the discharge flash of a thyratron circuit, controlled by suitable contacts on the engine crankshaft. (Duration of flash $47.5 \times 10-6$ seconds.) For visual observation a

rotating mirror is provided which is driven at engine speed by means of a synchronous electric motor. The same drive also operates the film drum.

Sample diagrams obtained on an oil injection engine operating at 1,500 r.p.m. are given.

The natural frequency of the pressure element is stated to be 8,200/sec., and with the recording film at 1 m. from the mirror, 1 mm. deflection corresponds to a pressure change of approximately 18lb. per square inch.

Generalised Analysis of Experimental Observations in Problems of Elastic Stability. (E. E. Lundquist, N.A.C.A. Tech. Note No. 658, July, 1938.) (59/43 U.S.A.)

A generalised method of analysing experimental observations in problems of elastic stability is presented in which the initial readings of load and deflection may be taken at any load less than the critical load. This analysis is an extension of a method published by Southwell in 1932, in which it was assumed that the initial readings are taken at zero load.

Bending Stresses in Box Beams as Influenced by Shear Deformation. (P. Kuhn, J.S.A.E., Vol. 42, No. 8, August, 1938, Transactions, pp. 319-24.) (59/44 U.S.A.)

The problem of redistribution of bending stresses caused by shear deformation on the cover sheet, which cannot be avoided even in the most favourable cases, is considered as the most fundamental problem in box-beam design. Simplifying assumptions are discussed that permit a mathematical approach to the problem. Solutions for special cases finally are combined into a method of analysis intended chiefly for box-beam wings.

Analytical formulæ are given for a simple case. With the help of these formulæ, various structural arrangements of a small transport-size wing are compared. Numerical values are given for each case to show the error introduced by using the ordinary bending theory, and also to show how much extra weight is required to make up for the inefficiency caused by shear deformation.

Torsional Vibrations in In-Line Aircraft Engines. (R. M. Hazen and O. V. Montieth, J.S.A.E., Vol. 42, No. 8, August, 1938, Transactions, pp. 335-41.) (59/45 U.S.A.)

A discussion is presented of the two-node as well as the single-node characteristics for various crankshaft systems both with regard to frequency and to severity of vibration. The effect of frequency on harmonic torque input, which is a measure of vibration severity, is also discussed. The paper shows that, with a careful selection of the vibration frequency, the harmonic torque input for various vibration orders can be reduced considerably.

A method is presented for the selection rather than the determination of vibration frequencies. It is shown that, by the careful selection of frequencies, certain harmonic orders both for single-node and two-node vibration can be minimised appreciably and/or eliminated from the normal operating range of the engine. The friction type and the dynamic pendulum type vibration damper are discussed.

The stresses brought about by vibration must be considered before an intelligent restriction of vibration amplitude can be made.

The Torsion of a Two-Spar Pyramidal Wing with Closely Placed Ribs of Great Stiffness in Flexure. (G. S. Elenevsky and V. M. Darevsky, Rep. Centr. Aero-Hydrodyn. Inst., 1937, No. 292, pp. 1-43.) (59/46 U.S.S.R.)

A method is described for calculating the stresses in pyramidal, four-boom box spars, having isosceles, trapeze cross-sections, when fixed at one side and subjected to torsion. In the longitudinal direction there are assumed to be stiff ribs, placed infinitely close together, whose cross-section increases with the height

of the beam; the wall thickness of the skin is constant and the distribution of the torsion moment is assumed to be parabolic. The longitudinal stresses are taken only by the longitudinal stiffeners (constant shear-flow distribution in the individual walls). The unknown quantities are the bending moments acting in the separate walls and their magnitude are determined from the condition that the work done in producing change in shape is a minimum. It is shown that the distribution of the torsion moment in the individual walls in the rigidly held cross-section can be determined immediately from the conditions at the fixture and the equilibrium condition. In conclusion, the effect of the geometrical parameter and stiffness parameter on the values of the longitudinal stresses is discussed.

Method of Design and Experimental Investigation of Box Spars. (A. Romaszevsky, Rept. Centr. Aero-Hydrodyn. Inst., No. 310, pp. 1-88.) (59/47 U.S.S.R.)

Ebner's method (introduction of anti-symmetrical buckling force groups) for calculating thin-walled box spars under the action of torsion, with constrained cross-sectional buckling, is applied to cellular spars with reinforced corners and having walls which are rigid only towards tension. The transverse walls are taken to be rigid (differential equations with three terms). The box spar is also stressed for transverse-force bending. In this case the walls are again taken as stable to tension only; on the tension side, each half of the cross-section of the wall is combined with the adjoining corner stiffener. In order to test the theoretical calculations tests were carried out on box spars. The bad agreement between the calculated and measured shear flows is mainly due to the fact that in the experiment the shear flows were determined only from the tensile stress in the direction of folding, by assuming a uni-axial stress condition; this assumption is not justifiable when the buckling stress is slightly exceeded.

An Approximate Solution of Several Problems of Stability of a Cylindrical Shell. (N. V. Zvolinsky, Trans. Centr. Aero-Hydrodyn. Inst., Moscow, Rept. No. 246, pp. 1-56, 1926.) (59/48 U.S.S.R.)

The problem of the stability of a circular cylindrical shell under shearing stresses applied at the edge is considered. The problem is analysed by means of Love's differential equations, which have been simplified by the author, and is also solved by the Ritz method. A cylindrical shell bounded by two generators and circular cross-sections is considered. In addition, the problem of the torsional stability of a thin-walled cylindrical pipe is solved by the Ritz method. The results obtained are compared with the theoretical and experimental results of other authors.

Relief of Internal Stress in Castings. (L. E. Benson and H. Allison, Metro-Vick. Gazette, Aug., 1938, pp. 342-7.) (59/49 Great Britain.)

With the object of obtaining information on the removal of internal stresses in castings, experiments in annealing have been carried out at different temperatures. The experimental procedure is described and results are given for annealing and growth tests on cast iron. Similar annealing tests were carried out on steel, Admiralty gun-metal and high tensile bronze specimens; summarised results are given.

Chemical Treating of Surfaces. A New Principle in Lubrication. (A. L. Foster, National Petroleum News, Vol. 30, No. 26, 1938; J. Frank. Inst., Vol. 226, No. 2, August, 1938, pp. 245-6.) (59/50 U.S.A.)

The Feritex process consists in treating the steel surface of cylinder walls, rings, pins, crank bearings, etc., with a solution of certain chemicals for a given time at a given temperature, then cleaning the treated surface and oiling. The principle involved is that of selectively removing certain constituents from the steel

to a certain depth, forming a highly polished surface without irregularities, but one which is covered with a network of microscopic pits, grooves and slits while still preserving the even level of the main portion of the finished and polished surface. The lubricant is retained in the " hollows " and supports the working parts to a degree unknown except when using extreme pressure lubricants. The chemical solution—the composition of which has not been disclosed—does not affect the heat treatment or properties of the metal obtained by heat treatment, but merely attacks the surface without affecting tolerances or manufacturing limits set by the requirements of the product.

Dynamic Strength Properties of Light Metal Alloys at Low Temperatures. (K. Bungardt, Zeit. f. Metallkunde, Vol. 30, No. 7, July, 1938, pp. 235-7.) (59/51 Germany.)

The fatigue bending strengths of both aluminium and magnesium alloys increase with decreasing temperatures down to $-65°$; this is the case particularly for the aluminium—copper—magnesium alloys, the lowest alloyed Al-Mg alloy containing 4.68 per cent. Mg, and the Mg-Mn alloy. The effect of temperature on the fatigue bending strength was not so great in the case the Al-Mg alloys having greater Mg- contents, and the Mg-Al alloy.

The impact resistance of Al- alloys is increased by lowering the temperature to $-65°$, apart from the highest alloyed Al-Mg alloy containing 7.73 per cent. Mg, the impact resistance of which remained unchanged; in the case of Mg- alloys, the impact strengths decreased somewhat from low initial values as the temperature was lowered.

Fatigue Testing of Wing Beams by the Resonance Method. (W. M. Bleakney, N.A.C.A. Tech. Note No. 660, August, 1938.) (59/52 U.S.A.)

Preliminary fatigue tests on two aluminum-alloy-wing-beam specimens subjected to reversed axial loading are described. The method used consists in incorporating one or two reciprocating motors in a resonance system of which the specimen is the spring element. A description is given of the reciprocating motors, and of the method of assembling and adjusting the vibrating system.

The following are the principal conclusions:—

1. The reciprocating motor in conjunction with a resonant system is a convenient means of applying rapid axial load reversals to large specimens such as wing beams for fatigue measurements;

2. Specimens with local asymmetries in section, such as that portion of the front wing beam which includes the cabane-support attachment, may be loaded nearly uniformly;

3. The load may be applied directly to the specimen through a layer of Wood's metal without the necessity of " building up " the ends to prevent failure at the terminals;

4. The problem of determining the stress applied to the specimen is not a simple one but will require further development; and

5. The beams tested had no outstanding weak points in fatigue but rather exhibit approximately the same resistance to fatigue around the many rivet holes and other discontinuities distributed throughout their length.

The Determination of the Meteorological Conditions of the Atmosphere by the Use of Radio Sounding Balloons. (H. A. Thomas, Proc. Roy. Soc., Series A, Vol. 167, No. 929, 5/8/38, pp. 227-250.) (59/53 Great Britain.)

The essential features of an original method of exploration are described; in this method a signal of fixed radio frequency is employed and each meteorological instrument produces a continuous variation of modulation frequency. Calibration of the meteorological parameters in terms of frequency can be made independently of the radio transmitter, and measurement of these audio frequencies at the

receiver is comparatively easy. The pressure- and temperature-measuring instruments are both arranged to produce variation of modulation frequency without the use of mechanical linkages. The cost of the apparatus is comparatively low, and reproduction in large quantities is possible.

The results obtained from a number of experimental ascents are analysed and it is shown that a high degree of reliability and accuracy is obtainable. Using the present balloon, observation of both pressure and temperature up to an altitude of about 10 km. is obtained, the accuracy of the pressure and temperature determinations being about 5 mb. and 1°C. respectively.

The Measurement of Sand Storms. (R. A. Bagnold, Proc. Roy. Soc., Series A, Vol. 167, No. 929, 5/8/38, pp. 282-291.) (59/54 Great Britain.)

In a previous paper the author described wind tunnel experiments on the conditions of wind and ground surface governing the mass flow of sand across open country.

It was found that the vertical velocity distribution of the wind is profoundly modified by the presence of the loose sand.

Expressions were obtained both for this new gradient as well as for the mass flow.

In the present paper the author describes full scale experiments carried out in Egypt to test these formulæ.

Bearing in mind the difficulty of an exact comparison (different size of grain, dunes not flat, etc.), the agreement is satisfactory, the observed difference being accounted for by change in experimental conditions.

The Law of Error and the Combination of Observations. (H. Jeffreys, Phil. Trans. Roy. Soc., Series A, Vol. 237, No. 777, 14/4/38, pp. 231-71.) (59/55 Great Britain.)

The limitations of the theoretical grounds for accepting the normal law of errors of observation are discussed, and seven series of observations capable of providing tests of its truth are examined. It is found that the X^2 test, as usually employed, is not sufficiently sensitive to establish departures from the normal law. A wider grouping, however, reduces the random error of X^2 sufficiently to show the departures clearly, though it is still less sensitive than the ratio of the maximum likelihood solution for the departure to its standard error. It appears that no form of the test is of much use when the law to be tested implies very small expectations in some of the groups.

An approximation to the method of maximum likelihood for Pearson laws of Types II and VII is developed, and extensions to Types I and IV are suggested.

Methods of combining observations following such laws and determining their uncertainties are provided. It appears that a number of discrepancies in astronomy and physics that have been accepted as systematic may turn out to be random, since with such a law large random discrepancies may occur more often than with the normal law if the mean and the mean square deviation are still used as estimates.

An Electric Mechanical Method for Solving Equations. (A. H. Schooley, R.C.A. Review, Vol. 3, No. 1, July, 1938, pp. 86-96.) (59/56 U.S.A.)

An electro-mechanical method is described for finding the real and complex roots of high-degree algebraic equations having either real or complex coefficients. This method involves the adding (by series connection) of as many simultaneously variable voltages as there are terms in the equation. Each voltage is proportional to a particular term. The roots are found by adjusting the sum of the voltages to zero. Ways are described which will permit the rapid tracing of

equations in their real and complex planes. An experimental model has been constructed for solving cubic and lower-degree equations for their real roots.

Acoustical Insulation Afforded by Double Partitions Constructed from Dissimilar Components. (J. E. R. Constable, Phil. Mag., Vol. 26, No. 174, August, 1938, pp. 253-9.) (59/57 Great Britain.)

A theoretical investigation is made of the sound transmission through a double partition constructed from dissimilar components. It is shown that the insulation is to be expected to pass through a minimum as the separation between the components is increased, just as happens in the case of double partitions constructed from similar components. The sound reduction at the minimum increases as the dissimilarity between the components increases. On the other hand for a given separation the frequency at which the minimum occurs is smallest, and the minimum consequently, of least importance, when the components are similar. It is shown that at frequencies for which the resonances of the components and the air-coupling resonance can be neglected the insulation obtainable from a double partition of given total weight and thickness is greatest when the components are similar. It is concluded that double partitions are best constructed from similar components, and some experimental evidence in support of this is quoted.

Rapid Method for Obtaining Negatives in Aerial Photography. (A. Charriou and S. Vallette, Pub. Sci. Tech. Ministere de l'Air, B.S.T., No. 79, 1938.) (59/58 France.)

Two methods are available. The first is suitable for all photographic emulsions, developing being carried out in 25-40 seconds in a bath of the following composition :—

S.T.G.1

Genol	15 gr.
Hydroquinone	15 gr.
Anhydrous sodium sulphate ...	50 gr.
Caustic soda	20 gr.
Potassium bromide	1 gr.
Water	1,000 ccs.

After being left in a 10 per cent. aqueous solution of acetic acid for a few seconds, fixing can be carried out in about 1 minute at 30°C. in a solution proposed by Lespert :—

Sodium hyposulphite	250 gr.
Liquid sodium bisulphite	25 ccs.
Ammonium chloride	60 gr.
Water	1,000 ccs.

Thus, when using normal photographic emulsions a negative is obtained in about $1\frac{1}{2}$ minutes.

The second method can only be employed in case of specially sensitive layers, *i.e.*, consisting of a very insoluble emulsion in a thin layer (this type of emulsion is now in use commercially). Treatment is carried out at a temperature of 50°C. and developing takes only 10 seconds in the following bath :—

Genol	15 gr.
Hydroquinone	15 gr.
Anhydrous sodium sulphite ...	50 gr.
Caustic soda	10 gr.
Potassium bromide	8 gr.
Water	1,000 ccs.

A developed, fixed, rinsed and dried negative can be obtained in 50 seconds.

Styroflex and its Importance for Construction of Cables. (E. Fischer and F. H. Muller, Siemens Verofft Nachrichtentechn, 1938, No. 1, pp. 121-8.) (59/59 Germany.)

The electrical and chemical properties of polystyrene and of Styroflex are described; the latter is an excellent constructional material for cables since its dielectric constant is very low. It is unaffected by water and from the chemical point of view is completely stable. Styroflex is pliable and can be easily prepared in fibre- or band-form. The material has been tested in practice and satisfied all requirements with respect to mechanical strength and electrical properties.

Stability of Two-Metre Waves. (C. R. Burrows, A. Decino and L. E. Hunt, Bell Tele. Pubs., No. B-1077, 1938, pp. 1-13.) (59/60 U.S.A.)

By continuously recording a signal of 150 megacycles over a 60-kilometre path for a year, fading of up to 20 decibels has been found. This instability was most pronounced from sunset to a few hours after sunrise. The average field strength also tended to be higher during the night. A comparison of stability over various paths from 60 to over 200 kilometres has revealed similar diurnal characteristics. For a shorter path of 30 kilometres, fading was found to be considerably less than for the 60-kilometre path.

The fading magnitude was found to be approximately the same on several 60-kilometre paths differing widely in attenuation and including both optical and non-optical paths.

Because of the nature of the variations over this 60-kilometre path an increase of 7 decibels in power would have been required to maintain the field equal to or greater than the observed mean value 99 per cent. of the time.

LIST OF SELECTED TRANSLATIONS.

NOTE.—Applications for the supply of copies of translations mentioned below should be addressed to the Under-Secretary of State, Air Ministry (R.T.P.), Kingsway, W.C.2, and will be dealt with as far as availability of stocks permit.

Suggestions concerning new translations will be considered in relation to general interest and facilities available.

TRANSLATION NO. AND AUTHOR.	TITLE AND JOURNAL.
	AIRCRAFT (CONTROL).
670 Fuchs, D.	*Wind Tunnel Experiments on Aerodynamic Brakes.* (L.F.F., Vol. 15, Nos. 1-2, 20/1/38, pp. 19-27.)
674 Stuper, J.	*Effect of Slipstream on the Wing and Tail Unit.* (L.F.F., Vol. 15, No. 4, 6/4/38, pp. 181-205.)
680 Muttray, H.	*Experiments on the Downwash Behind a Trapezoidal Wing Fitted with Fuselage and Propeller.* (L.F.F., Vol. 15, No. 3, 20/3/38, pp. 101-22.)
683 Leiss, K.	*Mass Balance of Control Surfaces.* (L.F.F., Vol. 13, No. 12, 20/12/36, pp. 430-2.)
695 Ruden, P.	*Experiments with Slotted Wings.* (Jahrbuch der Deutschen Luftfahrtforschung, 1937, Vol. 1, pp. 75-86.)
	AIRCRAFT PERFORMANCE.
433 ———	*The Performance of Modern Long Range Seaplanes.* (Flugsport, Vol. 29, No. 3, 3/2/37, pp. 79-83.)
650 Hohenemser, K. ...	*Performance Possibilities of Rotary Wing Aircraft.* (Ingenieur-Archiv, Vol. 8, No. 6, Dec., 1937, pp. 433-49.)

TRANSLATION NO. AND	AUTHOR.	TITLE AND JOURNAL.
691	Barth, W.	*The Rough Calculation of Flight Performance.* (Luftwissen, Vol. 5, No. 3, March, 1938, pp. 94-6.)

AIRCRAFT (DESIGN).

700	Lippisch, A.	*Results of Model Experiments with the Tailless Aircraft D.F.S.* 193. (Jahrbuch der Deutschen Luftfahrtforschung, 1937, Vol. 1, pp. 301-8.)
701	Seydel, E.	*A Basis for Comparing the Weight of Wing Structures.* (Jahrbuch der Deutschen Luftfahrtforschung, 1937, Vol. 1, pp. 371-6.)

AERODYNAMICS AND HYDRODYNAMICS.

145X	Schrenk, O.	*Wing with Boundary Layer Sucked Away.* (Luftfahrtforschung, Vol. 2, No. 2, 11/6/28.)
469	Frankl, F.	*Theory of Laminar Boundary Layer in Compressible Gases.* (Trans. C.A.H.I., No. 176, 1934, pp. 3-18.)
671	Cicala, P.	*Experiments on the Aerodynamic Forces Acting on an Oscillating Wing.* (L'Aerotecnica, Vol. 17, No. 12, Dec., 1937, pp. 1043-6.)

ENGINES AND ACCESSORIES.

483	Barth, W.	*Determination of the Resistance and Air Flow through Various "Cowled" Radiator Installations.* (Luftfahrtforschung, Vol. 14, No. 6, 20/6/37, pp. 300-3.)
491	von Philippovich, A....	*The Combustion Process in Explosion Engines.* (Zeit Elektrochem., Vol. 42, 1936, pp. 472-86.)
655	Skubatchevsky, G. ...	*Design of Supercharger Diffusors taking into Account the Friction Coefficients.* (Aeron. Eng., U.S.S.R., No. 9, Sept., 1937, pp. 52-67.)

MATERIALS AND ELASTICITY.

619	Geiger, J.	*The Stressing of Crankshafts.* (Autom. Tech. Zeit., Vol. 40, No. 4, 25/2/37, pp. 93-8.)
678	Ebner, H. ... ... Koller, H.	*Stress Distribution in Reinforced Cylindrical Shells.* (L.F.F., Vol. 14, No. 12, 20/12/37, pp. 607-26.)

INSTRUMENTS.

430	Myadzu, A.	*Influence of Type and Dimensions of Pressure Hole on the Recorded Static Pressure.* (Ing.-Arch., Vol. 7, No. 1, pp. 35-41.)
699	Janovsky, W. ...	*Telephonic Communication in the Presence of Noise and Wind.* (Siemens, Verofft, Geb. Nachrichtentech., Vol. 7, 1937, No. 5, pp. 873-8.)
707	Porro, General ...	*Photogrammetric Method for Determining the Speed of Aircraft and for Bombing Practice.* (Proc. of the International Congress on Photogrammetry, 1936, pp. 291-302.)

TRANSLATION NO. AND AUTHOR.		TITLE AND JOURNAL.
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